Palaeolithic Man in the North Midlands.

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IN the dark "corridors of time" through which we grope and stumble in search of tangible links with Palæolithic Man, only his indestructible tools are available. It is probable, from the analogy of living primitive people such as the Australian aborigines, that these represent but a small part of the actual equipment of even the earliest men and, therefore, we are inclined to underestimate his ability and intelligence. There is every reason for believing that he possessed as wide a range of tools and weapons of wood and bone as that of primitive people to-day. Recent discoveries at Creswell, to which reference will be made later, indicate that Middle Stone Age man was by no means the unclothed, ill-equipped savage that he has generally been painted. Throughout most of the Palæolithic Age, however, artifacts of flint are the only indications remaining of man's presence in any particular area, and the skill employed in their manufacture, coupled with the range of types represented, provide the sole measure of his cultural attainment. The earliest tools are naturally crude in form and technique and difficult to separate, with certainty, from the products of natural forces.

Chipped flints definitely recognisable as human artifacts, occur first in geological deposits of late Pliocene age, therefore, the Upper Pliocene may be safely taken as defining the approximate base level of the Palæolithic.

Continuing from that horizon, it includes within its span the entire Pleistocene period; the termination of which marks the uppermost extension of the Palæolithic. Rooted in the Pliocene it flourished and developed culturally during the early and middle Pleistocene, and towards the latter part of that age attained its maturity which is marked by the marvellous blooming of Art and of Sculpture in stone, bone and ivory.

During the cold, wet, unpleasant phase which followed the last glaciation, life became difficult for Palæolithic man.

Many of the animals he formerly hunted failed to return; food became scarce and the population probably much diminished. In consequence, his culture deteriorated and finally lost its distinctive character, tools were modified to meet new needs and new types produced; thus the close of the Pleistocene witnessed the end of the great Palæolithic Age.

The final expression of Palæolithic culture was merged with, or superseded by, new cultures which, as climatic conditions improved, filtered in from the south-east and east during the transitional phase between the Old Stone Age and the New, now termed the Mesolithic Age, which was the birth of a new era.

There is no time scale available with which to measure the Palæolithic, but some conception of its magnitude is provided by the fact that the Great Ice Age of Quaternary times falls entirely within it. If consideration is given to the fluctuations in climate which this involved and to the time necessary for the advance and retreat of the Polar ice over such immense areas of land as it is known to have invaded during the four glaciations comprised in this

Ice Age; and also their numerous oscillations; it will be obvious that the span must be measured in tens of thousands of years.

Man, in successive generations, experienced all these mighty events and their influence would be potent factors in stimulating his cultural evolution. The slowly advancing ice fields and the climatic variations must have compelled adaptation to the changing environment or a gradual migration southwards. Vegetable and animal life would be similarly affected. The change in fauna everywhere produced would inevitably lead to adjustments in hunting methods, in equipment and in his daily life, and these in turn cause new types of tools to be evolved to meet the changed circumstances. Old types would be discarded until, in the course of many generations, the former conditions returned and old types of tools again became dominant.

Migration would be an equally powerful force in the evolution of culture, by reason of contact with other groups of people, leading to the wide dispersal of the most useful tool types and to the diffusion of vital cultural elements.

The effect upon the development of man himself must have been profound, as only the fittest would have any chance of survival.

Archæologically, the Palæolithic falls into three well-defined periods, termed respectively Upper, Middle and Lower Palæolithic; each of which is further split up into various cultural sub-divisions characterised by different types of stone tools, or by the employment of distinctive technique in their production.

The three periods and their cultural sub-divisions are tabulated in Fig. 1 in which is included the relation of the respective horizons to the glaciations recognisable in this country. Also, greatly daring, I have suggested a possible correlation of these with the recognised Continental

	GLACIAL STAGE		CULTURE STAGE		
	ALPINE	BRITISH	FRANCE	ENGLAND	N. MIDLANDS (TRENT BASIN)
UPPER PALÆOLITHIC	Buhl	Hessle	Azilian Magdalenian	Developed Aurignacian or Creswellian	Upper portion of Mother Grundy's Parlour, Creswell; Whaley Shelters; Risby; Sheffield's Hill, etc.
	Interglacial	Interglacial	Solutrean Aurignacian	Aurignacian	Creswell Caves; Langwith Cave; Willoughton; Hardwick Hill
MIDDLE PALÆOLITHIC	Würm { III, II, I	Little Eastern { II, I	Mousterian Micocquean Tayacian (Late Clactonian) Clactonian Levalloisian	Mousterian Late Clactonian or Tayacian Levalloisian	Creswell Caves; Attenborough; Pin Hole, Creswell Hilton
LOWER PALÆOLITHIC	Great Interglacial	Great Interglacial	Acheulian Clactonian	Acheulian Clactonian	Hilton; Willington; Beeston; Whisby Hilton
	Riss	Great Eastern	Levalloisian	Clactonian Levalloisian	Hilton Hilton
	Interglacial	Interglacial	Chellean Clactonian	Chellean	Hilton; Whisby
	Mindel	North Sea	Chellean	Old Clactonian (?)	Hilton
	Interglacial		Old Clactonian		
	Gunz				
		Pre-Glacial and Upper Pliocene	(?)	Pre-Chellean	Hilton; Beeston

Fig. 1. Correlation Table.

glaciations which, on the evidence available, appears to me to be the most acceptable.

