

In response to the request for back copies of the Journal Mr. Sharpe came forward immediately and offered all he had and they constitute nearly an entire set. This is a most excellent gift. Now the only ones we still need are Old Series 3-6, 38, 45, 49, and New Series 1-9 and 12. Mr. Sharpe did most of his active Mendip Caving during the latter half of the 1930's and he has some excellent photographs to show for it. He was one of the first members of the club and was in the party who first broke into Cow Hole. Having given up active caving he has turned model boat builder and has a fine remote controlled boat over 6' long, which he sails on the estuary at Arneside.

Since the fatal accident in July last, various parties, with M.R.O. representatives amongst them, have been into Eastwater to see if it is safe. They have suggested to the farmer, Mr. G. Weeks, that an alternative route be clearly marked, bypassing the danger area and that notices be posted inside the cave at all points leading to this area warning Cavers of the danger. All this Mr. Weeks has now had done and he is willing to let some experienced Cavers into the Cave; it is now beholden to the Cavers to leave the danger area strictly alone.

Oliver Lloyd writes:- "The alternative route" referred to has been marked from the beginning of the boulder ruckle, where Balch raised that great slab, by way of the "dining room", straight across the 380' way, along the Upper Traverse Passage, up the "Traverse Passage" to that small chamber you reach just before Baker's Chimney, taking the right hand fork down a narrow crawl

into the Canyon. The notices fixed at each end of this line say "Cavers are advised to follow the marked route".

To the danger spot at the head of the 380' way there are six possible openings, four on the near side, one below on the 380' way and one on the far side from the Boulder Chamber. These have all been marked by notices reading "Danger - Do Not Pass This Point". I have not the slightest doubt that the first thing a lot of Cavers will want to do is to pass these points and have a look. The notices have, therefore, been placed in such a way as to not get damaged by Cavers climbing over them (I hope). They will, however, ensure that nobody can reach the danger spot by mistake.

Members will be interested to know that nearly 200 copies of the latest 'Swildon's Hole Survey' have been distributed - this must be a record sale of any Mendip Survey. Copies are still available from Howard Kenney, Tudor Cottage, Beryl Lane, Wells, Somerset, at 3/- post free for the small size and 4/- post free for the large one.

I would draw attention to the review of "The Origin of Limestone Caves". This is a symposium that will cause quite a lot of rethinking in caving circles and I am grateful to Trevor Ford for giving us such a full review of it.

FORTHCOMING EVENTS

August 26th Club Supper at Hillgrove. 6/- per head. Illustrated talk by David Kinsman on "Iceland & Jan Meyrn Island" commences 6 p.m. sharp. Supper at approximately 8.30. Please send cash when booking to: Michael Holland, 10 Bramley Road, Street, Somerset.

Early booking advised!

September Weekend trip to Cornwall. Details from Hon.Secretary.

FOREWORD

There is a change in the G.B. arrangements. Members can now apply to visit the cave on dates suitable to themselves. At least a week's notice must be given, and as I have to send the usual form of application to the U.B.S.S., any requests for a visit to the cave should be received by me not later than ten days before the date. The University Society reserve the right to refuse permission for any particular date, and they emphasize that the scheme will be for a trial period of six months.

The joint lecture meet with the R.A.F. at Colerne attracted quite a good crowd, but there may be members who could not get there and who may be interested to hear that Dr. O.C. Lloyd, the Hon. Secretary and Treasurer of the M.R.O., the Hon. Treasurer of the U.B.S.S. (who is also the self-resurrected gossip writer Cheramodytes), will be giving his lecture in other parts of the country.

We welcome the following new members:-

J.E. Blake, 123 Farnham Road, Guildford, Surrey.
D.J. Landeg, 39 Tombridge Cres., Kewton, Middx.
A.N. Woolmer, 1 Hazelton Road, Bristol 7.

Frank Frost.

Hon. Sec. Frank Frost, 71 Hazelbury Rd., Bristol 4.
Tel: Whitchurch 2022

Hon. Treas. Mrs. B.M. Willis, 15 Hooper Ave., Wells, Somerset.

Hon. Editor. C. Hawkes, 147 Evington Lane, Leicester.

CLUB SUPPER AT HILLGROVE
SATURDAY MAY 6TH

An informal supper was held at the hut for members and their guests, and was attended by about twenty people. We sat down to a vast meal of soup and ham salad, followed by fruit and cream, with a barrel of beer in the corner.

We were especially glad to be able to welcome Mr. Sealy to the supper, one of his cows enlivened the evening by producing a calf at closing-time, and two of the resident club midwives were called by telephone from the Hunters to help Mr. Sealy with the delivery.

Our thanks to Brenda Willis for preparing the meal, and to Mike Holland for getting things organised. May there be another club supper very soon.

P.S. Two plates of finely divided carrots are still available free of charge to members with lamp trouble.

FOUND

A watch has been found in Swildons, between the 40' and the sump. Any claimants for this please contact the Wells City Police.

PATE HOLE PROJECT - AUGUST 1960

E.J. Waddon

Survey Notes by D. Warburton

From 19-22nd August 1960 a combined W.C.C./C.D.G. party made a concentrated attack on Pate Hole, Appleby, Westmorland (N.G.R. 35/678121). This cave had been visited during Easter 1960 (W.C.C. Journal No. 77, Vol. 6, May/Aug. 1960), when a rapid survey of the portion of the cave then accessible (Main Passage and Diving. Pool) was made. It seemed likely that further passages would be revealed by diving at three points within the cave:-

1) A flooded crawl running NNW from the Main passage at a point some 780 ft. from the cave entrance.

2) A flooded bedding plane on the East side of the Main passage, 60 ft. before the rift leading to the Diving Pool.

3) The Diving Pool at the furthest end of the cave. Here a large underwater arch leading to the SW could be seen. (A recess to the NE was noted but little importance attached to it at the time). The Diving Pool promised to be the most profitable spot to dive, but the point of entry (and exit!) to the water was via a steep and slippery rift, not easily negotiable to a fully kitted diver. Accordingly a plan had been proposed whereby stemples would be fixed into the rift at the water's edge to form a diving platform.

On Friday, August 19th, the 15 members of the expedition arrived at the cave entrance and pitched camp close by. An advance party entered the cave equipped with stemples and carpenters' tools. To the amazement of those

who had been present at the Easter recce, it was found that the water level in the cave had dropped considerably. The diving possibilities listed above were now greatly modified. The flooded crawl (1) had almost completely drained, and the gravel floor had been washed out, enabling it to be easily entered on hands and knees. After about 100 ft. to the north, there was a junction with a larger passage, heading SE, which was later named "Oxbow Passage". From the junction a long crawl continued for some 360 ft. to the north, (North Passage), until it became too low to follow. The Oxbow Passage, which increased in size until it was almost as large as the Main Passage, was followed to the south, when other members of the party who had been in the Main Passage appeared through a flat dry crawl near point H-H' on the survey. Thus diving possibility No. (2) had also been disposed of!

