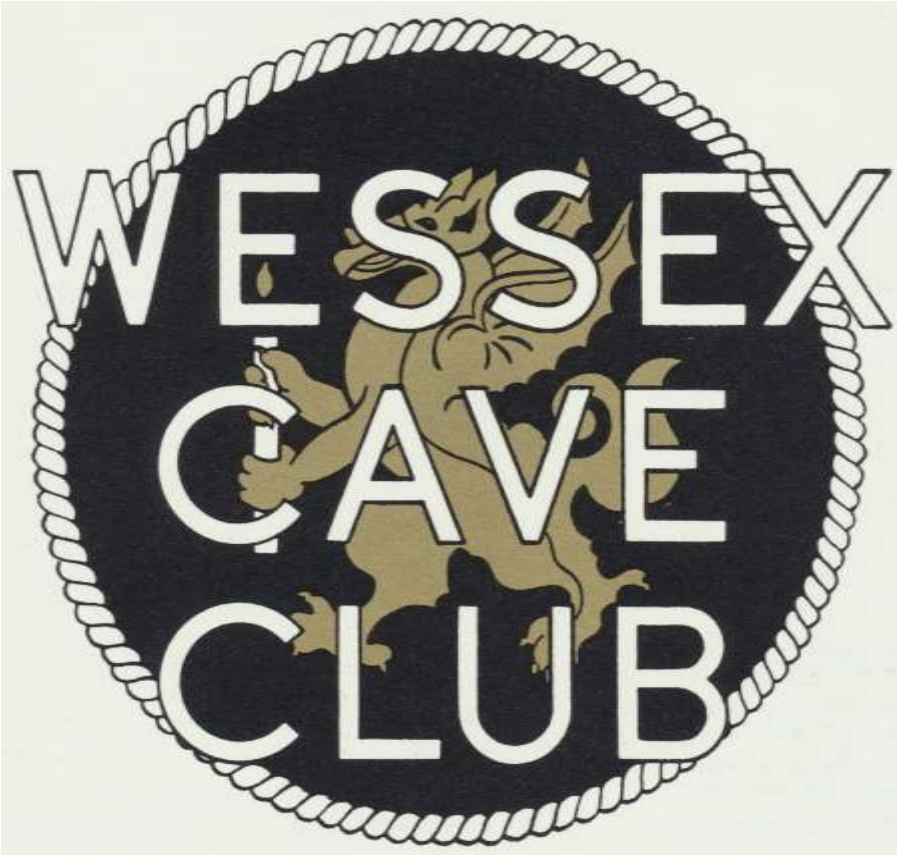

WESSEX
CAVE
CLUB

The membership list has now been brought up-to-date and we hope to publish it in the next issue. We have over 160 members plus the membership of affiliated clubs. This year a large number of members failed to pay their subscriptions until the very last moment, and due to this, there was a period when the club was in a poor financial position. Fortunately a good friend of the club came to the rescue, he wishes to remain anonymous, with a gift of £10. We would like place on record our grateful thanks to this member for his very timely help. He certainly helped the club at just the right moment.

Owing to lack of support, it was decided not to run the usual Easter trip to Yorkshire, but we were pleased to welcome a small party of the Craven Pothole dub who joined some of our members at Hillgrove. The Longwood Swallet incident resulted in a change of plans, but we hear that the meet was quite a success.

Helpers are needed to re-open Cuckoo Cleeves. This cave was discovered by a party of members of the club, but unfortunately the entrance shaft fell in towards the end of 1947. As there was a suggestion that the shaft was to be filled in, the club decided to take over the responsibility for fencing at the top of the shaft with a view to re-opening the cave. It should now be possible to make the entrance shaft quite safe after digging out a few feet of clay and rubble. We hope to do this during the two week-ends, June 18/19th and June 25/26th. Preparations so far include collection of materials to line the shaft and also three poles for the construction of a large tripod. Names please to Oliver C. Wells, Trinity College, Cambridge.

We welcome the following new members:
J.M. Fettes, R.M.C.S., Shrivenham, Nr.Swindon, Wilts.
B.E. Prewer, 14,Egerton Rd., Bath, Somerset.

Change of address

C.H. Kenney, Tudor Cottage, Beryl Lane, Wells, Som.
Dr. D.M.M. Thomson, 20 York Gardens, Bristol, 8.
W. Vawdrey, Westacre, Guildown Rd., Guildford, Surrey.
Mr. & Mrs. C. Vowles, 3 Alendale Rd., Burnham, Som.
D.B. Tanner, The Algoma Club, Copper Cliff, Ontario, Canada.
Capt. D.J. Hoare, 31 Palace Gardens Terrace, London, W.8.
E.H. Batten, 17, Victoria Sq., Bristol, 8.
Lt. T.R. Shaw, R.N., 6,Cleveland Place West, Bath, Som.
Dr. R.E. Davies, Dpt. of Biochemistry, South Parks Road, Oxford.
D.G. Goldie, Dolegarth, 8 Old Main Rd., Pawlett, Nr. Bridgwater.
R.R. Glover, 2 Hillborough Rd., Luton, Beds.
C.W. Duck, 10 Kingsley Park Ave., Sheffield, 7.
G. Applegate, Westcroft, Trowbridgc, Wilts.
Miss V. Boarland, Zum neuen Linden Hof, Kantstrasse 20, Zuric.

Future Events.

G.B. Guest Days,
Saturday 11th June. Meet at Cave, 3.0 p.m.
Note. Names must be sent to the Hon. Sec. of the Wessex Cave Club at least a week before the date.