In Col. 6 the Palæolithic sequence of the North Midlands is tabulated in relation to that of England as a whole and to that of France; the definition of the area included in the term " North Midlands " being that of the Trent Basin north of Leicester.

The occupation of a part of this area by man in Upper Palæolithic times was first established by the late Sir William, then Professor, Boyd Dawkins, by his classic excavations in 1874-76, in collaboration with the Rev. J. M. Mello at Creswell Crags. During the past sixteen years it has been my privilege to continue that work and to carry out further excavations at Creswell Crags; also to pursue active research on numerous other sites in the Midland area. The cumulative result of this has furnished a mass of archæological evidence obtained on sites widely separated and of different types, such as glacial deposits, caves, rock-shelters and open stations, much of which for some time appeared to be un-related, but has gradually fallen into place, like pieces in a jig-saw puzzle. Viewed as a whole, it now forms a harmonious picture of the Palæolithic Age, making it possible to demonstrate, on stratigraphical evidence, the presence of man in this area during every stage of the Palæolithic more completely, perhaps, than for any other part of England.

I propose to summarise and discuss this evidence as fully as the brief limits of my paper will permit and to deal with each period in turn, commencing with the most ancient.

THE LOWER PALÆOLITHIC.

The modern classification of the cultures divides them into two groups, as follows:—

Flake cultures.	*Core Cultures.*
Clactonian.	Pre Chellean.
Levalloisian.	Chellean.
Mousterian.	Acheulian.

All these are represented amongst the artifacts contained in glacial deposits and old terrace gravels of the Trent and they are the earliest traces of man's occupation of the area.

The first record is a note published in 1928 by Mr. Reginald Smith, F.S.A., in *The Antiquaries' Journal*, Vol. 8, p. 91, describing a number of palæoliths collected in a gravel pit at Beeston, near Nottingham, by Mr. F. W. G. Davey, an employee of the Railway Company. The implements were brought to the notice of Mr. Reginald Smith by the finder, who having been transferred to the London district, took a series into the British Museum for identification and later presented a selection to the Museum, where they are now exhibited.

The significance of this record was not fully appreciated either by local archæologists or geologists, the value of palæolithic artifacts as "fossils" for zoning the glacial deposits not having been realised at that time, and no further collecting, or research, appears to have been done at Beeston. Prior to the publication of his "note," Mr. Reginald Smith had urged me to undertake such, with a view to establishing the horizon upon which the implements occurred, but the demands of the Creswell excavations made this impossible and no opportunity presented itself until the autumn of 1935, when a general survey of the Trent Valley gravels was commenced. Interest in this work was further stimulated by two casual finds of typical palæolithic implements notified to me by Professor Swinnerton, of Nottingham, in 1936.

A hand-axe had been picked up by a school-boy from gravel spread upon a farm road near Scropton and a further specimen dug up by the schoolmaster in his garden at Church Broughton. Both these had been presented to the Museum of University College, Nottingham, where, by courtesy of Professor Swinnerton, I was enabled to examine them, and found them to be of Acheulian type. The precise location of the gravel from which these two implements originated was uncertain, but the preliminary survey of the region had already proved it to be a fruitful field for research and that extensive spreads of gravel existed on three distinct horizons; all of which were implementiferous.

Assisted by a Research Grant, awarded in 1938 by the Trustees of the Lord Leverhulme Fund, it has been possible to undertake organised research on these gravels and, though the work is still in its early stages, important results have already been obtained which justify the making of tentative correlations. The three horizons of gravel comprise two old river terraces and a high level glacial gravel.

Terrace No. 1, the low terrace, occupies much of the broad floor of the valley and passes beneath the recent alluvium. In gradient it conforms with the river, the surface being approximately 12 ft. above present river level. The total depth of this gravel is uncertain. It comprises the infilling of an ancient valley, the floor of which lies far beneath the bed of the Trent, which has cut its diminutive channel through it. The gravel is extensively worked in several places for commercial purposes by suction pumping. At the Attenborough pit, by this method a depth of 14 ft., or more, below water level has been reached; indicating a depth of 26 ft. +, for the gravel there. Access to the exposed face for research purposes is therefore both limited and difficult under these conditions.

Terrace No. 2 is less well defined than the first and occurs chiefly on the north side of the valley, at approximately 80 ft. above present river level. Like the first terrace, it conforms in gradient with the valley. The gravel is less extensively worked and, up to the present, only two good exposures have been located, viz., Beeston, near Nottingham, and Whisby, south-west of Lincoln. The latter is situated on the old course of the Trent when it flowed eastwards through the Lincoln Gap.

The high level gravels are the most important of the series and mantle extensive areas on both sides of the valley. Detailed observations have, so far, been confined to the northern spreads and chiefly to those lying between the junctions of the tributary rivers Derwent and Dove. Westwards they have been reconnoitred as far as Abbots Bromley and artifacts discovered in all the exposures examined.

On the Geological Map, these gravels are described as " Old Valley Gravels," but the sections exposed by recent commercial workings reveal them as of sub-glacial origin. Exceptionally good exposures are provided in the extensive pits of Hilton and Willington, where the gravel has proved to be highly implementiferous.

The Hilton Sections.

These are the most important both archæologically and geologically so far known in the North Midlands and may provide a key to the glacial succession there. They are exposed in two pits, situated respectively east and west of the road from Hilton to Sutton-on-the-Hill.