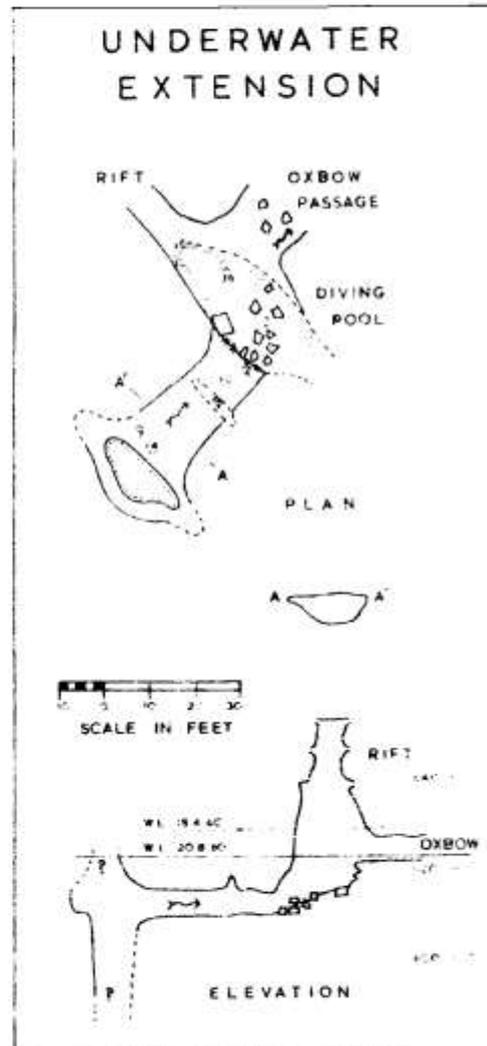
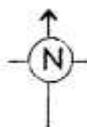
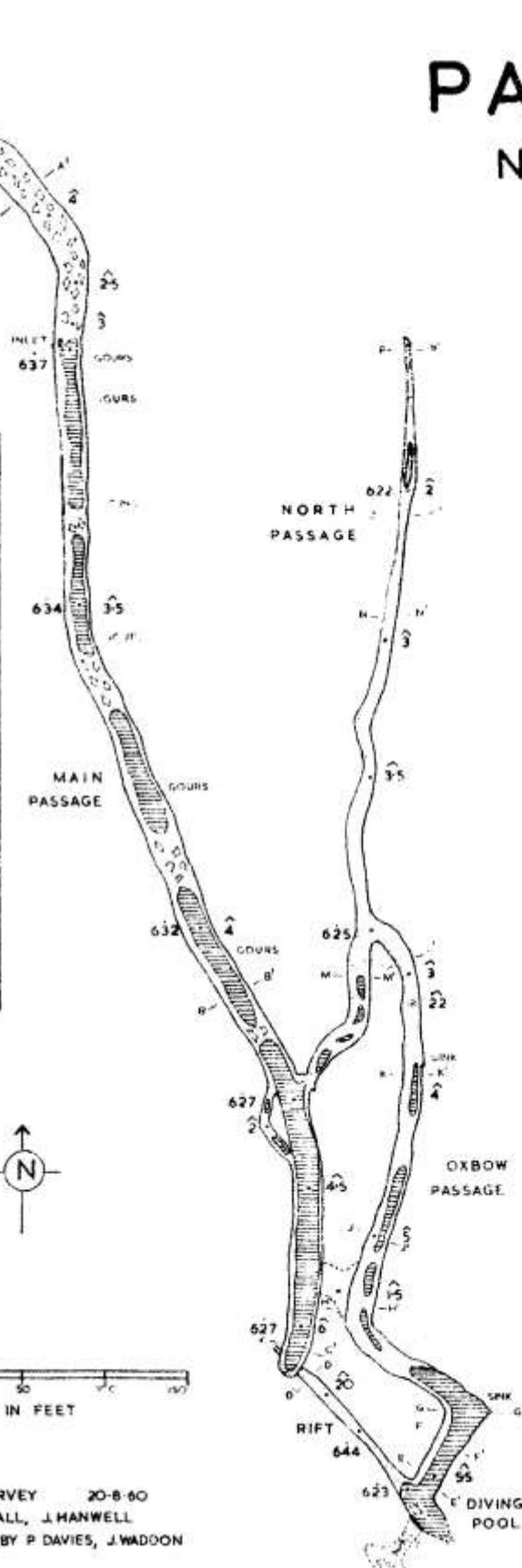
At the end of Oxbow Passage the party stood in ankle deep water looking into a cross rift containing a deep pool, with the roof some 30 ft. above. Yes, this was the Diving Pool, in fact the recess previously noted, the water level being at least 6 ft. lower than on the previous visit. There was no need to construct a diving platform in the rift, as access to the water was now easy.

Diving kit was brought into the cave and assembled at the edge of the Diving Pool. While the divers (P. Davies & E.J. Waddon) were in action under the control of Struan Robertson, a survey party led by D. Warburton and A. Surrall commenced to re survey the whole cave to a higher degree of accuracy than had been possible on the previous visit. M. Holland and J. Hanwell had

PATE HOLE

NEAR APPLEBY WESTMORLAND

NGR. 36789/51213
ALT. 645 FT.



C.R.G. GRADE FIVE SURVEY 20-8-60
D. WARBURTON, A. SURRELL, J. HANWELL
UNDERWATER EXTENSION BY P. DAVIES, J. WADDON

PD 1/61

been appointed official photographers, and also assisted the surveyors as required.

The two divers entered the Diving Pool, and made their way along a roomy passage leading SW. Visibility was excellent, the floor being of clean bare rock with well-defined scallops. After 52 ft. they found themselves in a flooded rift chamber, somewhat like the Diving Pool. It was about 40 ft. wide with a sheer sided pothole some 10 ft. wide situated centrally in the floor. The depth at the lip of the pot was 14 ft. There were narrow ledges around the pot, but the way on was obviously downwards. Since the opposite wall of the pothole could be seen descending for at least a further 15.ft., with no sign of any bottom, no attempt was made to climb down it, as this would have probably meant descending below the danger limit for the pure oxygen breathing sets being used. Any future dive at this place will require compressed air or mixture sets, as it is unlikely that the water level ever drops below the level at which it stood in August. The water flow was from the pot to the Diving Pool, then along the Oxbow Passage for about 300 ft. to a small impenetrable sink. In winter, the water level rises considerably, and local enquiries revealed that on rare occasions (usually late winter) a large stream flows out of the cave entrance, persisting for 3 or 4 days at a time. Is it possible that the name of the cave is a corruption from "Spate Hole"?

During the diving and surveying operations, D. Willis, E. Hanwell and M. Lane, who gave valuable help in transporting equipment into and out of the cave, went with their-wives to look for other caves in the neighbourhood. In a disused mine a mile away several nests

of cave pearls were found. Further downstream from Pate Hole a small dry cave known locally as "Lower Pate Hole" proved to be very short and partially filled by dead stalagmite. It is possible that this cave might yield archaeological remains, as its appearance and sheltered situation above the bank of the stream is suitable for a habitation site. The stream bed itself was very interesting, there were several potholes up to 14 ft. deep. One of these was called the "Great Kettle" by the locals - in time of flood it boils!

Everyone present voted the project a great success, due in no small measure to the ready co-operation and assistance given by the local inhabitants encountered. In particular, Mr. J. Alderson, on whose land we camped, and Mr. G. Park, who gave us permission to visit Pate Hole, deserve special mention.

Notes on the Survey

It is considered that except for the under water portion of the cave, a C.R.G. grade of five can be claimed for the survey. The instruments used were a compass (to 1°), clinometer (to 1°), steel tape (to 1"), being the same instruments used for previous surveys (Eastwater, Stoke Lane, Hilliers, etc.).

The total measured passage length was 2002 ft. Two closures were available: one (far end) of 348.44 ft. had a horizontal error of 6.23 ft. (1.79%), and a vertical error of 1.68 ft. (0.48%); the other closure of 504.36 ft. had a horizontal error of 2.88 ft. (0.57%) and a vertical error of 0.58 ft. (0.12%), Percentages are of total circuit.

The whole cave was surveyed in 46 legs,

plus the divers' survey, and completed in two moderately short trips. Backbearings were taken in important parts. The conditions were very easy for survey. All results computed.