Sec. F. Frost, 22 Wolseley Rd., Bishopston, Bristol 7. telephone Bristol 44221.
Asst. Sec. D. Thomson, 20 York Gdns., Bristol 8. telephone Bristol 36492
Treasurer, G. Williams, 1 Redhill Drive, Fishponds, Bristol.
Sec. London Group, D. Willis, 129 Broxham Road, West Norwood, London, S.E. 27

EASTWATER CAVERN.

Part III Notes on the Survey.

For more than thirty years after the opening of Eastwater, the only plan of the cave was the diagrammatic sketch first given in "Netherworld of Mendip", by H.E. Balch & E.A. Baker. The length and depth of the cave were considerably over-estimated, in fact the bottom of the Pots, 360 feet down, was shown as 500 feet, and an 800 foot route to the end of the cave was estimated at 2000 feet. To this period also belongs the name "380 foot way" for a passage less than half that length. A point of interest in the sketch is the drawing of a "Lower Great Chamber" at the end of the Pots, this being omitted in the later book, "Mendip Caves". This can only refer to the sand slope above the Terminal Rift, which if completely cleared of silt would indeed be a sizeable chamber, but why mention of it was deleted from later versions is not clear.

The first attempt at a full survey was made just before the war by J. Duck, on behalf of the M.N.R.C. Only part of the survey was done, and two groups headed respectively by N. Paddock and T.M. Blanch added to Duck's survey. The final composite map was not published, and what I believe is the only copy is in the hands of the Hon. Sec. Of course, many of the later parts of the cave were not known at that time, but comparison with our own survey shows very good agreement as far as the plan view is concerned, but there is a considerable discrepancy in depth, amounting to 40 feet at the bottom of the cave (more than 10% of the depth). The difference in the two surveys is almost directly proportional to the depth.

When the project was first contemplated, it was realised that in view of the complexity of the cave, a rather accurate survey would be essential if the finished plan was to be of value. The instruments we had at our disposal were 1) a prismatic, liquid filled A/M

compass, which could be read to ½° with practice, although the dial was only graduated in 2° intervals; 2) a mirror clinometer, which could be easily read to better than ½°; and 3) two steel tapes, 30 and 50 feet long. With instruments mounted on tripods, an accuracy corresponding with C.R.G. Grade 6 could be attained, but over a large part of the cave the use a tripod was found to be impracticable. Furthermore the mirror clinometer, by the design, could not be mounted rigidly, but had to be sighted in the hand. The compass itself, when not tripod mounted, was always placed in as stable a position as possible, and several bearings taken in each position. With these limitations we decided that a grading of C.R.G. 5 was justified. This accuracy is probably bettered, as a number of closures are available, and as all results were computed, the best mean positions were easily worked out from the co-ordinates.

Before the line survey was started, an aircraft altimeter was tested to see if it was accurate enough for lower grade surveys. The instrument was a three finger type, and could with considerable care be read to the nearest 5 feet. This was read at a number of points in the cave on five consecutive days, and the results compared with the survey and the original M.N.R.C. survey are shown in Table 1. Readings were corrected for variation in barometric pressure during each trip, one such variation making the entrance 40 feet higher when we emerged than when we entered. These results appear to indicate considerable possibilities in this type of instrument for a lower grade survey, as the readings are comparatively easy to make and used in conjunction with a hand compass and line would permit a very rapid survey to be made.

Towards the end of the survey, when a number of minor passages were being mapped, an alternative combination of instruments was used. This consisted of liquid filled, non-prismatic compass, graduated to 5° and read to about 1°, with a built in clinometer graduated

to 2°. These instruments were used for Davies' Detour, the series around Jack Brownsey's passage, parts of Ifold's series and an alternative Traverse entrance.

A number of closed traverses can be made in Eastwater, and it is possible to reach the Terminal Rift from the Boulder Ruckle by two completely distinct routes. The main line survey was divided into seven loops as follows:-

(1) Boulder Ruckle, 380 foot way, Upper Traverse, Baker's Chimney and Canyon. Boulder Chamber, Length 288 feet, misclosure 0.41%

(2) Canyon to Rift Chamber, Lower Traverse and part of Primrose Path, Upper Traverse and Baker's Chimney. Length 675 feet, misclosure on first survey 1.49% on resurvey 0.92%. The original survey misclosure was found to be largely due to an error in reading (or booking) the length on one leg.

(3) Dolphin Pot route and Two Verticals route, from the Canyon to the foot of the 2nd Vertical. Length 542 feet, misclosure 0.03%. This circuit, involving four pitches, closed with less than 2 inches error!!

(4) The Pots and Muddy Oxbow circuit, length 259 feet, misclosure 0.42%.

and with the less accurate instruments:-

(5) Baker's Chimney and alternative Traverse entrance to the east of the Canyon. Length 110 feet,misclosure 2.96%.

(6) Davies' Detour from foot of 2nd Vertical Pitch to Muddy Oxbow. Length 285 feet, misclosure 2.58%.

(7) Short Oxbow passage to the muddy Oxbow. Length 118 feet, misclosure 3.11%.

The remainder of the minor closures, such as the bypass to the S-bend, minor passages in the Rift Chamber, and Jack Brownsey's passage, were made by intersections. Except in places such as the Boulder Chamber, offsets were not generally measured, passage width and height being estimated, except in well defined passages

such as the Dolphin Tunnel. A large part of the survey was carried out by A.J. Surrall and myself with no other assistance, and this made a full supply of measured detail difficult to obtain particularly in such places as the Traverse and the Primrose Path.