The approximate height above O.D. is 225 ft.; the maximum depth of gravel being 17 ft. and the minimum 9 ft.

The type section is that exposed in the West Pit and varies from 13 ft. 6 ins. to 17 ft. in thickness and includes three zones which I define as " A," the lowest, " B," the centre and " C " the upper; each being consistently

separated by a band of sand or seams of fine washed gravel particles.

Zone " A " rests immediately upon bed rock, the Keuper Marl, which in places has been ploughed up and incorporated with the gravel, thus forming a matrix thereto, or remaining intact in lumps and lenticular patches.

In the extensive pits east of the road Zone " A " thins out, in places, and over a large area Zone " B " rests upon the Keuper Marl.

The Willington Sections. These are substantially the same as the Hilton sections, but comprise zones " B " and " C " only; zone " A " being absent.

Constituents. These are principally Bunter pebbles, derived from the country immediately to the north-east, but a few northern erratics are also present, amongst which Basalts and Limestones from Derbyshire and Yorkshire, Lake District rocks and Granite from the Cheviots have been identified. Eastern erratics occur much more plentifully, including Lincolnshire rocks, and there is a high percentage of flint in large and small fragments and tabular nodules. Amongst the flint constituents the percentage of artifacts is surprisingly high. No chalk fragments have been observed, but the Jurassic material suggests a chalky boulder clay origin. Careful observation had failed to detect any difference in the nature of the constituents in the three zones of gravel, but there are important differences in the physical condition of the material, to which further reference will be made.

Zone " A."

Archæological contents. Artifacts occur more frequently in this zone than in either of the upper zones, and, in common with all similar deposits, there is a marked tendency to local frequency. Implements found *in situ* fall into two well-defined groups, of which the first group

includes rostro-carinate forms and rostroid hand-axes, of pre-Chellean type, also Chellean hand-axes, a heavy chopper, or side scraper, of Chellean technique and a Levalloisian flake tool, with retouched edge flaking. These are patinated yellowish-brown to dark chocolate-brown. They are lustrous and heavily rolled and appear to have been derived from an earlier deposit. The second group is patinated bluish-white to white; the tools are lustrous, but are rolled only to a moderate extent. They appear to be contemporary with the gravel. Amongst these is a typical hand-axe of middle Acheulian type which was dug out 18 in. above the base of the bed and 12 ft. 6 in. below surface level; also several flakes, a typical late Clactonian (or Tayacian) flake, entirely unrolled and two slightly rolled Levalloisian flake tools.

In this zone there is a marked preponderance of large flints and nodules of flint. It is noticeable that most of the flints, both large and small, including the artifacts, exhibit evidence of subjection to excessive pressure. This is registered in the extensive crackling visible on their surfaces and by web-like lines of incipient fracture. The upper surface of Zone " A " is irregular and has been ploughed into by the gravel of Zone " B," but no contortion of the bed has so far been observed.

Zone " B."

In general character the gravel resembles Zone " A " but is slightly less compact. The archæological contents are the same, though less numerous, but they differ materially in condition. All are heavily rolled, with the exception of some Levallois and Clacton types, which are only slightly abraded. The patination of the various cultural groups is in agreement with the Zone " A " examples and suggests that the rolled artifacts are derived from that zone; a conclusion which the increase in abrasion supports. The infrequency of large flints is a noticeable feature and when examined carefully the

angular nature of the fragments and the absence of patina on some surfaces clearly indicates the breaking down of the material on the lines of incipient fracture observed in Zone " A." Several fragmentary artifacts have been recovered, fractured in this manner.

The upper level of this zone has been deeply trenched and uplifted in " mushrooms " and waves by the deposition and subsequent movement of Zone " C."

Zone " C."

This zone exhibits excessive contortion, suggesting lateral pressure, or collapse under the influence of waterlogging and melting ice and snow. The breaking down, by fracture, of the flint contents is progressively more marked and few fragments of large size remain intact. This zone has not yet yielded any Acheulian types, but two Clactonian artifacts, heavily rolled and therefore derived, have been found *in situ*; also a Levalloisian and a late Clactonian implement, patinated white and only slightly abraded, which appear to be contemporary artifacts and are significant for correlation purposes.

The River Gravels.

It will be profitable, at this stage, to consider the Terrace Gravels, the constituents of which indicate them to be outwash gravels composed of substantially the same materials as the High Level Gravels and containing similar archæological evidence.

Terrace No. 2. No intensive research has yet been possible, but the work accomplished has confirmed the evidence obtained by Mr. Davey at Beeston and added Pre-Chellean and Chellean types to the record.

The implements figured by Mr. Reginald Smith include typical Acheulian hand-axes and also a Levalloisian implement. These are reproduced here in Figs. 2 to 5, and are similar to examples found at Hilton.

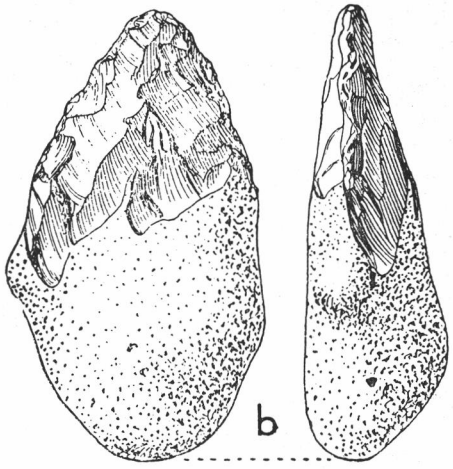

FIG. 2. Early Acheulian hand-axe. Beeston, Notts. L. 3.4 in.

