

Frank i'th' Rocks Cave and other Northern Caves in Relation to the Ice Ages.

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FRANK I'TH' ROCKS CAVE.

This exit cave is on the left bank of the River Dove, two miles south of the village of Hartington in the Buxton area. The river at this point is about 600 feet above sea level. The cave is a deep narrow fissure in Mountain Limestone, about 50 feet above the banks of the stream. The entrance faces South, opening on to a platform well sheltered from northerly and north-easterly winds.

Fig. 1 shows the plan of the original ground level before work was commenced. As will be seen the cave twists through almost 180 degrees, rising at the same time about 20 feet. After a preliminary investigation, and the digging of a few trial holes the cave was surveyed and marked out in 2 foot squares. The position of all finds could thus be accurately recorded. Excavation was begun at the entrance and pushed forward towards the back of the cave.

Altogether 15 tons of material were removed and sorted.

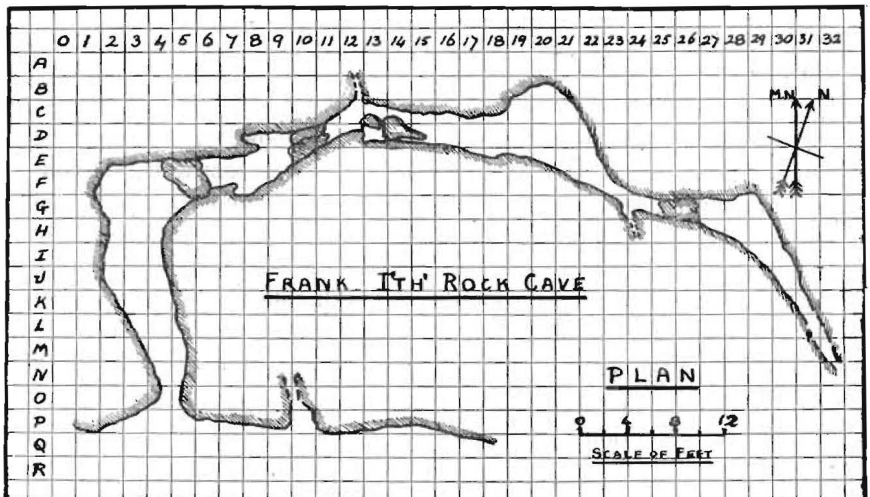


FIG. 1.

Fig. 2 shows views of two sections of the deposit near the entrance. The lowest deposit is a yellowish plastic clay of Pleistocene age, very tough and much compressed, containing angular and sub-angular boulders of limestone, and pebbles of local origin. Above this there was a black band of about 4 inches in depth, composed mainly of vegetable charcoal. On this rested 2 feet of hard cemented breccia from which the majority of the finds were obtained. A layer of fine dark cave-earth, capped by recent humus, overlay the whole. The black band and the breccia deposits became thinner and thinner as progress to the interior of the cave was made, and they eventually entirely disappeared in the vicinity of C and D, 20 and 21 on the plan. In this neighbourhood a more or less broken tufa floor was met with. During recent times a stream has made its way down the cave, and its bed may be traced from the back to the entrance where it is choked by debris brought down by the water. This stream carried in a sandy loam the grains of which are more characteristic of a re-assorted æolian deposit than of a fluvial deposit. It is easily distinguishable from the underlying clay by a slight difference in colour and texture.

In order to ascertain the depth and the nature of the lower levels of the plastic clay a pit was sunk in the floor of the upper chamber; squares C and D 20.

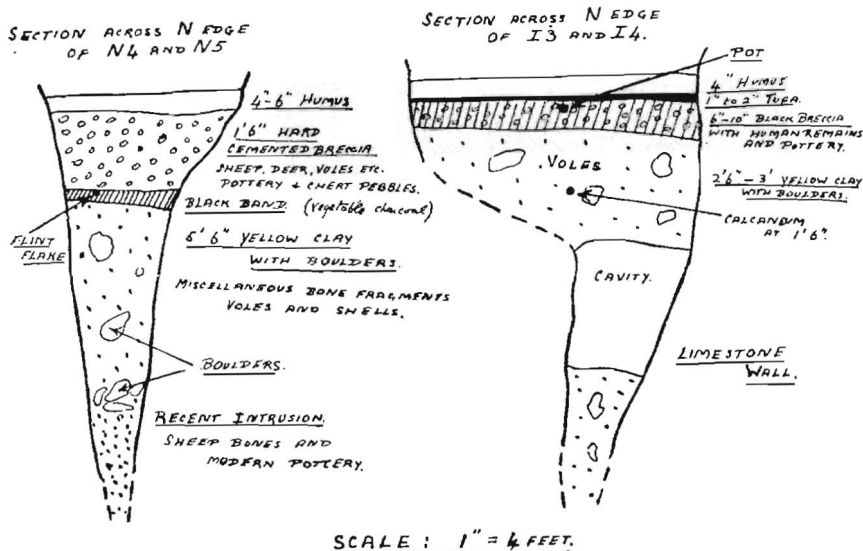


FIG. 2.

