EXCURSION TO THE CASTLETON CAVES

Leader: T.D. Ford — Sunday, 10th October 1971

Opening the excursion at Peak Cavern, it was explained that in spite of nearly two centuries of exploration of the Castleton Caves there were still many unsolved problems. Cavers dedicated to exploration in places difficult of access were still adding details to the story, but it was up to geologists to provide an explanation of why the systems had evolved in the way they had. Observation of detailed features, both above and below ground was necessary, and a careful assessment of processes past and present and their mutual interaction was needed before an approach to the whole story could be made. The Director explained that he had made some contributions to the present state of knowledge, but that much more research was needed. (see Ford 1967). The accompanying map (based on that in Ford (1967) by permission of the British Speleological Association) summarizes the state of knowledge concerning the distribution of underground passages. Links in drainage between cave systems which have been proved by dye tests are indicated, and the more important mineral veins are shown, as drainage undoubtedly used vein cavities for considerable distances though these were unlikely ever to be accessible. Altitudes of swallets, resurgences and of as many intermediate points as possible are given and these enable contours of a hypothetical water-table to be drawn, though it must be emphasized that this is not a boundary between a continuous zone of saturation below and a zone of percolation above as each drainage system is separate and follows its own independent channels sometimes crossing above or below another system.

The tourist part of Peak Cavern provided many interesting features. The large entrance chamber showed sections in lenticular "reef" limestones, cut by several vertical fractures. Solution had obviously allowed collapse of major blocks here. Much of the first part of the cave system beyond the Vestibule showed solutional development, and present day fluctuation of water levels indicates that this section has now long left the permanently submerged phreatic zone. Its relation to the valley profile outside was important, for if one restored the valley floor to some of the higher terrace levels seen further down the Derwent Valley, the Vestibule must have been submerged and functioning as a Vauclusian spring, with water rising to resurge perhaps 100 feet or more above its present altitude. When this phase had occurred was unknown, but the patches of scree cemented to the walls of the gorge outside the entrance indicated a former partial periglacial fill stage. The rope-walks in the entrance had been cut in a slope of scree and other debris, but without an archeological trench cut through the deposits, the story they might tell was not known.

Inside Peak Cavern, the Director outlined the events which led to the discovery of the inner passages by divers in 1949, and the subsequent relatively dry access which had been provided by draining the "Mucky Ducks". Further in, the main passages were developed mainly in widely spaced bedding planes dipping gently towards Castleton, and the stream had cut a vadose trench down from these. A clay fill stage had blocked many ancient passages, and this was now in process of gradual removal by the present drainage in places. Much of the inner cave was below Cave Dale, but this was regarded as a dry valley eroded on the surface in the periglacial conditions of the Last Glaciation, without regard to the cave beneath which was older.

On leaving Peak Cavern, the party paused to see the water flowing from Russet Well, situated on the east side of the Peak Cavern stream. Its catchment, however, is to the west, via Giants Hole and the other swallets, and through the inner parts of the Speedwell Cavern. In reaching Russet Well the water must flow beneath the Peak Cavern stream without mixing with it, thus emphasizing the discrete nature of such drainage systems. Russet Well did this by the water having utilized primary cavities in a mineral vein. In times of wet weather, snow melt etc., water backed up in both Peak and Speedwell Caverns, and overflowed as a mixed system via the now-blocked Peakshole Sough (a lead-miners drainage tunnel) and in the inner part of Peak Cavern.