MENDIP NOTES Cheramodytes

Knots

Commander Lawder's warning about knots in nylon rope coming undone certainly does apply to caving. It happened to me when I was lowering a camera tin down a 20 ft. rift in Swildon's. The tin was tied onto a line by a bowline, which came undone and the tin fell into the streamway. Many cavers use a waist line and karabiner when caving and attach the life line to it on pitches. The knots in these should always be inspected before climbing, as they sometimes become undone. It is a good rule always to add a half-hitch to a bowline tied in a nylon line. It is not so generally known that a bowline tied in sisal rope may also come undone, if it is pulled by the loop through a narrow crack. The crack may turn the knot inside out so that it slips. This also can be prevented by the use of an extra half-hitch.

The candles that went out

Dr.Allan Rogers is a little closer to solving the mystery of the seasonal incidence of bad air in Banwell Bone Cave. On 3.12.60, when it was observed that a candle would go out at a number of places in this cave, samples of air were taken and analysed in his laboratory by the laborious Haldane method. It was found

that, although the oxygen content was almost normal, the carbon dioxide was between 2.6 and 3% (normal 0.03%). On 29.4.61 he visited the cave again, this time armed with an ingenious little device, which enables one to estimate the CO₂ content of the air colorimetrically in a few minutes. Candles burnt freely in all places and the CO₂ content was found to be 0.3%. He then chose an isolated recess, estimated to contain about 200 cu.ft. of air and released 45 litres of CO₂ into it. The CO₂ percentage rose only to 1.8 (it should have been nearer 7.5%). Clearly there was a leak somewhere. He had with him the M.R.O. apparatus for purifying bad air in caves, but before using it decided to wait for 10 minutes to see if the percentage of CO₂ would drop of its own accord. It did, to 1.2%. This, he decided, was as great an improvement in the time as one could hope to get with the apparatus, so the rest of the experiment was abandoned.

What it does show is that, in the words of Euripides, "the cave is full of holes". This means that in the winter, when a high level of CO₂ is maintained it must be because the air entering through these holes is charged with that gas. There is only one reasonable explanation: it must be derived- from rotting vegetation on the surface, whence the air comes. Rotting vegetation in ponds produces marsh gas, a mixture of methane and carbon dioxide, owing to the action of anaerobic bacteria. On the ground, however, the rotting process is more thorough, so Ann Williams tells me, so that we are unlikely to find much methane in the cave, but may find traces of ammonia and hydrogen sulphide. This is a little job for next winter.

Shatter Pot

David Causer made an advance here on 8.4.61. Blasting the squeeze at the end of the right hand passage from Sand Chamber (the next after Oxford Chamber) they entered a high narrow rift, running uphill for 40 ft., roughly parallel with Shatter Passage. At the furthest point reached the rift is about 16 ft. high and ends in an "over and under" constriction. The "under" is too tight, but they have been blasting the upper opening two or three times since then. On 7.5.61 a useful amount of "damage" was recorded and hopes are reasonably high.

Double Trouble

The 8th of April was a busy day in Swildon's Hole, for it also saw Mike Thompson's party down in Double Trouble banging his squeeze. After four bangs they got through this into a narrow rift about 8 ft. long with water falling from a tiny inlet in the roof down into an oval hole in the floor (12 x 18 ins.), too small to pass with either comfort or safety. Prospects there are now not good. Our Angolan expert tells me that we are trying in the wrong place, but he has said that before.

Anyhow, everybody now seems to be getting ready for the big push into Swildon's VI, billed for June 17th.

Pine Tree Pot

This collector's piece is in the bottom of a large shake hole in the Nordrach anticline. It seems to belong to the Cow Hole series of pot holes. It is about 50 yards NS of the main road at Nordrach-on-Mendip, just by the first house SE of the cross roads. It was discovered by members of the Mendip Caving Group at Whitsun,

1960. They have gated it, but are admitting the caving public. The drill is to get the key from them (either from their Hon. Sec. or direct from members at their Field H.Q. down near Charterhouse pool), for which there is no charge, but a small returnable deposit, to allow for possible loss of key.

The cave is not very large, but it is interesting. A 10 ft. ladder is needed for the entrance pitch, and soon after that is a 35 ft. ladder pitch. Below that the passage is narrow and muddy and dodges to and fro among a number of cross rifts.

Bristol-Wessex

The Bristol members of the Wessex continue to hold worthwhile meetings. On the 27th April Frank Frost and Harry Stanbury, jointly, were describing and showing lantern slides of a Wessex caving trip to France which had taken place some ten years ago. The pictures, some excellent, were mostly by Luke Devenish. It was most entertaining. Just as Harry would be getting into his stride, Frank would interrupt with, "I think you ought to tell them the story of such-and-such at this point," to which Harry would reply, "No, I was coming to that later; it happened on the way back."

Or: Harry, "This waterfall was about 500 ft. high."

Frank, "No, I'm sure it was at least a thousand."

Harry, "Well, perhaps it was 500 metres."

On the 13th May it was Oliver Lloyd's turn. The R.A.F. Colerne were our hosts, and he gave his "Cave Rescue" lecture and showed the film. The discussion which followed was very profitable.

There always seems something more to be learnt. Frank told us some of the circumstances in which acetylene in caves may have poisonous effects; while after the same lecture in South Wales at Whitsun, Oliver heard of a case in which a caver exposed to a high concentration of banger fumes, after an underwater explosion, nearly died of pulmonary oedema.

More filming

I hear that Maurice Hewins has been doing some more filming in Upper Swildon's. I do hope he will show us the results one day, perhaps at the next Club Supper. Rumour has it that they are good.

LETTERS TO THE EDITOR

Dear Sir,

Mammouth Cave in the Mendips

The undated press cutting in Journal No. 77 Vol.6 May/August 1960 of the Wessex Cave Club gave an old and interesting account of a trip, down Lamb Leer. Mr. Frost very accurately estimated that it was published about 1880. Readers will probably be interested to know that the article appeared in "The Times" on the 10th August 1882.

Fledermausfänger

Dear Sir,

St. Cuthberts

I recently read in the Wessex Journal an account of the rescue operations in St. Cuthbert's Swallet to which I should like to add some further important and relevant details.

The surface hydrology of the Cuthbert's area is more complex than it seems and in wet weather the situation is as follows.

1. The main stream of water from Mineries is normally diverted into Plantation Swallet and does not affect the build up of water in the valley to any extent.
2. There is considerable seepage from Mineries which cannot be diverted and which forms a sizeable stream running down the valley to the Cuthbert's pond.
3. When the ground is fairly wet and considerable rain has occurred, the fall-off of water from the sides of the valley is enormous and again cannot be re-routed to avoid adding to the volume of the pond.
4. The dam built across the upper side of the pond will keep back the water until it is full, but this is only a few minutes at times of flood owing to the amount of water involved.

It is clear that if the entrance pitch of St. Cuthbert's Swallet is flooded it is necessary either to have the water pumped out or to wait until the level sinks sufficiently, since there is no other way of disposing of the water. This however is not nearly as simple as it seems.

During the last rescue operation the level of the pond was within a few feet of the cave entrance, water was spouting profusely from the sides of the entrance shaft, and the

entrance rift was passable only with great difficulty, if at all. When the Coventry Climax pump began work the pond level sank fairly rapidly until the depth had been reduced by about two feet, taking about an hour as far as I remember. After this point, although pumping at maximum, that is approximately 400 gallons a minute, it made no headway at all for an indefinite time, and was running red-white hot just to prevent the water building up. The only chance of getting the party out was to raise the level of the dam by a few inches so that the pumps could gain on the flow, and the party was warned that they had about ten minutes to get up the rift. They were still fairly fresh and made it, but a tired party might not be able to do so.