At a depth of 2 feet remains of a stalagmite floor, 3 inches thick in places, overlying the water channel, were encountered; 8½ feet down, the walls of the cave approached too near to each other to permit of further digging. The clay was quite barren and no trace of animal remains was seen.

Two trial holes were sunk outside the cave into the platform. The deposit consisted of a barren gravel breccia covered by a few inches of humus. The rock floor was struck at a depth of about 2 feet.

THE HUMAN REMAINS.

At least ten individuals are represented, most of them being children. One adult female, and possibly one adult male are distinguishable. Of the children four are very young, being probably less than seven years of age. The bones were found throughout the cave, chiefly in the limestone breccia. It is noteworthy that while portions of skulls, jaws and teeth, vertebræ and clavicles were numerous, there were few long bones and no adult skull found.

The inhabitants suffered from dental caries and rheumatoid arthritis.

The humerus of a young person (probably a girl) is of interest in as much as it had been broken, and healed in a bad position.

THE FAUNA.

Fifteen Mammalian, including Microtine species have been found. These consist of bones of the following animals:—

Sheep, Pig, Fallow Deer, Ox, Horse, Dog, Badger, Pine Marten, Pole Cat and Hare.

Sheep, Pig, Deer, Ox and Horse were found distributed over a large area of the cave, chiefly in the breccia and black band.

The Ox is *Bos longifrons*, whilst the Horse is that particular type of *Equus caballus* characterised by short thick-set limbs. It is, in all probability, a descendant of the Palæolithic Horse of Solutré, and a probable ancestor of the modern Shetland pony.

A canine tooth of dog (*Canis familiaris*) was obtained from square D 8, and was the first find to be made during the preliminary investigations.

A lower jaw of Pole cat (*Mustela putorius*) was found in square N 4, while square D 18 yielded part of an upper jaw.

Pine Marten (*Mustela martes*) is represented by fragments of mandible of two individuals. These were found in square D 17.

Badger (*Meles taxus*) was identified by part of a left lower jaw from E 3.

Bones of toad and the common hare were frequently met with in the breccia and stalagmite floor.

Four species of small mammals¹ were discovered :—

Microtus agrestis.

Arvicola sp.

Sorex araneus.

Microtus arvalis. (Continental Field Vole).

The first three species are of recent date, but *Microtus arvalis* is of Pleistocene Age, and was found near the entrance of the cave in the yellow clay, which is thus adequately dated.

The Avian remains are very scanty, only two upper beaks being found. These were both obtained from the breccia, and are :—

Kestrel² (*Falco tinnunculus*).

Jackdaw² (*Corvus monedula*).

The Molluscan remains are represented by :—

Helix aspersa.

Helix hortensis.

Vitrea cellaria.

Pyramidula rotundata.

These were found throughout the cave both in the yellow loam and breccia. The species are not extinct, but it must be remembered that many living species represent a great range in time.

FLORA.

Fragments of vegetable charcoal have been examined³ and identified as either Fir or Pine.

ARTIFACTS.

Worked Bone. A fine specimen of perforated antler, usually considered to be a cheek-piece of a bridle-bit, was found in square D 17. It is $4\frac{1}{2}$ inches long and $\frac{3}{4}$ -inch broad across the larger transverse diameter. This diameter is pierced with one hole. Mr. H. St. George Gray has classified this interesting series of antiquities according to the position and number of holes.

This specimen comes under type E, with one round hole through the long transverse diameter. Fig. 3, 1 and 1a shew details of the decoration, which consists of a dot and circle pattern on one side of the piece only. There are altogether 16 circles each enclosing a dot; the whole being enclosed in a rectangle. There are signs of consider-

¹ Identified by Mr. M. A. C. Hinton, British Museum.

² Identified by Mr. E. T. Newton, F.R.S.

³ By Prof. O. V. Darbishire, Bristol University.

able polish and wear on its lower end, and several cuts have been made across it with a blunt instrument.

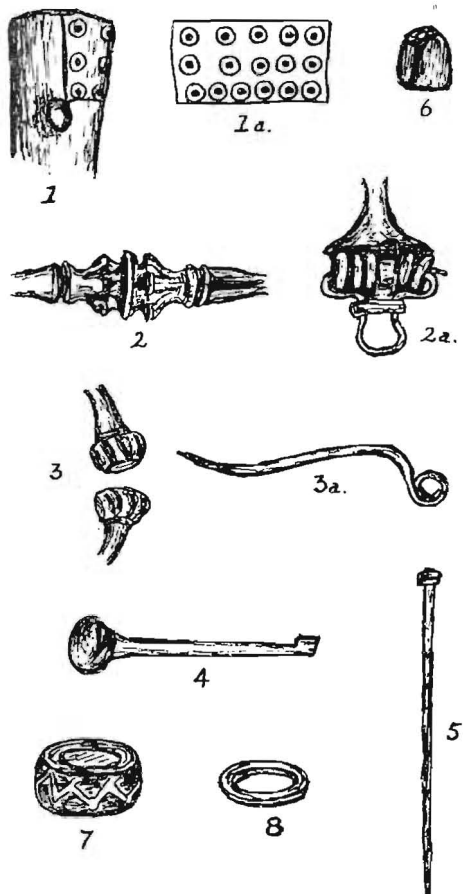


FIG. 3.