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The party then passed on to Treak Cliff Cavern. In contrast to the active system at Peak Cavern, Treak Cliff Cavern has been left high and dry by circumdenudation. It was discovered about 1750 by miners looking for Blue John Stone, the ornamental variety of fluorspar. The entrance tunnel leads straight into the old cave where Blue John is seen filling or lining the voids between boulders in the pre-Namurian boulder bed (Simpson & Broadhurst 1969). Ford 1969). Methods of mining were demonstrated and varieties of Blue John pointed out. In 1926 a breakthrough was made by Blue John miners into the inner caverns, Aladdin's Cave, Fairyland and the Dream Cave. Being in the solid limestone below the boulder-bed these are devoid of Blue John, but are well-decorated with multitudes of stalactites and stalagmites. Some of the new ideas of the formation of such speleothems were explained by the Director. Attention was also called to the ochreous clay on the floor of parts of the cave. There were several possibilities for the origin of this. Some could be insoluble residue from the limestone, but not more than a small proportion; some could be weathered shale from the former cover of Edale Shales; but a probable source for much of it was the former cover of loess which once overlay this area in late Pleistocene times.

Moving on to Giants Hole, the Director explained that this was but one of a series of swallet caves along the limestone margin. Several more lay to the west, and all engulfed small streams draining off the Millstone Grit of Rushup Edge. Their present position was clearly related to the shale margin having been eroded back from a former extent higher on the limestone. Old swallets should occur at higher levels but there was little evidence for these though some might be concealed beneath the loessic soil cover, and others had been so changed by mining that they were no longer recognizable. An important feature was that the swallets were mostly in hollows where solufluction debris off Rushup Edge had collapsed or been washed into pre-existing caves. Thus the present swallets were older than the solifluction sheet. Their drainage also penetrated right under the apparent topographic watershed which ran roughly southwards from Mam Tor. Giants Hole was the only one of the swallet caves which could be explored for more than a few hundred feet. The stream can in fact be followed for nearly a mile, to a depth of about 400 feet. Until recently this involved crawling through the body-tight Pillar Crawl and bailing out the Backwash Pool, but sufficient work towards opening the cave to the public had been done to make it an easy scramble. The party followed the stream passage noting features such as the scalloping of the rock surface by turbulence of the slightly corrosive waters draining Rushup Edge, and the former higher level of the stream cave system. Leaving the stream to pass through the former site of Pillar Crawl, the passage blasted through sheets of stalactitic fill was seen. From Pillar Hall onward the left-hand wall was seen to be a cemented stream-gravel fill, probably related to a different passage system active during solifluction and high run off stages. At Backwash Pool the former high-level of water was indicated by the undercut notch at head height! Rejoining the stream in Base Camp Chamber the high avens, well-decorated with stalactites, were thought to mark a strong joint system. Patches of old fill were seen cemented on the walls, and resistant chert nodules formed ledges. Exploration, on this occasion, stopped at the top of the 20 feet deep Garlands Pot, though the beginning of the narrow meandering Crab Walk could be seen below.

To close the day the party took advantage of an opportunity to visit Bagshaw Cavern at Bradwell. Descending the narrow stairway in the old mine workings by which the cave had been discovered, various features of mining were seen. The long silt-filled gallery to the Dungeon was traversed, and the former Pleistocene (?) fill stage was discussed. The more recently active passage near the Dungeon pot-hole was examined in more detail and much scalloping was seen, not only roof and walls, but also on fallen blocks. Finally the party squeezed by installments into Calypso's Palace, a stalactite Grotto formed in a calcite vein.

In closing the excursion the Director called attention to the simple facts that there was still a lot of exploration to be done before the cavers' dream of being able to go right through the systems was realised. There was also much geological and geomorphological research to be done before anything near a chronology could be established for the evolution of the cave systems. Many observations allowed a partial relative chronology to be worked out, but much more was needed, in particular some absolute dates. The party had doubtless realized that many of the old theories on the formation of cave systems were no longer tenable: members of the Cave Research Group of Great Britain were currently investigating details of how solution took place, of the rate of erosion, of the significance of mix-corrosion, of organic acids, and

of the effect of the lithology of the limestone on the nature of caves. Finally, the Director pointed out that the party had had the opportunity of seeing both commercialized and semi-commercialized caves, and in the latter at least had been able to appreciate something of the nature of the obstacles found in cave exploration. They had also had the problems of safety in caving pointed out, but two points needed emphasizing again - good reliable lights and not too big a party!

References

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