It appears probable that there are several outlets from the Cuthbert's pond, one of which must be at a fairly high level. Once the pumps had lowered the water below one or more outlets the pumps and remaining working outlets were not able to cope with the inflow. An estimated total of 100,000 gallons was pumped out during the operation.

If, therefore, anyone wishes to visit St. Cuthbert's Swallet in conditions when flooding is likely, they should understand that rescue may be impossible even with the willing help of the Fire Brigade.

Jill Rollason.

NOTE: Two proposals have been made by the Bristol Exploration Club for dealing with the water situation, the long term one being to open up either High Chamber or the Maypole series, both of which are believed to be not far from the surface, this would provide an alternative exit.

For more immediate results it has been decided to dig a culvert to drain water from the valley straight into the cave, by means of the passage which is known to exist above the entrance pitch. Since it is not possible to prevent water reaching the valley, the aim is to get rid of it immediately instead of waiting for it to percolate through the clay. There are only a few more feet of clay to be removed at present, and if any volunteers care to come along their efforts will be very welcome.

J.R.

SUMPING IN GOON SUITS

Noel Cleave

Exposure suits have, in recent years, revolutionised caving. Because of the endurance that they give one, and the comfort of dry caving, demand far exceeds supply. In particular, the supply of neck sealed total immersion suits is non-existent. This type of suit has normally been considered to be the only one suitable for sumping operations. Far more of the open necked variety of exposure suit exist, and recent experience has shown that these can be used, safely and successfully for sumping operations. They also have the advantage of being more pleasant to wear and cave in.

Stoke Lane presents no problems at all, the sump being so quick and short that leakage around the hood and neck are unimportant.

Sump I in Swildons presented the real challenge and I tried it successfully in

March, with Steven Wynne-Roberts. On the journey both coming and going through the sump I took in less than a cupful of water down the neck. The weaker cuff seals on this type of suit let in enough water to wet my arms to the elbow. After the Swildon's trip I did some experimenting in a bath, and discovered that one can in fact thrash around quite violently without leaking, but that movement of the head relative to the body does induce some leaking.

Finally at the end of April I went to Swildons V with Steve Wynne-Roberts, Dave Causer and Ken Dawe and had a dry trip through Sump IV both coming and going. This trip did, however, show up the cuff weakness badly as I had cuff leaks all the time in V and split a cuff on the return. Despite this I was almost completely dry when I changed out of caving clothes on the surface.

The method of sealing out the water from one's face and neck is the only problem. The system I used was to do up the draw-strings, ruffling the neck entry as tightly as possible; push these ruffles of fabric against my chin, and cross the tie tapes over and tie them around the back of my neck. I pull them very tight, but as they pull against the lower jaw they have no tendency to strangle one. A good tight helmet fit helps to seal the hood around one's head.

Quite obviously a little experimenting on the surface is needed before people go charging down to Sump One, but otherwise the operation presents no real difficulties and should ease the problem of goon-suit shortage enormously.

YE CAVER
Edited from a Rare Manuscript by
H.C. Attwood

Befel, nigh Closing Tyme, one Summer Day
On Mendyppe, to Ye Hunters I made way.
And ful of Folke yt was, that were so muckle
They wer as tyght as Boulders in a Ruckle.
And therin satt a Caver and hys Crew
That to hys hand had ech hys Pott of Brew.
Thys Caver was an Hardy Man and Bold,
Hys Berd, yt was a stubble thre dais old.
Upon hys head he hadd an Helmet sett
That al of Plastik was, as Blak as Jett.
And al biforn, to give hym Light, I ween
Hee hadd a Lampe, yt was Acetylene.
Clad was hee in a Boyler-Suit, itt's hue
Was al be-mudde, I gesse yt hadd bin Blew.
Grete Bootes thikke he hadd, and wel bespred
With Nayles, as thikke as is a Fakirs Bedde
And al about hym hung hys other Gere,
Yt wer so moche, I may not list yt here.
Hee hadd moche lore in Speleology
Ful wel he kenned yts Terminology.
Hee lerned could discours.of Deppe and Strike
Of Vadose, and Phreatic and the Like.
For to seke out a Cavern hys delite
That was be-hung with mony a Stalactite.
And for to seke hym hardly wold hee toil
And by ye tunne wold hee shift ye Spoil
Yn Pitch and Squeeze and Sumpe he was ful Hardy
Yett to kepe triste att Digges ever tardy
And thys a Caver was, that on hys Hatt
Hadd for Devyse a Dragone, or a Batt.

FURTHER ATTEMPTS AT CAVE CINEMATOGRAPHY

Maurice Hewins

Since our first experiments in Swildons last April, we of the Farnham Group had been considering possible improvements in our equipment. We were agreed that the first consideration must be to reduce the number of batteries involved (originally 12), but this could only be done by increasing the loading on each rather drastically. Using the same 3 lamps (150 watts 25v) as before, from one bank of 4 x 6v 12 AH motorcycle batteries, would require 18 amps - a rather high drain if we required to run for any length of time.

Nevertheless, we planned to have another go in March, and we set about streamlining the gear. By removing excess weight and careful packing, the whole apparatus was fitted into the three boxes previously used for batteries. Thus reduced in size, the unit could easily be carried and worked by four men for as long as the batteries would last.

At this point we had some luck, when we discovered that a new fast 8mm film was being marketed by Perutz. It was rated at 320 ASA tungsten as compared with 64 ASA for the Gevaert film we had used before. With this film it was calculated (correctly as it turned out) that we could easily film on one 150 watt lamp and so the question of overloading our batteries no longer arose.

On March 25th, a party of 4, Titch Hall, John Thomas, Peter Greenfield and I took the gear into Swildons for a trial run in the Top Series. We found to our relief that we could get satisfactory meter-readings with one bulb at a distance of 6-8 ft., and at a greater

distance using 2 bulbs. The addition of the 3rd bulb appeared to make very little difference possibly because the batteries objected to producing 18 amps.

On that occasion we succeeded in taking 50 ft. of film around the Long Dry, Kenney's Dig, and the Wet Way, for the loss of one broken bulb. The film itself was found to be up to expectation. The grain size, although worse than that of the Gevaert film, was quite tolerable and we felt that with this apparatus we could conveniently film in most caves.

A trip to Barnes Loop was planned for Easter Saturday but it turned out to be an anticlimax. The same party as before, reinforced by Dave King, arrived in the Loop only to find that all the bulbs had been broken in transit. There was nothing we could do except retreat cursing and swearing towards the surface, dejected but not entirely defeated. Before we left the cave we had "almost decided" to return shortly and try again.

BOOK REVIEWS

THE ORIGIN OF LIMESTONE CAVES A Symposium with Discussion
edited by G.W. Moore.

Bulletin of the National Speleological Society (U.S.A.) Volume 22 part
1. January 1960 (distributed 1961).

8vo., 84p., maps, plans, illus.

(Obtainable from the Society at 203 Virginia Hills Avenue, Alexandria,
Va., U.S.A., for about \$2.00)

Introduction to the Origin of Limestone Caves

by G.W.Moore p. 3

Origin of Caves in Folded Limestone

by William E. Davies p. 5

Origin of Bermuda Caves by J. Harlen Bretz p. 19

Changing Concepts of Speleogenesis

by William R. Halliday p. 23

Origin and Geologic Relations of Breathing Cave, Virginia

by George H. Deike III p. 30

Terminations of Passages in Appalachian Caves as Evidence for Shallow

Phreatic Origin by William B. White p. 43

Origin and Development of Fulford Cave, Colorado.

by John V. Thraillkill p.54

Stochastic Models of Cavern Development

by Rane L. Curl p.66

Geometrical Basis for Cave Interpretation

by Arthur L. Lange p.77

This is a must for every serious caver. It represents a reassessment of the classic papers of W.M. Davies, Harlen Bretz, Swinnerton, etc., together with an outline of the advances made over the last 20 years. The papers were presented at the Chicago meeting of the American Association for the Advancement of Science held in December, 1959, and it is a great pity that copies have only just reached this country, too late for some of the conclusions to be included in the forthcoming

new edition of "British Caving", for most of the ideas are as applicable here as in America.