A stag antler knife handle with a piece of the iron tang still in position was found in square D 17. It is in bad condition, but shews the marks of several knife cuts.

Three pieces of fallow deer bone came from the breccia near the entrance to the cave. They were sawn from one long bone, at right angles to its length. The bone had also been split longitudinally. Their use is unknown.

D 17 also yielded a bone pin and a bone needle. The former has a round head, finely incised with a series of vertical lines. Unfortunately the tip of the point is missing. The latter is about 2 inches long.

The end of a well-made and high-polished bone spatula together with other miscellaneous fragments of bone, shewing evidences of cutting and polishing, were found in near proximity to the pin and needle.

Worked Stones. Flint was sparse throughout the cave. Two unretouched blades about 3 inches in length were obtained; one from C 22, 6 inches below the surface, and under a thin layer of stalagmite; the other from M 4, 2-ft. 3-ins. below the surface, in the disturbed yellow clay. The former is highly patinated; it has no definite characteristics and may be of Neolithic Age. Three small retouched flakes were also found in the disturbed area of yellow clay.

A pestle of Millstone Grit was discovered, again in this disturbed region; that it came originally from the breccia is proved by the fact that the adhering clay was black and not yellow; it is double ended, both ends having been used for grinding.

One of the most interesting objects is a small Tertiary pebble from the Bunter beds. This was found in the breccia, and must have been placed there by human agency; moreover at one end it has been ground to a rough edge or point. Its length is $1\frac{3}{4}$ inches.

Another Tertiary pebble has been used as a hone for sharpening needles or other small objects, a well worn and highly polished groove having been made on one edge.

Bronze. Foremost among the few Bronze artifacts must be placed a Romano-British fibula from D 16; it is a development of the La Tène III type, and is of massive construction; it is about $1\frac{3}{4}$ inches long. (Fig. 3, 2 and 2a). Following Collingwood,⁴ these were manufactured at or near Brough-under-Stainmore in Westmoreland, during the 4th century A.D. They were frequently worn in pairs connected by a bronze chain. This development with a moulding on the bow is essentially English, and is not met with elsewhere. Its specific gravity is 8.1.

A second fibula of La Tène III type was also found. This is not in such good condition as the other, and presents no unusual features. It has been dated as prior to A.D. 55.

A bronze penannular brooch in first class condition came from square B 20. It is $1\frac{1}{4}$ inches in diameter. The mouldings are decorated with a spiral pattern. (Fig. 3, 3 and 3a).

Two bronze pins slightly over 1 inch in length are akin to the modern pin. The head of each is formed of two twists of thin bronze wire wound round the shaft of the pin (Fig. 3, 5).

⁴ Collingwood *Roman Britain*, Title Page and page 75.

A chain consisting of 16 oval links was found near the Romano-British fibula, and very probably belonged to it. It shows considerable use as the links are worn very thin in places.

A curious piece of bronze having a heavy head at one end, and a projection at the other was found in D 16. Across one side of the head is a nick made with a chisel-like instrument. This nick presumably pinches the head on to the stem (Fig. 3, 4).

Several pieces of torque were found, and other fragments of bronze of little importance.

COINS.

Altogether 12 coins have been found, three of which have not been identified as yet; the remainder have been kindly described by Mr. Harold Mattingly of the British Museum.

They are of Romano-British date, the following Emperors in Britain being represented: Valentinian I, 364—375 A.D., his brother Valens, 364—378, A.D., and his son Gratian, 367—383, A.D. The obverse of some of those of Valentinian I has imprinted "SECURITAS REPUBLICÆ." Of those of Gratian one reads "GLORIA NOVI SÆCULI" and another "GLORIA ROMANORUM."

IRON.

Several pieces of iron have been found. The tang of a knife fixed into an antler handle has already been mentioned. Several rivets about $\frac{1}{2}$ inch long are in a good state of preservation; these were well distributed throughout the cave. An iron hook somewhat corroded by rust, and several lumps of iron were discovered near the back of the cave.

BEADS.

Altogether 10 beads have come to light. They are all of glass, and may be divided into four classes. The first type is of cylindrical shape, about 1 cm. in external diameter and $\frac{1}{2}$ -cm. deep; it is of black glass, and its decoration⁵ consists of a zig-zag pattern of inlaid light coloured glass (Fig. 3, 7). It is paralleled by finds from Kent and Charent, West France. It is dated at 600 A.D., and usually known as Anglo-Saxon, although the pattern probably appeared in Roman times, and perhaps earlier. The place of manufacture is unknown.

The next type is represented by two specimens. They are annular in shape, delicately made and pale blue in colour (Fig. 3, 8).

⁵ Reported on by Mr. Reginald Smith.

The third type is of the common cylindrical form. Six were obtained, all being an opaque green colour.

The fourth type is rectilinear, and is of a deep blue glass. The form is that of a truncated pyramid with four sides (Fig. 3, 6).

POTTERY.