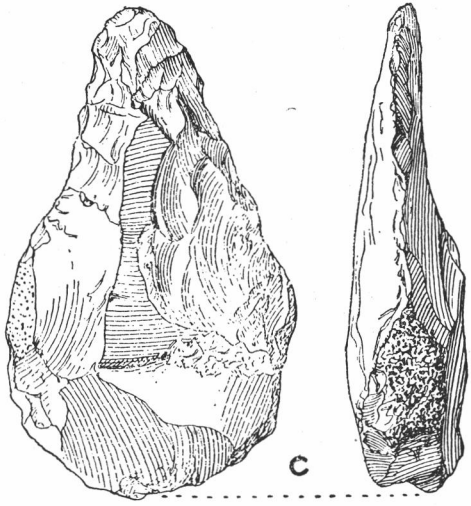

FIG. 3. Acheulian hand-axe. Beeston, Notts. L. 3.9 in.

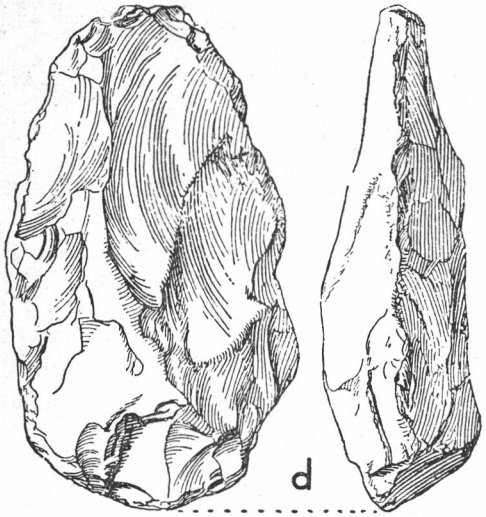

FIG. 4. Acheulian hand-axe. Beeston, Notts. L. 3.8 in.

FIG. 5. Levalloisian artifact. Beeston, Notts. L. 3.5 in.

No Clactonian artifacts have yet been recovered, but amongst a series of tools collected *in situ* at Whisby are two Clactonian flakes, heavily rolled; also a Chellean hand-axe, of heavy type, in similar condition.

The respective cultural types represented amongst the Beeston and Whisby implements agree in patination with those obtained in Zone " A " at Hilton and also correspond in the degree of abrasion exhibited; allowance being made for river action. One of the most important implements from Whisby is a fine hand-axe of late Acheulian type, found by Professor Swinnerton on a gravel heap in the pit. This is highly lustrous, of reddish brown patina and practically unrolled, which implies a local derivation.

Terrace No. 1. The general character of this gravel resembles that of Zone " C " at Hilton, the component flints being reduced to small dimensions by shattering and subsequent river action.

The Attenborough Pit has produced several indeterminate flakes and one small Acheulean hand-axe, very heavily rolled. The most significant artifacts comprise a small group of quartzite implements, closely comparable with those found in the Mousterian levels of the Pin Hole Cave. They are only slightly rolled and furnish strong evidence for the correlation of this terrace with the second phase of climatic variations recorded in the Pin Hole section; to which further reference will be made shortly.

The only mammalian remains recorded from the Trent gravels have been recovered from this terrace and comprise Mammoth (*E. primigeneus*) from Attenborough preserved in the University College Museum, Nottingham; and Mammoth and Woolly Rhinoceros (*R. tichorhinus*), found recently in the Quorn Pit, in the Soar valley, and preserved in Leicester Museum. The Quorn gravel is of similar character to that of Attenborough. No serious research has been attempted there, but a reconnaisance

of the pit yielded artifacts and a rough Acheulian hand-axe.

Tentative Conclusions.

It is now generally agreed that the Acheulian culture flourished during the great inter-glacial separating the second and third glaciations, i.e. the Riss-Würm of the Alpine series. Adopting the correlation of Boswell and Solomon for East Anglia, the corresponding British glaciations are the Great Eastern (Great Chalky Boulder Clay) and the Little Eastern (Upper Chalky Boulder Clay).[1] [2]

The Acheulian and its predecessor, the Chellean, are "core cultures," the typical implements being manufactured from a large nodule or portion of flint, reduced to form by chipping. The classic researches of the Abbe Breuil relative to the succession of cultures contained in the glacial and inter-glacial deposits of the Somme Valley terraces, indicate that core cultures are related to inter-glacials and flake cultures to glacials and there seems to be substantial evidence for supposing that the respective cultures were employed by two distinct races of men, the one—the flake tool folk—occupying a particular region when the rigours of climate had compelled the other—the core tool folk—to migrate. However this may be, it is a remarkable fact that flake tools predominate during periods of glaciation.[3] Of the two flake cultures, the crude Clactonian with its distinctive technique is the earliest and appears at the beginning of the great inter-glacial. Near the end of the interglacial it reappears as a predominant culture and it is now possible to demonstrate its evolution, finally, into typical Mousterian. The later phases of Clactonian are parallel with the Levalloisian and probably the two reacted upon each other, together with certain Acheulian influences, in bringing about the final evolution of the Mousterian. This is convincingly evident in the lower levels of La Micocque and of Le Moustier, excavated by Peyrony in the Dordogne.