The salient points of the various papers are summarized in Moore's introduction and the general conclusion is drawn that: "most caves were formed in a zone of saturation directly below a nearly horizontal local or regional piezometric surface. Acids resulting from chemical and biochemical processes operating in this zone during oxidization of sulfide minerals and organic matter present in the limestone are thought to have made this zone especially favourable for cave development". This conclusion which partly supports Swinnerton's ideas of 30 years ago, is evident through most of the following papers.

Davies' observations are based on 500 caves in the Appalachian Mountains and his evidence is presented in such a way that it clearly supports his conclusion that 5 distinct features are demonstrated:

- 1) passages develop across the dip or parallel to the strike and generally have uniform gentle slope independent of the rock structure.
- 2) many caves have multiple levels, and within a region the separation remains uniform.
- 3) intervals between passage levels correspond closely with intervals between river terraces in the adjacent surface valleys.
- 4) major caves are associated with major valleys, and only minor caves and solution pockets occur in upland areas away from major valleys.
- 5) passages decrease in size and become more numerous in parts of caves away from major surface valleys.

Features 2, 3 and 4 are similar to the interpretation of Ingleborough Caves put forward

by Sweeting in 1950. Do they apply in Mendip Caves?

Davies also concludes that there are four stages in development:

- 1) random solution at depth in a zone of saturation to produce non-integrated solution tubes and pockets.
- 2) integration of tubes into mature caverns at the top of the zone of saturation during a period when the water-table was uniform in altitude, and flow was constant for a long period towards major valleys.
- 3) deposition of clastic fill under alternations of saturation and aeration.
- 4) relative uplift of the cave above the zone of saturation with modification by erosion, speleothem deposition and collapse.

Davies makes his points with the aid of a number of sketch surveys, cross sections, tables of correlation of cave and terrace levels and a few photographs. He explains the branching and reduction in size of passages away from major valleys as being due to "increased flow and channelling in a narrow zone in the water-table close to the surface valley" - a generalisation which obviously fits so many of our own resurgences, and which fits the classic Swinnerton concept.

"The increase in the number of caves in the upper parts of river basins and in headwater areas indicates that stability in these areas favours cave development Geomorphic fluctuations in the lower reaches (rejuvenations) would reduce the length of time of stable groundwater conditions and the chance of integrating primitive openings into mature caves...."

Regarding fill, his ideas fit the facts better than some of Harlen Bretz's. "Fill is progressively developed at the time when the

cave is in transition from solution below the piezometric gradient to conditions of aeration above the gradient. The fill reduces the size of passages and permits the extension or temporary return of phreatic conditions. The extension of the fill to the ceiling occurs under ponded conditions under such conditions only clay could be transported for deposition". Some of his illustrations of fill are remarkably like the laminated fill in the Sand Cavern of Gaping Ghyll, as yet unstudied in detail.

J. Harlen Bretz's short paper on the Bermuda Caves, which are largely full of sea-water, suggests that they were formed by freshwater solution when sea-level was lowered during the Pleistocene Ice Age. "This is a paradox in that a rise in sea-level destroyed phreatic conditions", says Bretz, which to me implies that he feels sea-water is incapable of circulation and solution, which I doubt. Bretz uses the term "Paleosol" throughout, without definition and I could not find one elsewhere. I presume it means "ancient soil".

Halliday's "Changing Concepts of Speleogenesis" is perhaps the most important paper in the symposium, and I hope it will be reproduced in a more easily accessible English publication. He spotlights the misinterpretations of the Davies two-cycle and one-cycle hypotheses of cave origin, and the misguided attempts to classify all caves in one or the other category. Halliday suggests that "comparison of the features of individual limestone caves with those of nearby caves in a different stage of a genetic sequence, and with caves in different regions suggests that the terms "two-cycle" and "one-cycle" should be abandoned". He suggests the replacement of these by "Descriptions of

individual speleogenetic sequences". Halliday notes the confusion over certain terms such as "phreatic" in some cases. Is a flooded section of passage with open vadose stream passages both up and downstream still phreatic? Bretz called ceiling half-tubes "vadose" since they indicated free-flow by "vadose" streams, yet the passages were flooded then. Halliday says "Emphasis must be placed on the interpretation of the specific nature and sequence of cave features and upon determining the exact conditions which caused their presence". In other words, readers, don't just call passage X "phreatic" and go on your way rejoicing - no, look for the reasons, be they joint patterns, folds, faults, changes in lithology or what, as to why passage X shows phreatic features in contrast to its surroundings.

Deike's study of Breathing Cave, Virginia, is on the whole an admirable example to illustrate many of the points made by Davies, above. The 22,000 feet of passages form an almost rectangular network within only 77 feet thickness of steeply dipping limestone. The passages fall on several different levels, but on each of these most of the joint tubes of solutional origin terminate rapidly up and down dip, indicating solution at the contemporary water-table. The succession of levels appears to be related to the terrace heights in the neighbouring Bullpasture Gorge, in much the same way as Sweeting's levels on Ingleborough, though in the latter case the nearly horizontal bedding makes it difficult to rule out structural or stratigraphical control. One criticism could be that he says almost nothing about the obvious alluvial fill (except when provoked in the discussion) although including two photographs. On the

whole the paper could be a model for certain studies seriously needed in Britain, e.g. Gaping Ghyll, Lancaster Hole - Easegill, Agen Allwedd.

White's paper to some extent duplicates concepts in Davies' and Halliday's. He presents clear evidence from Appalachian Caves of solution effects on near-horizontal planes cutting across steeply dipping limestones. He attempts to classify his caves as Linear, Rectangular (one passage with angular bends), Branchwork, Network, and Irregular. He finds, however, that he cannot do this easily, and that there are intermediate forms. From his paper there doesn't seem to be much purpose in attempting this classification, anyway. He does draw conclusions as follows:

- 1) Most caves are horizontal, but only in Limestones which dip more than 35° do they become dominantly linear.
- 2) Networks along the dip tend to terminate in the up- and down-dip directions limiting the area of enlargement to a relatively thin zone.
- 3) Examination of the walls of passages in steeply dipping limestone shows no tendency for great extension along the dip.
- 4) In near vertical limestone, the passages maintain the same rounded cross section possessed by passages in caves in flatter limestone.

He also says. "There is almost no evidence for an earlier spongework or network extending along the bedding ... as predicted by the deep phreatic theory". He distinguishes caves with well-rounded cross sections as being due to rapid flow, and those with irregular cross- sections as due to slow flow - both in the shallow phreatic zone.

Moore, in the discussion of White's

paper, asks what is special about the top of the phreatic zone? He implies that something more than Swinnerton's flow concentration is needed and suggests "The change in the limestone from reducing to oxidizing conditions may be part of the answer and another possibility is that biological activity occurs in this zone where there is an interface between aeration and saturation. The limestone generally contains several percent of organic material which could serve as food for micro-organisms Carbonic and organic acids produced by the micro-organisms could work with the acids formed by the oxidation of sulfide minerals at the top of the water-table".