A quantity of pottery of different ages has been found. In the disturbed areas several pieces of a large coarsely glazed pitcher or bread pan of XIII century date were found; also parts of a XV century vessel with a bung hole or circular spout.⁶

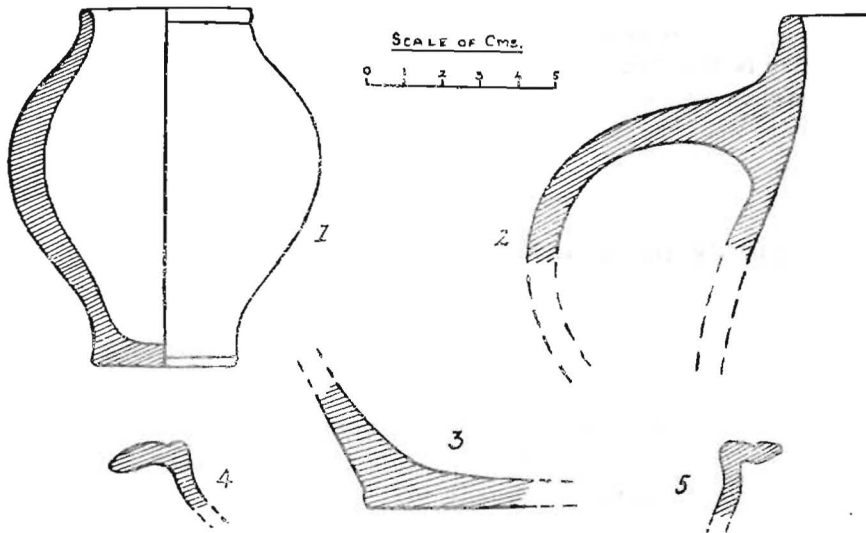


FIG. 4.

Of Roman pottery there are parts of at least six vessels. The most complete is a small jar of good reddish paste. It is some 8 cms. in diameter at its widest part, 1 cm. thick, and just over 12 cms. high. It has a slight thickening round the lip, but is otherwise undecorated (Fig. 4, 1). Of coarser material is a piece with a part of the handle affixed. The handle is of heavy construction and well decorated with a series of ribs. A part of the base of this pot was also found (Fig. 4, 2 and 3). Several pieces of rims apparently belonging to the shallow dishes so typical of Roman times were well distributed over the cave (Fig. 4, 4 and 5).

Two fragments of pseudo-Samian ware have also been found. One is decorated, but the decoration has been so badly worn away that the scene depicted is not clear.

⁶ Kindly examined by Dr. Cyril Fox.

CONCLUSIONS.

During the long years of Upper Palaeolithic times this apparently satisfactory dwelling site was not occupied by man or beast. This must have been due to one of two reasons. Either the cave itself was not then in a suitable condition, due to running water or dampness, or the climatic conditions were too severe to support life. As will be shewn below this latter condition was probably the cause.

With regard to the later occupation it seems that the cave was visited throughout the latter part of the Roman stay in Britain, and perhaps spasmodically during succeeding years; for with the exception of the two pot-sherds of much later date there is no evidence of any extended use of the cave after the beginning of the 5th century. It may be that some of the children were buried in the cave, but there is no direct evidence for this other than the fact that most of their remains were found at the higher levels in the more remote portions of the cave.

A SURVEY OF THE NORTHERN CAVES IN RELATION TO THE ICE AGES.

Frank i'th' Rocks Cave (point 26 in Figure 5) is the third cave within a comparatively short distance of Buxton which we have excavated. The other two are Thirst House Cave, and a cave locally known as The Fox Hole (Points 16 and 15 in Fig. 5). These two caves are situated in Deep Dale, about five miles east of Buxton, and, like Frank i'th' Rocks Cave, both were found to have barren Pleistocene deposits. Similar results are being obtained at Beeston Tor Cave⁷ (Point 27 on Fig. 5). In view of the similarity of the deposits and their contents in these four cases it seems of interest to review other cave excavations in the North of England in order to ascertain if similar results were obtained and to determine, if possible, why the Pleistocene strata are practically devoid of human and animal remains.

In Frank i'th' Rocks Cave the oldest deposit is a yellowish plastic clay containing erratic stones of comparatively local origin (*e.g.*, quartz pebbles from the Bunter beds) and angular and sub-angular limestone boulders which have presumably fallen from the roof. The deposit is about seven or eight feet thick at the entrance, and is barren with two exceptions. The first is the recent intrusion of modern animal bones where the stream found its way through channels under the boulders, and the second exception is the for-

⁷ Since writing *Hyaena* has been identified from this cave.

tunate occurrence of a few typically mid to late Pleistocene voles (in particular *Microtus arvalis*). These latter are important and show that the deposit is a product of the later stages of the last cold period when the more recent boulder clays were in process of formation. The cave deposit is, in fact, very similar to a boulder clay. In most parts of the cave this clay is covered by a hard limestone breccia containing bronze and iron artefacts and pottery, but in a few places a somewhat sandy deposit immediately underlies the breccia. Both Dr. Wallis and Mr. Jackson have verified the fact that many of the grains of this sandy loam are more characteristic of an æolian than of a fluviatile deposit. The dual natures of the constituent materials and the slightly yellower colour of the loam distinguish it from the underlying clay and suggest that it has been formed by a stream washing into the cave a mixture of æolian sand and ordinary local limestone and sandstone detritus. The matrix of the overlying limestone breccia is chiefly hard crystalline calcareous matter with softer patches of dark red cave earth composed mainly of angular grains of silica.