It is, however, in my opinion highly probable that in the Clactonian and the Levalloisian we have two techniques and not two distinctive cultures and that climatic variations and changing environment possibly played a part in the predominance of the respective flake and core technique at different periods. It is admitted that the flake technique was almost exclusively employed by the ancestral Mousterian race, but, I submit, there is strong evidence to indicate that Acheulian—and also later people—employed both the Clactonian and Levalloisian techniques when occasion demanded it, or the craftsman deemed it expedient. It is unbelievable that they confined themselves entirely to core tools and, therefore, many of the artifacts which we classify as Clactonian or Levalloisian may, in actual fact, be of Acheulian production.

Reviewing the archæological evidence provided by the Hilton gravels and the River Terraces, it is significant that flake tools of both Clactonian and Levalloisian type occur in both rolled and unrolled condition; the rolled pieces corresponding in patination and in the degree of rolling with the respective core tools. There are, however, a number of unrolled flake tools which occur in Zone " A " at Hilton and also in Zone " B," which are apparently contemporary with the gravel and are probably representatives of the flake culture which preceded the true Mousterian.

At this early stage, definite conclusions cannot be advanced, but a study of the Hilton Sections in relation to the contained artifacts suggests that in Zone " A " we have a deposit laid down at the end of the great Acheulian inter-glacial and that it therefore represents a remnant of the little Eastern glaciation, the upper portion of which has been ploughed away and incorporated in Zone " B." The Little Eastern is equated with the Würm; which has three stages of advance and retreat during minor inter-glacial phases—Würm (1), (2) and (3).

In the Pin Hole Cave section at Creswell, as will shortly be demonstrated, two glacial phases separated by a correspondingly long inter-glacial stage are recorded. These glacial phases are all associated with Mousterian occupations, the earliest being represented by a flake culture of late Clactonian (or Tayacian) type and a hand-axe of Micocquean type. These flake tools correspond with the unrolled Clactonian implements in Zones " A " and " B " at Hilton.

As a hypothesis, and with all reserve, I suggest the equation of Zones " A " and " B " at Hilton with the two glacial events recorded in the Pin Hole.

The interpretation of Zone " C " is obscure. It may be due (1) to events related to the final melt-out of the Zone " B " glaciation; (2) to a local re-advance of the ice after the Zone " B " stage; (3) to the final glaciation of our northern region, the Hessle glaciation. If the latter is the correct explanation, then the presence of Upper Palæolithic tools in this zone may be anticipated. Careful observations are being made with this in mind, but no tools are yet forthcoming which are definitely referable to that period.

The archæological contents of Terrace (2) suggest the equation of that gravel with the melt-out of the Zone " A " Hilton stage; followed by a period of valley cutting during the inter-glacial; a resumed activity during Hilton " B " melt-out and the final infilling of the valley and formation of Terrace No. 1 before the end of Mousterian times. Further research will no doubt provide additional light on these problems.

THE MIDDLE PALÆOLITHIC.

From the scanty remnants of man's handiwork contained in the gravels, only a vague shadow picture of his life can be visualised, but in the Middle Palæolithic,

when the wider range of tools and fragile objects preserved in cave deposits are studied, the blurred outlines clarify and come into focus, presenting a more definite outline of his cultural status.

The excavations in the Pin Hole Cave, Creswell, which, aided by grants from the British Association, I was privileged to carry out over a period of thirteen years have provided abundant evidence of man's occupation throughout the Middle Palæolithic and given a type cave-section for Britain, the details of which are indicated in Fig. 6. An actual and similar section, totalling 20 ft. in thickness, has been preserved intact, where the excavations terminated, and is now scheduled as an Ancient Monument, for future reference. [4] [5]

Two beds of cave-earth are present—an upper, red, cave-earth, 6 to 7 ft. in thickness, sealed beneath either crystalline stalagmite or breccia; and a lower, yellow, cave-earth, 10 to 11 ft. in thickness, the total average depth of the deposit being 17 ft. to the bed rock of the cave. The upper cave-earth contains a series of typical Upper Palæolithic industries ranging from Aurignacian and proto-Solutrean at its base, to a late Aurignacian culture at the top, corresponding in *time* to the Magdalenian of France. These will be referred to later.

The lower cave-earth, 10 to 11 ft. in thickness, contains three cultural zones, each of Mousterian type, the lowest of which (Mousterian 1) is 13 ft. beneath the floor of the cave. The uppermost (Mousterian 3) merges into the proto-Solutrean level of the upper cave-earth, which is super-imposed upon it at an average depth of 6 ft. 6 in.