Thrailkill's paper on Fulford Cave, Colorado, is disappointingly incomplete, in that the details of evidence are not presented with sufficient accuracy to assess critically his hypothesis of early deep phreatic, middle shallow phreatic, and late vadose stages of speleogenesis. He also invokes cave-formation during a period of erosion in Mid-carboniferous times (between Mississippian and Pennsylvanian) together with subsequent fill. This may well be true but detailed description is not included. The cave is 10,000 feet above sea level but appears to be reasonably easy of access, so it is hoped that further work will be done in the future, particularly in relation to "periods of slow downcutting alternating with periods of more rapid downcutting" and their correlation with the substages of the Wisconsin Glaciation. Thrailkill finds difficulty in defining "deep" and "shallow" phreatic, and suggests that the change from laminar flow to turbulent flow should mark the boundary, the presence of scallops (flutes or facets) indicating turbulent flow - which is a function of the size of the conduit and the velocity, not of the depth.

I doubt if this is universally applicable as I know of caves with turbulent flow, but no scallops, factors such as lithology, acidity of the water and amount of cushioning clay being important.

Curl's statistical study of random and non-random elements in cave "populations", is for the statistical specialist to assess, not your reviewer. An attempt is apparently made to assess just how much of a cave could be predicted from known conditions of structure etc, and how much is entirely random. This is done with a "population" of West Virginia caves, but in the discussion Curl appears to have difficulty in defining how he decided which caves should be included in his population.

Finally Lange's short paper discusses certain aspects of the geometry of speleofacts (cave-fashioned forms) as potential guides to their genesis. Some aspects seem so obvious as to be not worth mentioning, whilst others could be useful, but are not developed far in his argument. He reintroduces the term "speleogen" meaning "a cave structure formed by transfer of mass from solid to fluid", that is by removal of material; and redefines Moore's well-known "Speleothem" as "a cave structure formed by transfer of mass from fluid to solid". This includes not only stalactite deposits as originally defined, but also various mud and sand banks, and fill in general. While the concepts may occasionally be of value, I feel the terminology is ill-chosen.

The symposium gives so many pointers to the possibilities for further research that it cannot be ignored. How many of our British Caves have had much more than the most elementary hydrological study? Where do Swildons Hole and Eastwater Cave fit into the hypothesis of

shallow phreatic solutional origins? Do G.B. cave and Longwood show any relationship to erosion surfaces and terraces? If allowance is made in Ogof Ffynnon Ddu for glacial diversions of drainage, can we point to a series of levels related to still-stands in a falling water-table? Can our biologists support the suggestion of biochemically assisted solution just below the water-table? Is it possible for our geologists to elucidate the changes in the state of oxidation of accessory minerals and organic matter close to the water-table?

Elementary speleogenesis has often been practised in searching for a high-level route over the terminal sump. How much more will detailed speleogenetic studies lead to? The answer lies in your hands.

Trevor D. Ford

NORTHERN PENNINE CLUB JOURNAL Vol. 2 No. 2 1959 (1961)

4to., (VII) + 59p., 5 folding plans.

(Obtainable at 7s.6d., p.f. from The Secretary, at Green Close, Clapham, via Lancaster).

This is a workmanlike report of the activities of one of the foremost clubs in the north of England. It describes the exploration of three entirely new caves, as well as important extensions in many others. The surveys are clear but they have been reproduced on impermanent paper which will darken with age.

T.R.S.

THE HOLLOW MOUNTAINS by W.R. Mitchell (Skipton) 1951

Obl. 8vo, 32+(i)p. illus.

(Obtainable from the author at 4 High Hill Grove, Settle, for 2s.6d. p.f.)

This little book is a history of cave exploration in the West Riding of Yorkshire. The visits of the 18th and 19th century, tourists in search of picturesque scenery are brought to life by reproductions of contemporary prints and by quotations from several rather scarce books of that period. Later, more serious exploration was started by local men and several of the deeper potholes had been explored before Martel made his famous descent of Gaping Ghyll in 1895. The Yorkshire Ramblers' Club was formed in 1892, to be followed by many other famous clubs, some of which have survived to the present day.

This book appears to be accurate in all but a few details and it certainly makes interesting and entertaining reading. It is a reprint of a recent series of 25 weekly articles in the "Craven Herald & Pioneer" and this explains the coarse screen of the illustrations and the unusual page layout. It also explains how it has been possible to publish such a worthwhile book so cheaply.

T. R. S.

JOURNAL OF THE CRAVEN POTHOLE CLUB Vol. 2 No. 6. 1960

8vo., 44p., map, plans, section, illus.

(Obtainable from 10 Sheep Street, Skipton, at 6s.4d. p.f.)

This issue is not up to the standard of previous years. It is scrappy and gives the impression that the club has lost some of its former enthusiasm.

T.R.S.

IRELAND 1959 by J.M.Boon et al.

Shepton Mallet Caving Club Occasional Paper No. 1. 1960.

4to., 25p., map, plans.

(Obtainable for 2s. 6d. from F.J. Davies, 10 Bramley Road, Street, Som.)

This is a praiseworthy beginning to a new series of publications by the Shepton Mallet Club. Although no startling discoveries are announced, the authors found several new or at least unrecorded caves and most of these they have systematically surveyed and described. They deal largely with the caves of the Marble Arch complex in Northern Ireland, as well as a small system in Co. Sligo and a few caves elsewhere in Ireland. A clear introduction clarifies the topography and problems of the Marble Arch area, but in the body of the paper "the chief concern was to record original discovery or to extend and clarify points arising from earlier work". The editing and production are generally first class and it is a pity that the Legalough Sink was allowed to remain on the border between Co. Fermanagh and Co. Clare!

T.R.S.

CAVING IN NORTH WALES by F.J. Davies & B.M. Ellis

Shepton Mallet Caving Club Occasional Paper No. 2. 1960.

4to., 38p., maps, plans. 2s. 6d.

(This paper and the one above may be had for 4s.0d. together)

There has been little caving activity in this area and all the known caves have been entered without digging. The caves are mostly small (the largest, Cefn Cave, is only 500ft. long) but the authors point out that if the

area attracted more cavers, new discoveries would probably arise quite rapidly. As an aid to new work they have produced this comprehensive resume of the present-day position in North Wales, After an introduction to the area as a whole, they discuss the caves where they consider there is special possibility of extension. There follows a list of caves not visited by the authors, collating briefly the information available in the literature, and finally a list of the caves they did visit, with a summary description of each and plans of the three most complex. There is evidence of painstaking care in their work and the information is well presented.

T.R.S.

DIE HÖHLE Vol. 12 No. 1. 1961

(German text with summaries in French)

8vo., 32p., map, plan, section, illus.

(Obtainable from Verband Österreichischer Höhlenforscher, Wien II, Obere Donaustrasse, 99/7/1/3, Austria, at about 5s.0d. for a set of four issues).

This latest number contains several items of more than local interest. Dr. Franke puts forward a theory, based on mathematics, to explain the formation of different types of stalagmites, including the terraced and buttressed form common in large columns. Another article deals with cave fungi and there is also an obituary of the distinguished European caver, Professor Karl Absolon, who died last October at the age of 83.

T.R.S.