This recent stratum is blackened throughout by decayed organic matter without any very definite evidence of fire; and where undisturbed, is covered with a thin coating of stalagmite which varies in thickness from a fraction of an inch to two inches near the cave walls. Above there is humus.

A similar sequence of deposits was found in the caves of Deep Dale with the addition of a very hard barren crystalline calcareous deposit below the yellow plastic clay in Thirst House Cave.

There is an interesting comparison which can be made between the deposits of Frank i'th' Rocks Cave and some contemporary deposits in other parts of England. For example, at Clevedon in Somerset an unstratified limestone breccia containing a mid to late Pleistocene mammalian fauna underlies an æolian sand. Elsewhere⁸ one of us has described this breccia and compared it with the Coombe Rocks of the South coast. It would seem to be contemporary with the later boulder clays of the North and the yellowish plastic clay of Frank i'th' Rocks Cave. The æolian sands at Clevedon are later than these "cold" deposits, but earlier than the overlying stony loam from which (at Clevedon) pieces of Neolithic pottery have been obtained.

On the South coast between Brighton and Southampton an unstratified flint gravel known as Coombe Rock underlies either an æolian sand (as at Little Posbrook near Portsmouth) or a brickearth

⁸ *Proc.*, Vol. I, p. 128.

(as at Selsey). The Coombe Rocks are the deposits resulting from severe climatic conditions. The more recent of these deposits was probably formed towards the end of Pleistocene times,⁹ and is therefore contemporary with the upper boulder clays. Neolithic remains from the overlying brickearths and alluvium fix the cultural period contemporary with the formation of these uppermost strata.

Further towards the West in Kent's Cavern the sequence of events is even more complete because the mammalian remains and human artefacts extend over a longer period of time with no barren stratum to break the continuity of the evidence during, and subsequent to, the last cold epoch. Mid and late Pleistocene remains are obtained from a layer of dark cave earth which is covered by a layer of granular stalagmite. Above this is a black mould containing Neolithic, Bronze and Iron Age material. It may be remarked in passing that as a rule the nature of cave deposits does not give much information concerning the climate which prevailed during the time of their deposition.

During recent excavations north of Manchester an æolian sand was exposed, overlying the boulder clays. The most recent and superficial deposit was a loamy soil which yielded no human or mammalian remains.

These five examples cited from different localities in England are, in so far as they give any evidence, all in agreement with the hypothesis that the climate of England was abnormally cold in mid and late Palæolithic times, and has gradually ameliorated during the Neolithic period. Between these two main periods an exceptionally dry and cold interval occurred during which the æolian sands and reassorted mixed æolian and fluviatile cave deposits were formed. These latter deposits are probably the English representatives of the newer loess of the Continent. From this and other evidence it would seem that this dry interval occurred when the Aurignacian culture was at its zenith.

We thus arrive at the conclusion that the barrenness of the mid and late Pleistocene cave deposits in the Derbyshire caves referred to above is a consequence of the severity of the climate in the northern parts of England. In the caves of the South (such as Kent's Cavern and St. Brelade Cave, Jersey) we get evidence of both mid and late Palæolithic cultures. At Gower (South Wales) and Aveline's Hole (Mendip Hills) the earliest "human" artefacts are late Palæolithic. In the caves of the Derbyshire district, *as a general rule*, only post-Palæolithic human remains are to be found. This seems to be a

⁹ *Proc. Geol. Association*, Vol. XXXIV, p. 253.

reasonable distribution on the supposition that the amelioration of the climate proceeded from the South northwards. For example, when the Pennine District first became habitable the contemporary culture was late Palaeolithic or early Neolithic. Thus the Derbyshire hills are covered with Transitional microliths, whilst only one Acheulean implement has ever been found North of Lincolnshire. This was a surface find at Bridlington (Point B on Fig. 5). Excluding the evidence from the Welsh caves, which is not in disagreement with these facts, but which is outside the scope of this survey, there is one outstanding and important exception to the foregoing generalizations. This exception is based on the evidence obtained from a group of caves situated south-east of the Pennine Chain between the high lands, and the River Trent. From the map of Figure 5 it will be seen that the black dots in this locality indicate the presence of late Palaeolithic