Before the final plan was drawn out, the co-ordinates of all survey points were computed from the readings. This was done in duplicate, each calculation being made direct from the survey noted, enabling errors in transcription to be corrected. The compass bearing was corrected by a local magnetic variation established in each trip, using a sight to Penn Hill. The clinometer and tape needed no correction (the zero of the clinometer had been established as correct). When all the co-ordinates had been computed, the circuit misclosures as given above were found, and these were eliminated by meaning in the loops 1-4 given. The loops were weighted according to distance, but not specifically as to given survey legs, as no obvious errors could be located, except in the original Traverse loop. The minor loops 5-7 were then closed accepting the major circuit as accurate. It would have been more logical treatment of the data to include these loops as part of the major circuit and correct with weighting, but without a computing machine the amount of mathematical work involved was considered to be unjustifiable. Finally the non-circuit parts of the survey were computed and fitted to the main framework.

The eastings and northings were computed from a point at the entrance, and the vertical component as height above O.D. Armed with the three-dimensional coordinates of nearly 250 points, the survey was then plotted on three large sheets of graph paper, the upper and lower series separately, and the elevation to a smaller scale. With the skeleton plotted, the passage outline and detail was filled in from the survey notes, supplemented by notes made on later trips.

The investigation of Eastwater required over forty survey and exploratory trips to complete, during which time over 1000 measurements were made, and about 200 hours spent underground. Many helpers were involved in this thankless job, and we should like at least to record their names, as a small token of appreciation for their assistance. They are:- J. Candy, K.A. Chambers, P. Davies, R. Flavell, D. Ford, E. Hensler, R.E. Lawder, Dr. O.C. Lloyd, P. Morton, Dr. W.I. Stanton, O.C. Wells, D. & B. Williss, R. White and G. Woodhouse.

TABLE I.
Spot heights (below grating).

Station	Present Survey.	Altimeter.	Original M.N.R.C. Survey.
Head of 380 foot way	47	40 (fluctuated violently)	50
Boulder chamber ledge	63	70	-
Head of Canyon	88	80	80
Top of Slide	121	115	-
Dolphin Tunnel entrance	144	145	175
Dolphin Pot top	132	130	145
Dolphin Pot bottom	166	160	175
Top of 33' pitch	186	180	200
Bottom of 33' pitch	220	220	-
Opening of Ifold's series	178	185	appr.185
Top of Ifold's series	150	145	-
Harris' passage cat run	257	245	270
Foot of 2nd Vert. Pitch	253	240	275
Top of Pots	290	290	315
Jack Brownsey's Passage	358	350	390
Terminal choke	390	390	*

* (marked as gravel choke at 415, but passage now extends further)

Eastwater Cavern - Part IV

"The labours of Hercules".

The line survey of Eastwater was started by A.T Surrall, R. Flavell and myself, full of enthusiasm, at 7 o'clock one sunny June morning, with the thought of breakfast at the Eastwater Hut to spur us on our laborious way through the Ruckle. Unlike W.I. Stanton in his survey of Swildons; we started at the near end, pleasant enough for the first few trips, but growing steadily more arduous and less attractive. Fortunately, we had a week's caving holiday ahead of us, so that by the time we were getting disillusioned about the whole thing, there was enough of the plan on paper to make things very much more interesting. David Willis helped us with part of the major Dolphin Pot circuit, but a grim foretaste of what was to come occurred on the Two Verticals part of the route. This was the first time that Alan and myself had surveyed with no stooges, and our difficulties assumed formidable proportions. Parts this route are by no means roomy - I have a treasured memory of Alan wedged solidly in the S-bend, trying - to take forward and back bearings from a position that would have tested the abilities of a contortionist - and in many places it was quite impossible for us to pass one another. When we came to survey the Primrose Path, the difficulties became almost insurmountable for two people, but we somehow struggled through to the squeeze, with tempers somewhat frayed.

Many unsuspected difficulties came to light in the first few trips. The mirror clinometer had to have separate illumination, and to avoid making the instrument too cumbersome, Alan fixed a light on his helmet which when switched on, shone directly into his right eye. This light was in such a position that to turn sharply to the right involved the risk of gouging out his eye on the reflector. It also caused much ribald comment among other parties in the cave. Alan

also complained bitterly that every time I chose a nice convenient survey point, on his arriving there with the compass, he found that a) it was impossible to survey backwards without standing on his ear, b) it was in quite wrong place for the next leg forwards and c) it was very wet! (This point occurs in other caves. On a recent surveying trip to Hillier's cave, Derek Ford found me a beautiful survey point, easily located, on top of a stalagmite boss. Unfortunately, the drip that had created the boss was still very much in evidence, and the readings were punctuated by splashes onto the middle of the compass dial, and low but heartfelt curses from the surveyor). Some of the comments were so original that Phil Davies recorded them for posterity in the survey notes.

After our initial week's start, trips were made from time to time throughout the winter of 1952 and the summer of 1953. By this time we had decided that surveying without a stooge was, to put it mildly, inconvenient, and to remedy this defect we brought a succession of would-be cavers from Birmingham to Mendip, assuring them that in Eastwater they would find the most delightful cave in all Britain. And a succession of would-be cavers departed, sadder and wiser, nevermore to go a-caving - but the survey progressed. We had been dreading the most arduous of all the survey trips - the Primrose Pot - but as was recorded in Journal No. 41, the trip was successful, thanks to the many helpers who came to our assistance. We had already taken the line survey down to the squeeze, but we balked at getting the full equipment through that hideous slot. However, Eric Hensler came to the rescue with a tiny liquid filled compass, and the survey was made. On two stretches of the vertical the tape was too short, and measurements were made by the rungs of the alloy ladders in use, these being checked while under tension. This part of the map is necessarily less accurate than the rest, but in plan view it amounts to very little, being almost wholly vertical.