There is no evidence that the deposition of the cave-earth was at any time aided by the action of inflowing or torrential inrushes of water; the reverse is indicated, practically dry conditions having prevailed throughout the successive periods of occupation by man. Therefore, deposition of the cave-earth would be slow, and so great

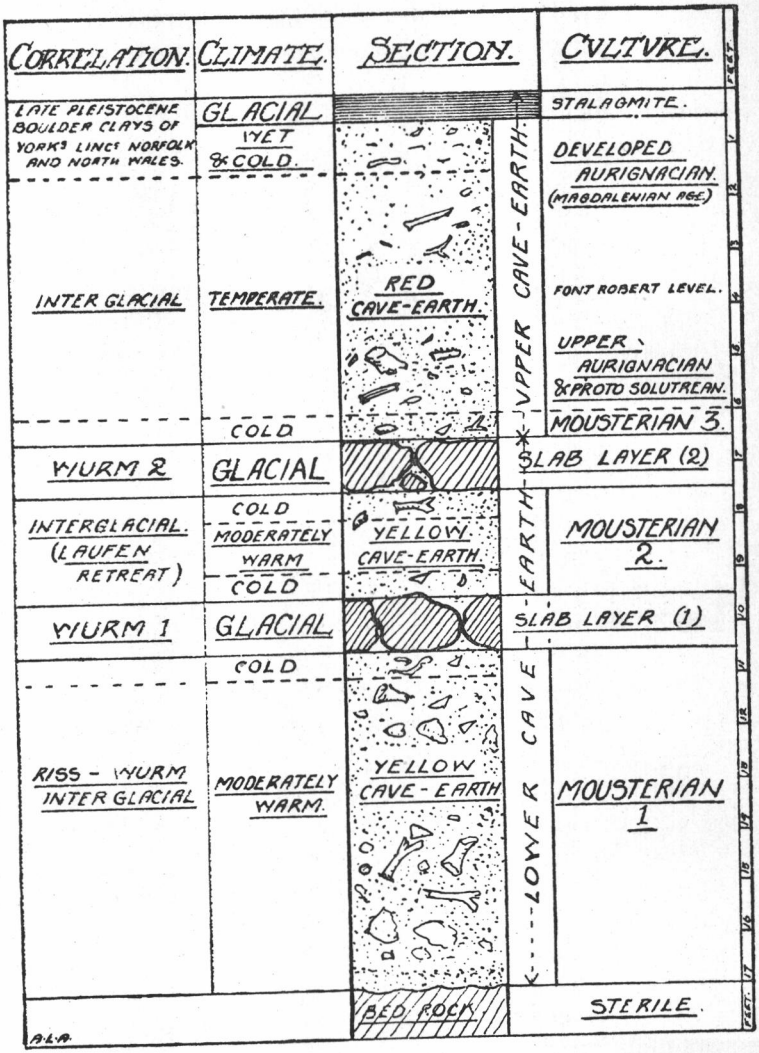

FIG. 6. Typical section of the Pin Hole Cave, Creswell.

a depth having accumulated implies that the occupation of the cave was an extremely long one. This is further emphasised by the indication of marked fluctuations in climate.

It is the lower cave-earth and its three zones of Mousterian occupation with which we are at present concerned and this has preserved a record of events embracing the whole of the Middle Palæolithic and the period of the third major glaciation of this country, that of the Little Eastern, and which, assuming that British and European glaciations can be correlated, appears as already indicated to correspond with the Würm of the Alpine series. If my assumption is correct that Zone " A " of the Hilton gravel is a remnant of one phase of the Little Eastern glaciation and that Zone " B " registers a readvance and a second maximum, then the lower cave-earth in the Pin Hole equates with those events.

The cultural Zones (2) and (3) yielded artifacts in both flint and quartzite of " Typical " Mousterian technique. The lowest of these zones, Mousterian 1, is of old Mousterian type, principally a quartzite industry consisting of rough *coups-de-poing*, together with a few flakes of flint, and it precedes the glaciation. At the base of this deposit the artifacts recovered include flakes of massive Clactonian type which correspond in facies and technique with the Tayacian industry of La Micocque; which occupies a similar position there in relation to the true Mousterian. Flakes of similar type, as already noted, have been found in Zones " A " and " B " at Hilton and provide further evidence for the correlation of the deposits.

The associated fauna is a moderately warm one, and includes Horse, Bison, Elk, Giant Deer and Lion. The Mousterian 1 level is separated from Mousterian 2 by a thick layer of massive slabs and rocks torn from the roof and walls above by the action of intense frost. This slab layer is sterile of human indications, but includes an

exclusively cold fauna, arctic forms predominating. The fauna in the overlying cave-earth is indicative of a gradual amelioration of climate; and at about 8 in. above the slab layer the second occupation zone occurs (Mousterian 2), Horse, Bison, Lion and Giant Deer being included in the associated fauna; and the general conditions suggest a moderately warm climate and abundant animal life. From this level upwards the oncoming of renewed cold is suggested by scanty traces of human occupation and the increasing abundance of Reindeer, the presence of various sub-arctic animals, and the scarcity of Horse and Bison; until finally a second layer of massive fallen slabs is encountered. This slab layer is constant, and entirely seals the underlying deposits at a level of about 10 ft. above the bed rock of the cave. The associated fauna is a cold one, and glacial conditions are once more indicated.

The Mousterian 3 zone, which averages six inches in thickness, rests immediately upon this second slab layer and marks the upper limit of the lower cave-earth. The associated fauna is moderately cold, and the layer merges into the Aurignacian and proto-Solutrean level of the upper red cave-earth. It will be noted that the lower cave-earth provides evidence in the form of the two slab layers and their associated fauna of two glacial maxima, separated by a comparatively mild inter-glacial phase during which man resumed his occupation of the cave. It would appear that these events are episodes in one glacial epoch, and it is noteworthy that they correspond with Penck and Brückner's Würm I, the Laufen retreat and Würm II.[5]

It is now possible that this mild inter-glacial phase marks a comparatively local retreat and readvance of the ice, perhaps confined to the North Midlands. I am not aware that such has been previously recorded in relation to the Little Eastern glaciation elsewhere. If, however,

my interpretation of the Hilton section is correct, it records in Zones " A " and " B " a sequence of events, corresponding with the two glacial maxima recorded by the slab layers in the Pin Hole; thus providing further evidence for a North Midlands retreat during this glaciation. It will be observed that the archæological evidence from both places strongly supports this tentative conclusion.