WESSEX CAVE CLUB
MEMBERSHIP LIST 1960/61

- ADAMS, J.F., The Manse, Wood Ditton, Newmarket, Suffolk.
ASH, Mr. & Mrs. A.G., 31 Oliver Rd., South Ascot, Berks.
ASHWORTH, H.W.W., 9 Lucas Close, West Town Lane, Bristol 4.
ATTWOOD, H.C., 155 Goddard Ave., Swindon, Wilts.
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Somerset.
BAKER, M.J., "Morello", Ash Lane, Wells.
BALCOMBE, F.G., 6 Temple Gdns. Golders Green, London, N.W.11.
BARBOR-MIGHT, R.N., 14 Rivercourt Rd. Hammersmith, London,
W.6.
BARRETT, J.H., 15 Leicester Walk, St.Annes, Bristol 4
BARRINGTON, N.R., Bonnington Manor, Dunton Green, Sevenoaks,
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S.W.20.
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BRYANT, T.C., 15 Filton Ave., Bristol 7.
BULGIN, R.H.C., 59 Melbourne Rd., Bristol 7.
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BURNETT, J.M., Mitford House, Hencotes, Hexham, Northumberland.

BURT, P.E., 3 Manor House, Rothamstead, Harpenden, Herts.
BUSSELL, J.L., (5066426 J/T), Block 6, Top North, R.A.F. Khormaksar,
BFPO 69.

CANDY, J.G., Dept. of Geology, McMaster University, Hamilton,
Ontario, Canada.

CARLTON, J.K., 18 Rothsay Place, Bedford.

CASTERET, N., Mairlon, St. Gaudens, Ariège, France.

CAUSER, D.J., 19 Kenmore Cres., Filton Park, Bristol 7.

CHARLES, P.H., 14 St. Augustine's Rd. Edgbaston, Birmingham 16.

CHURCH, J.R., 35 Rayens Cross Rd., Long Ashton, Bristol.

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CRYER, Miss G.P., 9 Birch Road, Southville, Bristol 3.

CULLINGFORD, Rev. C.H.D., Paddock House, Linden Pit Path,
Leatherhead, Surrey.

DALE, M., 57 Kingsway Ave. Kingswood, Bristol 5.

DAVIES, J.M., 47 Heol-y-Bont, Rhiwbina, Cardiff.

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DAVIES, Prof. R.E., Dept. of Biochemistry, School of Medicine,
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DEAR, I.A., E.T.V. Steady, c/o C.D. Office, Portsmouth Dockyard.

DEARLING, A.R., 46 Grayham Rd. New Malden, Surrey.

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DEWEY, A.C., 21 Larchwood Rd. Hermitage Wood Estate, Woking,
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DINGLE, A.E., 107 Waverley Rd. Stoneleigh, Epsom, Surrey.

DOBSON-HINTON, Mrs. D.P., Glaisters, Wrington, Som.

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DUCK, P.W., South Bungalow, Rookham, Wells, Som.

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EDWARDS, W., 91 Rookery Rd. Knowle, Bristol 4.

EVERED, H.F., Huntscott, Wootton Courtenay, Minehead, Somerset.

FARR, D.N., H.M.S. Tiptoe, c/o H.M. Dockyard, Devonport, Devon.

FORD, Mr. & Mrs. D.C., Dept. of Geography, McMaster University, Hamilton, Ontario, Canada.

FRAME, Mr. & Mrs. J.W., "Brillig", Tekels Ave., Camberley, Surrey.

FROST, Mr. & Mrs. F.W., 71 Hazelbury Rd. Knowle, Bristol 4.

FROST, F., 42 Brentry Rd., Bristol 5.

GLENISTER, M.P., 42 Beaumont Close, Weston-S-Mare.

GLENNIE, Brig. E.A., Seaton House, Shrublands Rd., Berkhamstead, Herts.

GOODGE, D.P.W., Heathway, Frimley Grove Gdns., Frimley, Aldershot, Hants.

GOSLING, J.G., The Anchor, Filton, Bristol.

GREENFIELD, P.J., 26 St. George's Rd. Farnham, Surrey.

GRIFFIN, A.R., Rookstone House, Chew Magna, Som.

GULLY, A.M., 29 Eastfield, Westbury-on-Trym, Bristol.

GURNETT, C.H., West Nominees Ltd., 41 Lothbury, London, E.C.

HALL, T., (3609440 L/Bdr), Regimental Office, 94 Locating Regiment R.A., BFPO 23.

HANCOCK, P.T., 12 Canowie Rd., Redland, Bristol 6.

HANWELL, Mr. & Mrs. E.R., 8 Hooper Ave., Wells.

HANWELL, J.D., Cross Farm, Draycott, Cheddar, Som.

HARDCASTLE, M.E., 44 Canynge Rd. Clifton, Bristol 8.

HARRIS, C.W., Montery Lodge, Wells, Som.

HARRIS, P.K., Dene House, Dene Rd., Whitchurch, Bristol 4.

HARRISON, W.G., RCNC Construction Dept., H.M.Dockyard, Malta
G.C.

HARVEY, B.E., 16 Braunton Rd., Bedminster, Bristol 3.

HAWKES, Mr. & Mrs. C.J., 147 Evington Lane, Leicester.

HEMMINGS, A.S., 24 College Rd., Bristol 8.

HENSLER, E., "Gilead Balm", 12 Knighton Close, Woodford Green,
Essex.

HEWINS, M.A.H., 51 Roman Way, Farnham, Surrey.

HILL, T.J., 20 Clifton Park, Bristol 8.

HOBBIS, C.R., Warren Lodge, Long Ashton, Bristol.

HOBDAY, F.J., 28 Haywards Rd., Haywards Heath, Sussex.

HOLLAND, L., 334 Portland Rd. Hove 3, Sussex.

HOLLAND, M.J., 10 Bramley Rd., Street, Som.

HONY, B.V., "Trewithen", Love Lane, Bodmin, Cornwall.

HOOPER, J.H.D., 34 Richmond Rd., Staines, Middx.

HOOPER, M.L., 6 Marbeck Rd., Westhury-on-Trym, Bristol.

HOWMAN, M.H., Blenheim Company, R.M.A. Sandhurst, Camberley,
Surrey.

HUCKER, F.C., Penniless Porch, Wells, Somerset.

HUGHES, R.F.G., 51 Sandown Rd., Bristol 4.

HUMPHRIES, K.W., 22 Avon Rd., Keynsham.

JAMES, C.V.D., "Hallen Lodge", Hallen Rd., Henbury, Bristol.

JAMES, Miss J.M., Archery Nook, Wellington Hth., Ledbury,
Herefordshire.

JOHNSON, Lt. A.M., 16 Beach Rd., Weston-S-Mare.

JONES, U., 3 Durham St., Elswick Rd. Newcastle-on-Tyne.

JOSEY, M.F., 44A Zetland Rd. Bristol 6.

KEMP, D., 57 Theobalds Rd., London, W.C.1.

KENNEY, Mr. & Mrs. C.H., Tudor Cottage, Beryl Lane, Wells, Som.

KENNEY, R.R., 5 Butt Close, Glastonbury, Som.

KENT, Mr. & Mrs. L.J., Fisherman's Hut, Yarlington, Wincanton, Som.

KING, C.D., 17 North Ave, Heath End, Farnham, Surrey.

KINSMAN, D.J., 123 Knole Lane, Brentry, Bristol.

KNIPE, J.E., 37 Lansdown Rd., Redland, Bristol.

LAMB, Rev. P.F.C., Montrose Hse, Winkleigh, Devon.

LAMPORT, T., "Pinehurst", Upper Hale, Farnham, Surrey.

LANE, Mr. & Mrs. M.J., 41 Wellesley Ave, Beverley High Rd., Hull,
Yorks.

LAWDER, Com. & Mrs. P.B., Brook Hse, Wrington, Bristol.

LAWDER, Capt. & Mrs. R.E., Brook Hse, Wrington, Bristol.

LENNON, I.G., 8 Druid Road, Stoke Bishop, Bristol 9.