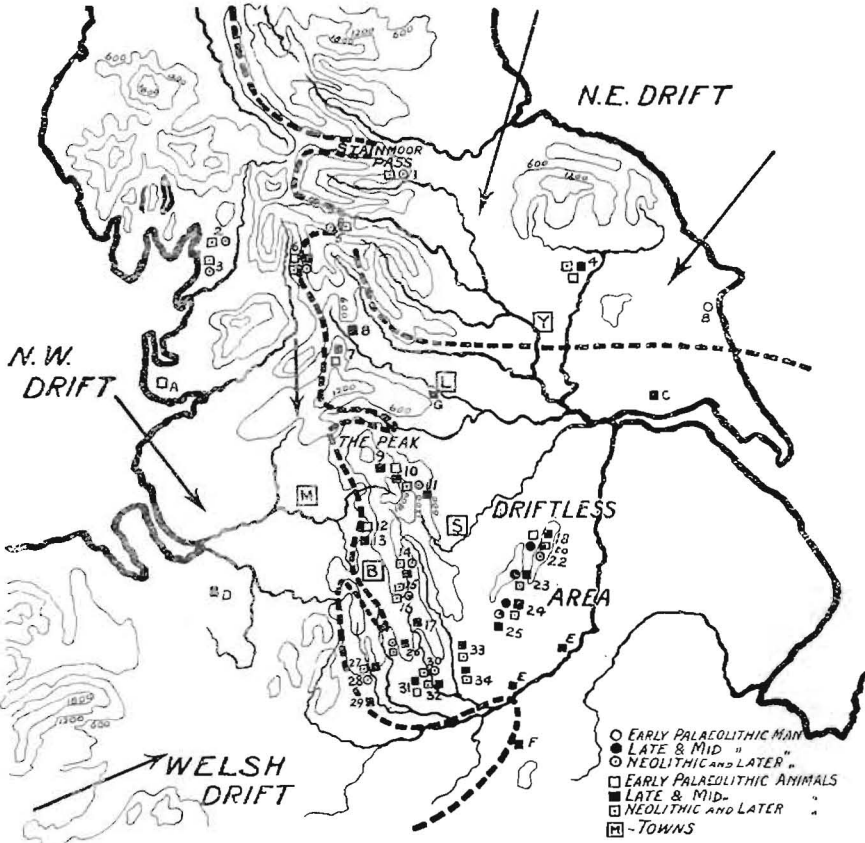


FIG. 5.

man in this region. Inasmuch as some of the flint artefacts appear to be Mousterian, mid-Palæolithic cultures may even be represented. This curious anomaly is of fundamental importance, and is only explicable on the suggestion that the thick chalky boulder clays of the Midlands are relics of an earlier glaciation than the last cold period which we have hitherto been considering. It would be of interest if this conclusion could be established from prehistoric archæological data, because recently Prof. Kendall¹⁰ and many other glacial geologists have ceased to consider the northern boulder clays as evidence of one great glaciation.

A very superficial study of the glacial geology of the Pennine district reveals two curious facts; namely, that the evidence indicating the former existence of ice on the West of the Pennine Chain shows that it must have been very much thicker and much more continuous than that on the eastern side, and that the area immediately south-east of the range is almost devoid of drift deposits altogether, in spite of the vast accumulation of boulder clays further south and further east. These facts have long been realised, but no agreement has been reached concerning their explanation.

Now it so happens that the portion of the Pennine district practically devoid of drift is just the area in which the remains of mid or late Palæolithic man have been found in the caves. The numerous caves which yield only post-Palæolithic human remains are situated within or close to the areas covered with drift. These points are emphasised in Figure 5 where the dotted lines (based on collected geological evidence) represent what was probably the boundary between the habitable and glaciated areas at one period of the cold epoch which occurred in mid to late Palæolithic times.

The southern edge of the North-eastern drift passes through the great moraine at Escrick and Wheldrake, whilst the western limit of the North-western drift is in the neighbourhood of the Bunter Hills and Annesley Park in Nottinghamshire. This is but one phase of a transitory state of affairs. It is probable that the North-western drift retreated before the North-eastern, and that the Manchester moraine is an indication of a minor oscillation of the ice margin during this retreat.

The tongues of ice across the Pennine Chain at Stainmoor Pass, at Kinderscout and down the Goyt and Dove Valleys are the routes by which Lake District erratics have been conveyed to the eastern side of the Pennines. It may be that this only occurred during the former and more severe glaciation when the southern moraines and

¹⁰ *Geology of Yorkshire*, Kendall and Roote (1925).

Midland boulder clays were formed. Obviously a more recent and less severe glaciation could not entirely obliterate the older evidence left at higher altitudes.

The area marked as driftless in Figure 5 contains isolated patches of drift in a few localities. These patches generally contain chalky débris, and are therefore presumably relics of the earlier glaciation which resulted in the chalky boulder clays of the Midlands. It is probable that the present absence of continuous drift is due to the washing away of the glacial deposits when the earlier ice sheets retreated. The whole of this south-eastern area has been subject to much denudation, and, as at present, the main drainage was probably towards the south and east, across the land now practically devoid of glacial deposits. Some such hypothesis is necessary to explain the absence of the earlier drift, because it is inconceivable that the area remained uncovered when the Midland boulder clays were formed. Thus, this area was particularly habitable during the last cold period when the ice sheets reached the limits defined by the dotted lines in Fig. 5.

It is possible that the Eastern coast and North Sea were under ice during mid and late Palæolithic times, but it is certain that the ice did not extend far inland. Hence its existence does not affect the present argument concerning the driftless area, but it may be that the eastern end of the dotted line south of York should bend southwards along the eastern coast line. The dotted lines are thus only very approximate, but any similar distribution of the drift streams during the last cold epoch will easily explain the presence of Mousterian and Aurignacian man at Creswell and Langwith Caves, and his complete absence elsewhere in this district. In this respect the negative evidence from the other caves is as important as the positive evidence from the Creswell district. The occurrence of Mousterian implements in the Thames Valley gravels at Crayford may possibly indicate the line of migration of Neanderthal man on his way from the south to the Pennine district.