Ifold's series also provided its quota of thrills. One large boulder selected as a useful survey point vanished from underneath the compass while a reading was being taken. The wrathful roar from below left no doubt as to the direction of its passage. The Weaver-Bowen extension was almost responsible for a casualty. Keith Chambers and myself had entered this passage to carry the survey back to a point as near as possible the Rift Chamber. This done, I looked in the opposite direction, and noticed that the passage continued in a south-westerly direction as an extremely narrow rift very constricted at the bottom. With more enthusiasm than sense I penetrated along this until progress became utterly impossible - the rift is only wide enough even for a midget at certain points. At length the inevitable happened, and I became well and truly stuck. Considerable wriggling only served to make matters worse, and at length I called for assistance. With Keith's help I struggled for about 20 minutes, and eventually unjambed, and moved up into a slightly roomier part of the rift. By this time I was in no condition to negotiate the squeeze back into the Weaver-Bowen extension, and after two fruitless attempts I was forced to strip off completely. By the time I was back in the final chamber of the, Primrose Path I was utterly exhausted, and wishing I had never heard of Eastwater. After the exertion in those somewhat constricted passages, the return trip up the Primrose Path seemed like a stroll up some broad highway.

The survey of Davies' Detour was carried out while the exploration was in progress, and it was at times a battle of wills between, on the one hand, Oliver Lloyd and myself, intent on recording the exact readings between two points, and on the other hand, Phil Davies and Oliver Wells, determined to force the next of many squeezes, and mouthing imprecations on all cave surveyors who dislodged boulders onto their heads at critical

moments. We had quite a nasty moment at one point here, with apparently impenetrable squeezes on both sides of us, but as in the Weaver-Bowen extension, the removal of a few clothes worked wonders.

The end of the Eastwater survey came, as with Stanton's survey of Swildon's Hole, at one of the most remote parts of the cave - the far end of Ifold's series. Oliver Wells and myself were taking the last few measurements, and there was a sigh of relief when the tape was rolled up for the last time. A few more trips were necessary to clear up passage detail, and the last of these was a marathon, 13½ hour Primrose Pot trip. At the end I turned to Oliver Lloyd, who had endured the trip to the bitter end, and remarked that I had finished with Eastwater for ever. Two weeks later I was digging - in Eastwater.

Denis Warburton.

SAINT PAUL'S SERIES MUD SUMPS, SWILDON'S HOLE.

DISCOVERY OF PARADISE REGAINED.

Shortly after the discovery of the Saint Paul's Series we started work in the mud sumps, in an effort to discover further passages. The first four working parties consisted mostly of C.U.C.C. members, and about these trips the less said the better. We concentrated on the first mud sump (a mistake) but only made slight progress. We learnt our lessons the hard way, including 1) Bailing is hard work and takes a long time. 2) Stirrup pumps are useless underground. 3) Hot drinks are essential. 4) The water must be put far enough away to prevent it returning by another route. 5) The buckets must be large enough. 6) A box measuring 7" by 12" is too big for the St. Paul's squeeze. These trips were so unpleasant that when Denis Kemp suggested to me an attack on the second mud sump (at the end of the Lower

Fault Passage) none of the original team could be persuaded to come.

Our resumed efforts were successful during the week-end 5/6 March. A party of seven (mostly 'Land Rover Group') bailed for three to four hours on the Saturday reducing the water level by about 15", leaving a small airspace and a strong draught (out of the hole). This was the state it was in when Denis examined it last summer. On the Sunday we returned suitably reinforced and reduced the level by another four or five inches before squeezing through feet first, turning the water in the sump into liquid mud as we did so. Three members of the party carried out a brief reconnaissance which was all that time and energy allowed.

The sump itself is about three feet long and is a squeeze, with a rock roof and mud floor. It lies between a mud slope on the north side and a steep grave bank on the south side about six feet high. There is no possibility of digging a trench on either side to reduce the water level. Indeed it is a mystery why the gravel bank on the south side has not run in and made it impassable, since there is no water flow.

A low passage with sand or gravel floor and flat roof leads after a few yards into Meander Passage, which is about ten or twenty feet high and has every appearance of being a stream passage, except that it has no stream in it. Meander Passage intersects a large rift running down the dip, which in turn intersects a cross rift (presumably to the east) and at the junction a large pile of boulders can be climbed but further progress (along the cross rift) is prevented by a ladder pitch of about 20 feet. Several small passages lead off but we did not explore them.

At no point did we find any water or see any formations. The passages so far entered (200 feet or so; are mostly characterised by loose boulders and mud.

decided to call the new passages 'Paradise Regained', not only because it is appropriate but mainly because W.I.S. wrote to me once in a letter from Angola "...and don't worry about surveying Mayday Passages - go and discover Paradise Regained instead".

The original explorers hope to continue work but for various reasons this will take a long time. Top priority must be given to the removal of the mud sump which at the moment represents a very real danger. The success of this venture is due entirely to the support given by about twenty cavers who took part, and to them I express my thanks. (Tom Andrews, Richard Burn, Keith Chambers, Peter Charles, Phillip Davies, Hillary Don, Keith Evans, Ronald Gill, Denis Kemp, Oliver Lloyd,, Tom Malkin, Peter Martin, Keith Murray, Brian Prewer, Anthony Smith, Harry Smith, Eva Waller, Denis Warburton, Malcolm Wilson, Bill Youden).

O.C. Wells. 16.3.55.

A CAVE IN LEBANON.

Readers of the Journal may be interested to hear of a cave in Lebanon that formed the object of a British naval expedition last June.

Variously known as the Jeita Cave, Dog River Cave and Nahr el Kelb, the cave is occupied by a large tributary of an important river. This river, also named Nahr e1 Kelb, runs into the Mediterranean some twelve miles north of Beirut.