LLOYD, Dr. O.C., Withey House, Withey Close West, Bristol 9.

LONG, K.G., Riverbend, Seawalls. Rd, Sneyd Park, Bristol 9.

LYDDIETH, J.C., Burra Folly, Limpley Stoke, Bath.

MANKTELOW, J.T., 17 Drayton Rd., Borehamwood, Herts.

MARTIN, E.W.R., 5 Upper Sandhurst Rd, Brislington, Bristol 4.

MAXWELL, W.G.R., 12 Heybridge Drive, Barkingside, Ilford, Essex.

McLaren, P., 10 Halswell House, Goathurst, Bridgwater, Somerset.

McMILLAN, A.J.S., 5 Oakfield Rd, Bristol 8.

MIDDLEBROOK, R., 6 Christchurch Terrace, Warminster, Wilts.

MILLAR, R.F., 76 Stradling Ave, Weston-S-Mare.

MOGG, D.T.S., 7 Barlington Rd, Redland, Bristol 6.

MORLAND, T.E., Culham College, Abingdon, Berks.

MORRIS, A.E., 6 Aubrey Rd, Bristol 3.

MORRIS, A.J., 6 Aubrey Rd, Bristol 3.

MORRIS, W.A., 43a Manor Park Cres., Edgware, Middx.

MORRISON, A.J., "Landons", Mountway Rd, Taunton.

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Bristol.

MURRELL, P.H., Hightrees, Nash Lane, Yeovil, Som.

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NUNWICK, R., 8 Howlands, Welwyn Gdn. City, Herts.

OLDHAM, A.D., 52 Monmouth Rd., Bristol 7.

PADDOCK, N.L., Enville Mount, Enville Rd, Bowdon, Altrincham, Ches.

PADFIELD, M., 4 Ryde Rd., Knowle, Bristol 4.

PARKES, J.G., Woodcote, Wood Lane, Parkgate, Wirral, Ches.

PEARCE, Dr. R.A.J., No. 3 Rodwell Hall, St.Thomas Rd., Trowbridge, Wilts.

PECKHAM, G.E., 40 Hazelbury Rd. Knowle, Bristol 4.

PECKHAM, P.H., 40 Hazelbury Rd. Knowle, Bristol 4.

PHILLPOTT, J., 71 Stoke Lane, Westbury-on-Trym, Bristol.

PHILPOTT, R.A., 3 Kings Drive, Bishopston, Bristol 7.

PICK, S.J., 80 Letchworth Rd., Leicester.

PICKNETT, R.G., 34 Pauls Dene Cres., Salisbury.

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PUGH, J.A., Min. of Health, P.O.Box 1423, Accra, Ghana.

PIKE, R., 88 Redland Road, Bristol 6.

RAHTZ, P.A., 27 Cotham Road, Bristol 6.

ROACH, B.S., 17 Dowry Parade, Hotwells, Bristol 8.

ROBERTS, C.F., "Danetree", Coxwell St, Faringdon, Berks,

ROGERS, Dr. A., 10 The Paragon, Clifton, Bristol.

SAVORY, H., 61 Lower Redland Rd, Bristol 6.

SAVORY, J., 61 Lower Redland Rd, Bristol 6.

SEALY, Mr. & Mrs. A.E., Hillgrove Farm, Hillgrove, Wells.

SHARPE, E.W., Tralee, Orchard Rd, Arnside, Westmorland.

SHAW, T.R., 1 France Hill Drive, Camberley, Surrey.

SKINNER, Mr. & Mrs. J., 24 Harrowdene Rd., Bristol 4.

SMITH, P.H., c/o Mrs. Townsend, 73 Marshfield Rd., Chippenham, Wilts.

SMITH, P.J., No. 17 Caravan Site, Kingsdown Park, Nr.Swindon, Wilts.
SMITH, P.W., 24 Sinclair Ave., Prescot, Lancs.
STACEY, Rev. W.D., Queens College, 1 Claremont Lane, Taunton,
Som.
STANBURY, T.H., 6 Aubrey Road, Bristol 3.
STANTON, Dr. & Mrs. W.I., c/o Crabtrees, Street, Som.
STAYNINGS, Mr. & Mrs. A.J., 8 Fanshawe Rd. Hengrove, Bristol 4.
SURRELL, A., 25 Beverley Court Rd, Quinton, Birmingham 32.
SUTCLIFFE, D.M., 62 Clarence Rd. St. Albans, Herts.
SWITHENBANK, Mr. & Mrs. J., Apt. 323, 838 Plymouth Ave.,
Montreal 16, P.Q.Canada.

TANNER, D.B., 2174 Bartlett Ave, Victoria, B.C.
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Wilts.
THOMAS, J.A., 5 Hale Reeds, Heath End, Farnham, Surrey.
THOMSON, Dr. & Mrs. D.M.M., P.O. Box 172, Entebbe, Uganda.
THOMPSON, M., Ashen Hill Cottage, Priddy, Wells.
THURSFIELD, C.J., Magdalen College School, Brackley, Northants.
TOVEY, S.N., 54 Cowling Drive, Stockwood, Bristol 4.
TRATMAN, Dr. E.K., Penrose Cottage, Burrington, Bristol.
TUCK, N.W., 53 St.Arans Rd, Cwmbran, Mon.
TUDGAY, G., 1 St.Edward's Rd. Clifton Wood, Bristol 8.
TUDWAY, R.W., 83 Bell Barn Rd, Bristol 9.

WADDON, E.J., 65 Raleigh Hall, Eccleshall, Stafford.
WAINWRIGHT, M., 26 Kings Ave. Woodford Green, Essex.
WALKINSHAW, D., 2a Downshire Hill, London, N.W.3.
WALL., Mr. & Mrs. M., Mount Pleasant, 10 The Dell, Kingsclere,
Newbury, Berks.
WALLIS, Dr. F.S., The Museum, Torquay, Devon.
WARBURTON, D., 20 Beverley Court Rd. Quinton, Birmingham 32.
WARWICK, Dr. G.T., 47 Weoley Park Rd, Selly Oak, Birmingham 29.

WATTS, M.L., 27 Berkeley Sq., Bristol 8.
WEDGEWOOD, Sir J., Barlaston, Stoke-on-Trent, Staffs.
WELLS, Dr. & Mrs. O.C., 406 Lenox Ave., Pittsburgh 21, PA, U.S.A.
WHITE, B.P.C., c/o Townsite Cafeteria, Kawerau, New Zealand.
WHITTLE, R.A., 8 Cote House Lane, Westbury-on-Trym, Bristol.
WICKHAM, N.J., Top o' the Hill, Church Rd., Hartley, Nr. Dartford,
Kent.
WILLIAMS, G.H., Cedarwood, Cadbury Camp Lane, Clapton-in-
Gordano, Somerset.
WILLIAMS, M.B.J., 46 Hampton Rd., Redland, Bristol 6.
WILLIS, Mrs. B.M., 15 Hooper Ave, Wells, Som.
WILLIS, D.A., 15 Hooper Ave, Wells, Som.
WILSON, D., 26 Drake Rd, Ashton Gate, Bristol 3.
WITHEY, Mr. & Mrs. M., 79 Whomerley Rd., Monks Wood, Stevenage,
Herts.
WOODS, Mr. & Mrs. M., "Litton Cheney", Sedgeberrow, Worcs.
WOOLLEY, R., 90 Ridgeway Rd., Long Ashton, Bristol.
WYNNE ROBERTS, S.G., 8 Beaufort East, Lambridge, Bath.

YEO, I.N., 5 Broadway Rd., Bishopsworth, Bristol 3.
YOUNG, D., 2 Conbar Ave, Rustington, Sussex.

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