An explanation of the distribution of the several black circles and squares on the map of Figure 5 thus involves the supposition that the boulder clays of this country are the products of at least two glaciations. The latter was contemporary with mid to late Palæolithic times. Presumably this last cold epoch was much less severe than the former; a supposition which seems necessary to account for the more northern limit of the latter drift, and for the penetration of Neanderthal and the later Palæolithic peoples as far North as the South-eastern edge of the Pennine Chain.

Even in the south of England it is difficult to find evidence for more than two cold periods, and it would appear from the foregoing consideration that the prehistoric archaeological evidence from the northern districts points to the same conclusions. The most recent opinions based on northern glacial geological data also agree with this view.¹⁰

It is noticeable in passing that late Pleistocene animals seem to have penetrated further North than the contemporary men. Many of these animals (such as the bear and reindeer) persisted into Transitional and early Neolithic times; consequently their remains are found over a more extensive area.

Another explanation of the wider distribution of the late Pleistocene animals may be that the animals migrated Northwards during the summer whilst the men remained, perhaps intermittently, in the caves which they could inhabit throughout the year. Sir William Boyd-Dawkins has already suggested a seasonal migration to account for the varying assortment of animals he found at Windy Knoll. This may be paralleled with the fact that at the present time animals live further north than man in the Arctic regions.

Another point of interest, although not directly bearing upon the main thesis, arises from the consideration of point B in Fig. 5. Although the last cold epoch by no means destroyed the evidence of the presence of the earlier Acheulean folk in the Southern parts of England, the evidence left in the North is necessarily very scanty and largely obliterated. Point B is, however, of interest in that its location is within the area which appears to have been uninhabitable in later Palæolithic times. This is what might be anticipated when it is remembered that Acheulean man is associated with a fauna indicative of a climate somewhat warmer than that of the present day. Presumably, under these conditions early Palæolithic man would have been able to roam and hunt all over England and Scotland, but in the latter place the evidence for his existence (other than that preserved in caves) is completely obliterated by the subsequent last cold epoch.

This is confirmed by the locations on the map of the open squares which are scattered over the country, irrespective of the positions of the drift deposits. It has already been shown that where early Palæolithic animals are found in caves their remains usually underlie the deposits containing "cold" middle and late Pleistocene fauna.¹¹

Thus from a survey of the spelæological work in the North of England we conclude that here, as in the South, this country has suffered from *at least* two distinct cold periods; the earlier of which is represented by the chalky boulder clays of the Midlands, while the later and last cold epoch is represented in the North, by the more recent boulder clays and the late Pleistocene cave deposits of the Pennine district.

¹⁰ *Geology of Yorkshire*, Kendall and Roote (1925).

¹¹ *Proc. Geol. Soc.*, Vol. 54, p. xcv, *et seq.*, and *British Assocn. Reports*, 1874 and 1875.