The underground water emerges as a swift-flowing river from beneath a low archway, but the cave system can more easily be reached from another entrance two hundred yards away.

The party from H.M.S. Bermuda carried a supply of

one-man inflatable dinghies, which were launched only a few yards from the entrance. The river here was dammed to form a wide pool, while away to the left the water roared away in rapids towards the resurgence. Upstream we were able to paddle in open water for 100 yds or so, before a huge mass of rock blocking the stream necessitated a portage. Upstream again the river flowed slowly and silently in a deep canal some 30 feet wide. The roof here was about 100 feet high, and some most attractive stalagmite formations could be seen in places on ledges high on the walls.

After rather more than a quarter of a mile's steady paddling, we were able to land and pull the boats up on a sandy spit of land on the right. A magnificent dripstone pillar, some 55 feet in circumference and 60 feet high, has been named Maxwell's Pillar after one of the first explorers of the cave. Behind Maxwell's Pillar a short climb gave access to a large platform with a who1e forest of calcite columns and bosses.

Climbing into the boats again after a short rest, we continued upstream along a very similar passage for a further 400 yards. At one point the river narrowed to such an extent that it was almost too swift to paddle against, and we landed to find an alternative way over some rocks. A great roof fall provided the next obstacle, for the water flowed through a mass of boulders over which we had to climb with the boats. A short rope descent brought us to the water again, and another 200 yards was covered in the boats without difficulty.

Then, just one kilometre from the entrance, we were brought to a standstill in a gigantic chamber, fully 300 feet high and 1000 feet long. Again the water appeared from beneath a mountain of fallen rocks, but instead of a placid river on the other side, we found only some impassable rapids where the whole river forced itself through a passage only a few feet wide.

At the end of the summer, when the water is low, these rapids can be passed by traversing above the stream, and the annual expeditions of the Speleo-Club du Liban have opened up vast lengths of cave beyond this point.

T.R. Shaw

ARTIFICIAL FORMATIONS.

It is possible by observation and comparison, to conceive some idea of how the crystalline cave formations result. The transition between the early straws of man-made tunnels like Sandford Levvy, and the heavy calcite depositions as complete as those in Stoke Lane, can be traced. Intelligent suggestions can also be made about the formation of other familiar cave decorations - wall and roof crystals, helictites,and all the others. But it is possible to make similar forms under laboratory conditions, and although these are not very regular in shape or structure, they do demonstrate some interesting points.

An article by Lyman C. Huff, in the American Journal of Geology gives further information, and the Journal can be borrowed through the Bristol Central Library, and probably through any other. Most of the experiments described employ simple apparatus, and can be fitted up at home. They include the production of artificial straws, helictites, and encrustations resembling gypsum flowers.

The simplest formations to reproduce are straws and helictites. They are best grown from sodium thiosulphate. Other soluble crystalline substances may work, but Huff used thiosulphate, and it appears quite satisfactory. Sodium thiosulphate, readily forms a supersaturated solution when a warm solution is cooled, it is also very soluble, so little evaporation is required to produce quite a lot of crystallization. The only apparatus needed is a thistle funnel, and to cause a slow steady

drip pieces of cork are pushed into the end. The quantity of cork is determined by trial and error, but half to one inch is about the best. The thistle funnel is then filled with the super-saturated solution, or with a saturated solution and a few crystals, and after a crust has formed around the end of the tube a straw forms at the rate of 1/10th - ¼ inch per day.

In this simple piece of apparatus the rate of growth is affected by two factors. These are 1) the rate of flow. This depends on the tightness of the cork, which can be varied in different experiments, and 2) the rate of evaporation. This depends on a number of subsidiary factors. It is increased by draught, and slows appreciably in wet weather. It is unlikely that the variations in level of the fluid in the thistle funnel make very much difference, but it should be topped up from time to time. When the rate of flow is rather fast straight straws tend to be formed, and when the rate of evaporation is high helictites of a kind result. Huff recommends that to grow helictites, the quantity of cork he adjusted to produce flow so slow, that dripping does not occur, the solution crystallizing before it can do so.

To quote a few results. The first I grew was just under two inches in length before it broke off under its own weight. In warmer weather one grew to 3½ inch with a kink in the middle. From time to time small projections grow out at right angles up to a quarter of an inch rapidly and stop; they then remain stationary or even slowly regress. If these be due to capillary attraction this might be expected to occur, there is no other apparent explanation. In another experiment a supersaturated solution was allowed to solidify under a straw. This produced a little soft stalagmite and then a complete column, with a mass of crystals around the base, and a crystal surface sloping away from it.

Some formations would seem easy to grow, but prove difficult when tried.

For example, there is found in caves quite frequently, growing on the end of a straw dipping into a static pool, a mass of crystals (like the Chandeliers in Swildon's Hole). A thiosulphate solution either dissolves the straw if not quite saturated or sets solid if supersaturated. The intermediate stage does not seem to occur. If a substance which does not form a supersaturated solution were used the results would doubtless be more successful. Copper sulphate would probably be quite satisfactory.

The artificial formations resemble the natural ones in appearance and in the presence of a central hollow core, but there are several differences, so analogy must not be carried too far. The most noticeable of these is the appearance on cross section. Natural straws are quite round with thin walls, whereas the experimental ones tend to be square with narrow rectangu1ar canals which are rarely placed centrally. The cave straw tends also to be quite regular in shape (unless deposition occurs on the outside) but the artificial are irregular and never entirely straight. The molecules of a calcite straw are said to be arranged as though it were fashioned from a single large calcite crystal. This does not appear to be the case in laboratory imitations. The mode of formation is, of course, very different. Natural calcite is deposited as a result of the change from calcium bicarbonate to the carbonate, a chemical change. The thiosulphate straws are deposited from a saturated or supersaturated solution, a physical change. The physical equilibrium is much more easily disturbed than the chemical, and exact analogies must not be expected.