Lacustrine Conditions.

The evidence for two periods of glaciation, separated by an interglacial phase, is confirmed by the late geological history of the Creswell Ravine and that of the lower cave-earth. The fragments of limestone present in the yellow cave-earth and the rocks comprising the slab layers are alike extensively decomposed; rocks up to 9 in. in thickness being in many instances reduced to dolomitic sand. This decomposition extends also to the walls of the cave, and though there is no difference geologically in the nature or composition of the limestone, the walls flanking the lower cave-earth are decomposed to a depth of 4 to 6 in., whilst those flanking the upper cave-earth and the rocks contained in it are entirely unchanged. This a marked increase in this decomposition below the level of the lowest slab layer, and it extends to an additional depth of three to four inches there and forms an abrupt cove on the walls, parallel with the slabs of slab layer No. 1. These conditions indicate that the factors producing the disintegration have been more prolonged in their operation up to that level, or that they have been duplicated; which I believe to be the true explanation. A further important point is that the height to which decomposition extends consistently follows a horizontal plane, in both the cave-earth and on the walls. A survey of the crag faces along both sides of the Ravine reveal evidence of extensive erosion and hollowing backwards in the form of coving, and levelling

has established that the horizontal plane of this erosion corresponds with that of the decomposition on the walls of the Pin Hole and indicates that they are related.

Professor Fearnsides, of Sheffield University, who examined a typical section of the cave deposits, expressed the opinion that the decomposition of the rock was due to the chemical action of comparatively still water upon the Magnesian Limestone during prolonged immersion, or water-logging. A chemical analysis of samples of both the upper and lower cave-earth, made by Mr. W. Hugill, B.Met., confirmed this view and also revealed that the composition of both layers was originally the same and that their present difference is consistent with, and only to be explained by, prolonged water-logging by brackish or semi-stagnant water. It seems obvious that the cause of this is to be looked for in the enormous flow of water resulting from the melt-out at the close of the two glacial phases recorded by the first and second slab layers and that the first of these layers and the Mousterian 1 zone of occupation was subjected to two successive submergences. This explains the increased decomposition observable on the cave walls beneath the line of the first slab layer.

Creswell Ravine terminates abruptly and debouches upon open country, it is evident, therefore, that no rise in the level of the stream which flows through it could cause these lacustrine conditions unless there was a barrier blocking it. To account for this I have formerly advanced the hypothesis that this barrier was (1) of rock, situated at the end of the Ravine; or (2) a barrier of ice, or boulder clay, in proximity thereto.[5]

In the light of present knowledge respecting the glacial lake, " Lake Humber," which appears to have occupied so large an area of the Trent Basin, I am now inclined to the view that the Creswell Lake was an arm of the greater lake and that the barrier producing it was the ice which filled the estuaries of the Trent and Humber.

Cultural Status.

Important evidence relative to the cultural status of Mousterian man has been discovered in Zones (2) and (3) of the Pin Hole, which throw an entirely new light on his life and abilities. Utilised bone and rough bone tools of this age have been recorded in several of the European caves, but in addition to these the Pin Hole has yielded a series of more complex artifacts, of types not previously recorded. These include perforated phalanges of Arctic Hare, Hyæna, etc., skilfully drilled with circular holes, for suspension. Several of these are perforated longitudinally, suggesting that they formed necklace " beads," or amulets. There are also three small bone piercers shaped by grinding, then polished and rubbed to a fine needle-like point; objects which may well be ancestral needles, and they imply that skins were pierced by their means and stitched together for clothing. I am not aware that similar tools have been recorded elsewhere in Mousterian levels. More surprising and significant is the discovery in Zone (2) of a bone " bull roarer " an object never previously found at such an early stage of man's history and therefore of considerable scientific importance. The material is part of the long bone of a large animal, probably bison or mammoth, and it bears evidence of having been rubbed down and polished by friction upon a fine grained stone. It has been shaped in this manner to a long oval and at one end a hole drilled of " hour glass " section; indicating drilling from both sides. The bone has been slightly disintegrated by the action of dissolving agents during the prolonged period of submergence to which this layer, as we have already seen, was subjected and it is to this cause that the small perforations and the destruction of the edges is due.[6]

Hearths, containing wood ash and charcoal, were encountered in all three of the Mousterian levels and around them bone fragments showing evidence of fire;

indicating that these people were fire-users—if not fire makers—and that they cooked their food. Taken as a whole, these facts and objects appear to indicate a much higher degree of culture than has generally been assigned to man of the Middle Palæolithic period.

In addition to Creswell, traces of Mousterian occupation were found in Harborough Cave, near Brassington, in the form of quartzite tools, and by Storrs Fox in Ravencliffe Cave, Cressbrook Dale, in the form of a flint side scraper.[7]

With the on-coming of mild climatic conditions subsequent to the glaciation, all traces of Mousterian man disappear from Creswell.