| No. on Fig. 5 | Cave | Locality | Reference | Contents |
|---------------|-----------------------------------|-----------------------------------|--|------------|
| 1 | Richmond Cave ... | N. Bank of Swale | Q. J.G.S., Nov. 1868 | ‡ |
| 2 | Dog Holes | Warton Crag near Carnforth ... | <i>Lancashire Naturalist</i> , vol. 2 <i>Trans. Lanc. & Ches.</i> <i>Antiquar. Soc.</i> , vols. 27, 28 and 30 | ‡ |
| 3 | Kirkhead Cave ... | Coast, N. Lancs. | <i>Memoir. Anthro. Soc.</i> , vol. II, p. 358 | ‡ |
| 4 | Kirkdale Cave ... | Kirkby Moorside | <i>Phil. Trans. Roy. Soc.</i> , 1822 & <i>Macmillan Magazine</i> , Sept., 1862 | ■ □ |
| 5 | Scoska Cave ... | Littondale | <i>Yorkshire Ramblers Club</i> <i>Journ.</i> , 1906, <i>Journ. of</i> <i>Anatomy & Physiology</i> , vol. XLI, p. 221 | ‡ |
| 6 | Victoria Cave ... | Settle | <i>Geol. Mag.</i> , vol. X., <i>Nature</i> , vol. IX, & | □ ■ ‡ |
| 7 | Raygill Fissure ... | Lothersdale, Colne | <i>B.A. Reports</i> , 1874-5 <i>Proc. Yorks. Geol. & Poly-</i> <i>tech. Soc.</i> , vol. IX, p. 280 & vol. X, p. 390 | ■ □ |
| 8 | Calf Hole Cave ... | Skipton | | ■ |
| 9 | Peak Cavern ... | Castleton | <i>Trans. M/c. Geol. Soc.</i> , vol. XV | ■ |
| 10 | Windy Knoll ... | Winnats Pass, Castleton ... | <i>M/c. Lit. & Phil. Soc.</i> , Oct. 1874, & Q. J.G.S., 1875 & 1877 | □ ■ |
| 11 | Cavedale Cave ... | Castleton | Q. J.G.S., 1875, p. 238 | ‡ |
| | & Hartle Dale Cave | Bradwell | <i>Proc. Yorks. Geol. & Poly-</i> <i>tech. Soc.</i> , vol. IX | ■ |
| 12 | Victoria Quarry ... | Dove Holes, near Buxton. | Q. J.G.S., vol. 59 | □ |
| 13 | Fissure | Dove Holes, near Buxton | <i>Trans. M/c. Geol. Soc.</i> , vol. 15 | ■ |
| 14 | Ravencliff Cave ... | Cressbrook Dale ... | | ‡ ■ |
| 15 | Fox Hole | Deep Dale, Buxton | | |
| 16 | Thirst House Cave | Deep Dale, Buxton | | ‡ |
| 17 | Cales Cave | Lathkil Dale ... | <i>Proc. Zoo. Soc.</i> , 1906 | ■ |
| 18 | Pin Hole Cave ... | Creswell Crags ... | <i>Geol. Mag.</i> , vol. X. <i>Journ.</i> <i>Roy. Anthro. Inst.</i> , vol. LV | ■ ‡ ‡ □ |
| 19 | Robin Hood Cave | Ditto. | Q. J.G.S., 1876 | ■ ‡ ‡ □ |
| 20 | Churchole Cave ... | Ditto. | Q. J.G.S., 1877 | ■ ‡ ‡ |
| 21 | Mother Grundy's Parlour | Ditto. | <i>Journ. Roy. Anthro. Inst.</i> , vol. LV | ■ ‡ ‡ |
| 22 | Dog Holes | Nr. Pin Hole Cave | | ■ ‡ ‡ |
| 23 | Rock Fissure ... | Creswell Crags ... | Q. J.G.S., Nov., 1875 | ‡ ■ |
| 24 | Langwith Caves ... | Langwith Bassett | <i>Trans. Derbyshire Arch. Soc</i> vol. 35-36, p. 137 | ‡ ■ ‡ |

260 FRANK I'TH' ROCKS CAVE IN RELATION TO THE ICE AGES

| No. on Fig. 5 | Cave | Locality | Reference | Contents |
|---------------|-------------------------------|---------------------------------------|--|----------|
| 25 | Yew Tree Cave ... | Pleasley Vale ... | <i>British Pleistocene Mammalia</i> , III | ■ |
| 26 | Frank i'th' Rocks Cave | Beresford Dale, nr. Hartington | | † ■ |
| 27 | Beeston Tor ... | Manifold Valley | Not Published | † |
| 28 | Thor's Cave | Dove Dale | Not Published | ■ |
| 29 | Quarry Cave ... | Water Houses ... | <i>M/c. Lit. & Phil. Soc.</i> , 1864 | ■ |
| 30 | Harborough Cave | Brassington, near Wirksworth ... | <i>Journ. Roy. Anthro. Inst.</i> , 1923... .. | † |
| 31 | Hoe Grange Quarry | Longcliffe, Brassington | <i>Q. J. G. S.</i> , 1905 | □ ■ |
| 32 | Cave | Balleye, Wirksworth | | ■ |
| 33 | Boden's Quarry ... | Matlock | <i>Trans. M/c. Geol. Soc.</i> , vol. 15 | ■ |
| 34 | Fissure | Matlock-Bath ... | <i>Trans. M/c. Geol. Soc.</i> , 1880 | ■ |

| Letter on Fig. 5 | Deposit | Locality | Reference | Contents |
|------------------|---|--|---|----------|
| A | Boulder Clay ... | Blackpool | | □ |
| B | Surface | Bridlington... .. | <i>Memoir Arch. Sur. Yorks.</i> | * |
| C | River Gravels ... | Market Weighton & Vale of York | Ditto. | ■ |
| D | Glacial sand beneath upper boulder clay ... | Northwich | <i>Trans. M/c' Geol. Soc.</i> ... | ■ |
| E | River Gravels ... | Trent Valley ... | <i>Sur. Memoir</i> , Nottingham | ■ |
| F | Ditto. . | Allenton, Kegworth & Loughborough | Ditto. | ■ |
| G | Brickearth | Wortley, Leeds ... | <i>Proc. Yorks. Geol. & Polytech. Soc.</i> , vol. X, p. 293 | ■ |

*—Early Palæolithic Man.

†—Mid and Late Palæolithic Man.

‡—Neolithic and Later Man.

□—Early Palæolithic Mammals.

■—Mid and Late Palæolithic Mammals.

||—Neolithic and Later Mammals.

Much of the earlier excavation was undertaken with the help of Mr. L. Y. Baker and Mr. G. Gunn, whilst much valued assistance was also rendered by many members of the Spelæological Society who travelled to Derbyshire for the purpose. The cost of the excavations was partly met by a grant from the Percy Sladen Fund through the Derbyshire Caves Research Committee, and partly by a grant from the Spelæological Society. To both of these bodies, and also to Mr. Bryce who kindly gave permission for the excavation to be undertaken, we tender our sincere thanks. The finds are to be deposited in the Buxton Museum.