There are many other experiments which can be done to imitate natural formations. It should be possible to make mud formations, as some of these form comparatively rapidly. The crystalline phenomena of caves are rather easier to understand than the mud formations and therefore constitute a convenient starting point when working out techniques. It is useful to photograph these structures as they grow, in order to compare the present

appearance with that several days previously. The changes are more than mere increase in length. Using thiosulphate in this way it should be possible to derive some clues as to the method of growth of any new calcite formations, although a true conception is more likely to be evinced by observation of the natural phenomena.
Donald Thomson.

AN ACCOUNT OF THE DIGGING AND EXPLORATION OF WHITSUN HOLE.

Walking Eastwards from Hillgrove, a line of sink holes and swallets can be followed for nearly half a mile. At the lower end of the field adjoining Hillgrove House to the East, there is a round pond, next to which lies the largest of these depressions. This area is shown on the maps as Valley Wood, although the trees have now been felled. Amongst the undergrowth there is evidence of at least two abandoned digs, one of them still nearly 50 feet deep.

In the next field another pond is encountered. This overflows across the wall into a deep circular sink, at the bottom of which there is a small opening. This opening, no more than a crevice between two rocks, can be shown to take alternate inward and outward draughts, rather as if it was breathing. Immediately adjoining this last sink, in the same field, which used to be Wells Hill Plantation, there is a blindly ending valley wherein lies the entrance of Whitsun Hole. The valley descending generally from South to North, collects a small stream which flows off the Old Red Sandstone to the South.

Still further to the East, the same line of sink holes extend nearly as far as the road from Green-Ore

to Whitwell Corner. Some of these are active swallets. The surface drainage off Horrington Hill to the South accumulates in shallow valleys, which feed the streams sinking into these swallets. Open holes, grass covered mounds of spoil, or the remains of timber and iron shafts, betray much hard work and disappointed hopes.

Originally this valley in Wells Hill Plantation was V-shaped, with an almost vertical face at the North End. A few trees were still dotted around, the best of the timber however had been felled during the First 'World War. In 1938 or 1939 Arscot and Frank Frost began to dig a few yards from the lowest point of the valley, where in wet weather the stream used to sink. Once clear of the thin top soil, they found themselves digging in clay amongst boulders. An upstream extension was enlarged, then because of the unstable nature of the whole dig, coupled with the outbreak of war no further work was done. Tools were left on the spot.

Several years elapsed, during which time, the remaining trees of the plantations in this area disappeared, the original dig gradually filled up, and the tools became buried.

Ten years later, "The London Group" restarted work in the valley. It was Whitsun time in 1948 when Bill Weaver, Eric Hensler, Aubrey Glennie, Ruth and Hywell Murrell and Willie Stanton began work once more. The working party must have been surprised and very puzzled to find a 1914-18 War entrenching tool, several feet below ground level. It was not till the A.G.M. of this year that they solved the riddle of the buried entrenching tool.

By 1949 the shaft had reached a depth of nearly 20 feet, at the same time a second exploratory shaft, a few feet further up the valley was sunk using gelignite. Half way through the digging season the first shaft was abandoned because the North face had become very unstable;

also a small hole had appeared in the West bank and two of the party began enlarging it. During the Winter this West bank collapsed revealing a large natural hole. The fallen debris was pushed into the original shaft, the trial or second shaft having filled itself during the wet months. The natural cavity was further excavated and was the origin of the existing entrance. At the end of the 1950 season the small stream was diverted into the hole by a wooden trough, in an attempt to wash out the liquid clay, which was flowing into the bottom of the shaft. In 1951, there was still an extensive flow of clay, and a further collapse of the West slope entailed more spade work to keep the entrance open. The "Water Treatment" was continued for the winter.

Once again in April 1953, the valley was filled with the noise of digging. The banging of buckets, the ring of entrenching tools on rock, the shouts of "Try this one for size" came from the bottom of the shaft as the next load was hooked on to the rope. Keith Evans, Tom Malkin and myself were responsible for this fresh uproar. After two years of neglect the shaft was six feet deep. Several week-ends later, at a depth of ten feet, a large completely immovable, flat boulder, separated us from a small cavity, which could be seen through chinks around its edge. One of these chinks was very laboriously widened, until it was possible to reach and enlarge the cavity at arms length. Some time later we were able to squeeze into this tiny hole, which went under the grandiose name of chamber at the time. Further progress was blocked by a large loose rock, too large to take out, too solid to break up, and leaving too little space to squeeze round it. We solved the problem by rolling it into a depression dug in the floor to receive it. The passage beyond extended for ten feet to a choke. At our next visit we penetrated this choke, to find ourselves in a small chamber in an atmosphere of wedged boulders. I was at first rather apprehensive of what seemed to be a "trigger rock", which might if disturbed bring down the East and South Walls of the chamber. However this stone resisted the remotely controlled forces applied

to it from above, and must now have been used as a foot hold many times, by people sliding down into the chamber.

My next visit at the end of July 1953 was in the company of Ruth and Hywell Murrell. After the preliminary work of eliminating the entrance squeezes had been accomplished, from the surface, we found there were three possible ways out of the boulder chamber. The most obvious of these, a tight squeeze was tackled by Mrs. Murrell, while I shuffled my way, on my back, down a small sloping passage almost filled with loose stones and gravel. I was grateful for the assistance from below, some of the debris was being removed from under my boots. We had both arrived in the same place.

The squeezes had opened into a chamber, whose roof tapered upwards as an aven for 14 feet. A small passage led from this chamber into another at the lower end of the slide. From this point the passage descended in a Westerly direction for 24 feet, now in pleasantly solid rock, to a dry mud choke. Above this choke another aven ascended. It was found to connect with the first, by a high-level system of bedding plane and boulder passages. This upper series is now in a dangerous condition, on account of a boulder perched on the brink of the first aven. The upward bedding plane extension of this high-level series, tends back towards the surface, ending in a clay and boulder choke. The lower extension has been very closely examined with a view to enlarging it, but the project was abandoned because of intolerable working conditions in the very confined space.

The terminal mud choke has received much attention. It has however resisted the most violent earthquake to which it could be subjected. The only apparent result is that the floor has settled a little, but its place has been taken by a pool of water. An interesting little mud choked tube descends a few feet on the left; that has been partially excavated, and takes a small

trickle of water which sinks in the floor. This at one time was the deepest part of the cave, approximately 40 feet below the entrance.

I mentioned a third possible way out of the boulder chamber; a vertical pit in the floor, below a corresponding but smaller rift in the roof. The pit was originally only 4 feet deep, choked with boulders. In wet weather the stream which sinks just South of the entrance, emerges at the head of the pit, making work under the cascade almost impossible and very uncomfortable. In dry weather, when there is no evidence of the main stream, a trickle of water flows from a low bedding plane 8 feet down, only to sink once more in the floor of the pit amongst the rubble. The present depth of the pit is approximately 10 feet; work is becoming increasingly difficult, due to lack of space to pile the spoil. This either has to be thrown through the squeeze into Aven Chamber, or pushed down the slide, in which case a human pipe cleaner is occasionally necessary to keep the passage open. This task is naturally very unpopular, and is usually left until it is very nearly impossible, too.

In September 1954 Bob Lawder noticed a low bedding plane opening, half way up the second aven; everybody else had dismissed it as being far too small. Bob, however detected a draught, which we others had missed. Finding the small dimensions of the opening a challenge to his large size, he went immediately to work enlarging it, until it could be called a passage, and until a "ferret" could be inserted. The ferret squeezed on for about 15 feet, squeezed down a vertical rift for 10 feet, then squeezed into a stream passage where he became firmly wedged in a right angle bend. After many trials and much tribulation, the passage was widened so that a moderately small caver could reach him. Further enlargement of the passage was only possible after the "ferret" had been removed. The corner was at last rounded, just beyond lay "the Father and Mother of all squeezes". six feet further on lay

"the Grandfather and Grandmother of all squeezes". Both were forced by Mrs. Murrell after much manoeuvering, her report of what lay beyond was very disappointing, after the excitement following the new discoveries. The roof slopes down to meet the floor, composed of hard packed gravel and water worn stones.

The newly discovered stream passage is obviously joint determined; an inlet passage is filled with mud, perhaps connecting with the terminal mud choke. Murrell concludes that since the direction of the cave before the terminal choke is West, and the direction of the new series is North-West, that the two passages probably do not connect. He suggests that the terminal choke may lie at the head of another vertical rift, descending to a lower series, perhaps into the active stream route beyond the point at which it sinks in the pit. I myself think that the pit itself offers far greater opportunities. It, at least, contains no mud. We have discussed the possibility of diverting the stream, such as it is, down the slide. The result may be interesting, particularly if the water reaches the terminal mud choke.

Work has been suspended during the winter, but I hope to dig in the pit again, when the stream dries up. I would appreciate any information from members of the Club who have dug in any of the neighbouring swallets or sink holes. If all such digs could be recorded in one place, much repetitive work might be avoided.

Phil Davies

The history of the excavation of Whitsun Hole is unusual in that water has been used extensively, to reduce the labour of digging. During the 1949-52 period so much clay was washed from the dig, that a subsidence nearly 5 feet deep, at the back, has appeared in the bank above it. The labour of digging all that out (no sooner was the shaft cleared, than it filled up again)

would have been immense. Perhaps the continued use of water will reveal the way on once again.

Hywell Murrell.

Whitsun Hole Survey.

Shortly after the discovery of Whitsun Hole we carried out a Grade Three survey to show the general run of the passages. No great attempt was made at accuracy but since two closures were available the survey was computed quite carefully which showed that with the instruments used an error of up to ten per cent can be expected. This made the depth of the cave as then known 42 feet (possible error up to eight feet)

This survey was prepared for the Journal but before it could be published further passages were discovered. These passages were just sufficiently extensive to make it impossible to amend the original survey which had been duplicated a few hours previous to the discovery. Further jubilation was caused to the discoverers of the new passages by an error in the scale of the copy pinned on the wall of the hut making the cave twice as big as it should be. Matters were not improved when I tried to correct it and made it four times too big. (This was made the subject of a drinking song which was to be heard for a time in nearby taverns just before closing time but the less said about this the better). However, Denis Warburton, being partly responsible for the incident, surveyed the extension and assisted in the preparation of the final version. This increases the depth of the cave by another five feet. The total passage length becomes about 150ft.

The instruments used (giving a ten per cent accuracy) were a prismatic compass read to the nearest five degree mark and a simple clinometer (protractor and plumb line) read to the same accuracy. Lengths were measured with a yardstick to the nearest half foot or

so. Denis' survey was somewhat more accurate, but he only claimed Grade Three. The only 'incident' that took place during the survey was caused by the rapid and completely unexpected descent of the first aven by a large boulder. There is another one waiting to fall, so take care!

The cave is most clearly shown in the projected section, drawn along the dip. This section was drawn without showing the Slide which is the usual route to the bottom (avoiding the first aven). The 'Inclined Rift' is quite impenetrable and the connection shown is presumed to exist. The plan is drawn in two parts, with dashes to show how they fit together. Grateful thanks to my various stooges for their help, in spite of their driving of pins into an image of what they assured me was intended to be myself. Fortunately there was little likeness so perhaps I will survive the curse.

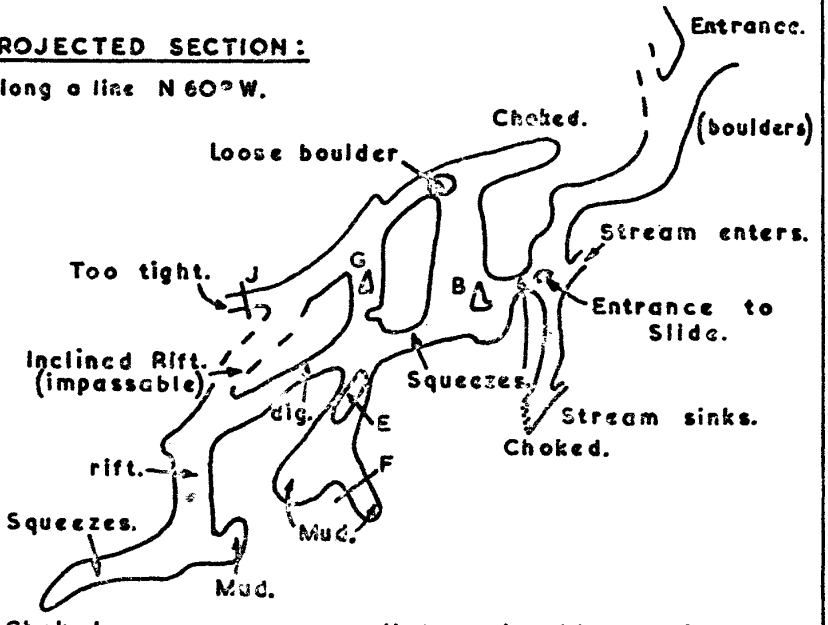
Oliver Wells.

WHITSUN HOLE.

Survey by D.Warburton and O.Wells.
CRG Grade Three.

PROJECTED SECTION:

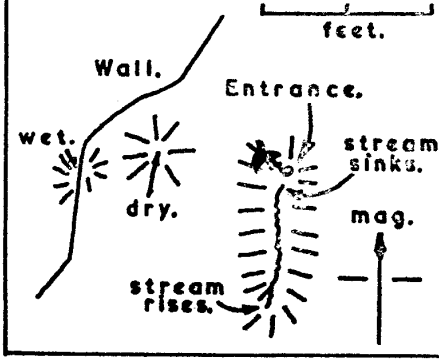
Along a line N 60° W.



Note In this section the Slide and certain other low-level passages are omitted. Refer to low-level plan for details.

SURFACE DETAIL:

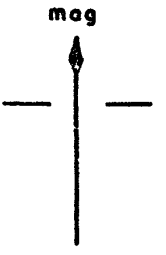
SCALE 1"=200'
0 100 200
feet.



SCALE 1"= 15'.
0 10 20
feet.

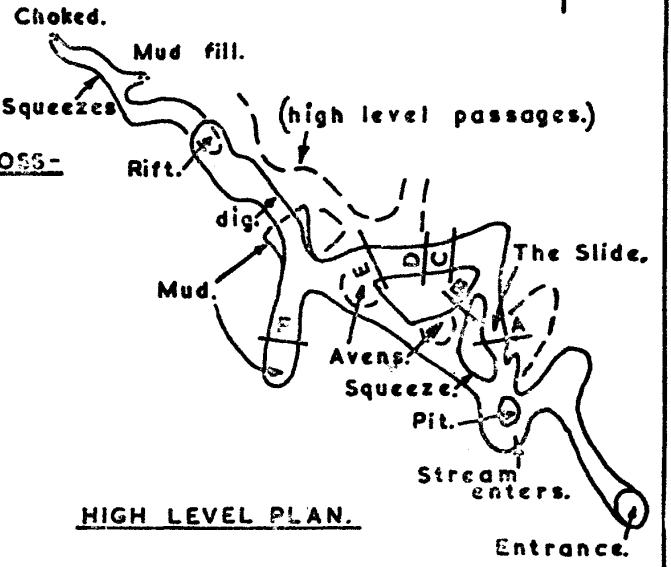
O.W.

WHITSUN HOLE. (Continued.)



LOW LEVEL PLAN:

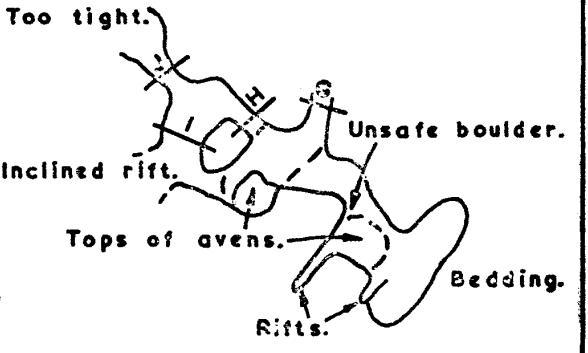
High level dashed.



PASSAGE CROSS-SECTIONS:

A.
B.
C.
D.
E.
F.
G.
H.
I.
J.

HIGH LEVEL PLAN.



SCALE 1" = 15'

0 10 20

feet.

R.Davies, D.Warburton, O.Wells.

O.W. 20.1.55