THE UPPER PALÆOLITHIC.

The recognised cultures are:—

Aurignacian
Solutrean
Magdalenian.

Of these the Aurignacian is the dominant culture in England; Solutrean being represented only in its early form and Magdalenian by intrusive elements.

In the North Midlands, Creswell and the Langwith sites provide the most complete record of the period as a whole, throughout which the caves and rock shelters were frequented by bands of hunters during their seasonal expeditions in pursuit of the migrating herds of Bison and Reindeer. Unlike the French caves and rock-shelters, our caves were never in permanent occupation, but only casual, or seasonal; for a few days or a few weeks perhaps, at recurrent intervals of time; consequently the artifacts are seldom abundant, but as they mostly represent tools lost and not the waste flakes of manufacture, they are of good quality.

Reference to Fig. 6 will indicate that in the Pin Hole Cave the upper cave-earth spans the interglacial separating the third (Little Eastern) and the fourth

(? Hessle) glaciation; the layer of crystalline stalagmite which seals the deposit being apparently the product of an intensely cold, wet period, during which the cave ceased to be habitable by either man or animals, and which I equate with the Hessle glacial events. Man did not quit the Ravine, however, but continued to live under the rock shelters, such as Mother Grundy's Parlour and the Yew Tree Shelter, now in course of excavation. He also occupied rock-shelters in the Langwith region at Whaley and a small cave near Whitwell; all of which have furnished evidence of his presence up to the end of Pleistocene times.[4]

The Creswell region was not itself subjected to glaciation during the Hessle glaciation, and the sites referred to have established the fact, first indicated at Mother Grundy's Parlour, that man lived in the region during the whole period of those glacial events.[8]

The Pin Hole Cave and Mother Grundy's Parlour are the type stations for the English Upper Palæolithic and, together, have preserved a record of occupation embracing the entire period. Mother Grundy's Parlour, in its uppermost level, furnished the first definite proof that no hiatus occurred between the old and the new Stone Age and that the Palæolithic merged ultimately with, or into, the Tardenoisian. A fact which has since been abundantly confirmed by the rock shelters of this area, as already noted.

Both these sites, and the Pin Hole in particular, have yielded a representative series of artifacts in flint and bone including several proto-Solutrean implements of exquisite technique. The bone artifacts include bodkins and awls; a whistle; perforated phalanges; an amulet of mammoth ivory and two anvils, elephant foot bones with saddle-shaped depressions on one surface resulting from chopping, or similar use. There is also a fragment of mother-of-pearl skilfully shaped and which possibly

formed part of an amulet, and a cowrie shell, *Cyprea moneta*, a shell which, like the mother-of-pearl, is of special significance because of the distant source of origin and suggests primitive barter and other possibilities.

Art, so important a feature in the French caves, is represented by the engraved drawing of a horse's head, found by Sir William Boyd Dawkins in the early excavations, and by five examples yielded in my recent work in the Pin Hole and Mother Grundy's Parlour, of which the engraved drawing of a masked man executing a ceremonial dance, is of special importance. This is engraved upon a piece of reindeer rib. There is also a fragment of a bevelled spear point, in mammoth ivory, bearing an engraved pattern of conventional fish type.[8] [9]

Open Stations.

Upper Palæolithic man did not live exclusively in caves and rock shelters, however, and researches in North Lincolnshire have located several open stations of the period. One of these is situated upon Hardwick Hill, overlooking the Trent Valley. The artifacts are of Middle and late Aurignacian type and many of them exhibit evidence of attrition, such as would result from wave action on a beach. The site lies on and above what is believed to be a shore line of the glacial Lake Humber. Other stations, of substantially the same date, occupy the western slopes of the Lincolnshire Cliff, at Willoughton, and were discovered in 1931 by Mrs. E. H. Rudkin. One of these was excavated in collaboration with the finder and proved to be surprisingly prolific.[10] [11]

An area of 200 square feet yielded over four thousand artifacts, of which a large proportion were finished implements and included large numbers of typical burins.

The culture levels were stratified and separated by bands of material deposited by the action of periodic solifluxion; indicative of cold climatic conditions associated with a glacial phase.

Similar conditions are registered at Risby Warren, near Scunthorpe, where late Aurignacian artifacts lie in and beneath a solifluxion layer, on top of which occur the earliest indications of the Mesolithic, intermixed with elements of the final Palæolithic. Finally, the latest Aurignacian culture is represented on an extensive open station at Sheffield's Hill,[12] on the northern end of the Lincolnshire Cliff, and upon it can be seen the superposition of the earliest Tardenoisian culture, much in the same way as at Mother Grundy's Parlour, Creswell.

It will be observed that in the later portion of the Upper Palæolithic there is a wider distribution of sites, but that these, so far as is now known, are confined to two areas—the region around Creswell and the North Lincolnshire Cliff. Further research may reveal similar occupation sites in other areas also.

Field work on various sites, which the geological and faunal evidence proves to be of substantially the same date, has convinced me that exact cultural similarity in tool types is rarely exhibited at any period. Many of the industries display essentially local differences, though preserving the general facies of the culture to which the industry belongs. This is a fact insufficiently recognised in the past and has led to many misinterpretations. It is surely unreasonable to expect close similarity amongst the tools of different groups of people occupying a country in Stone Age times, when exact similarity does not exist to-day, even under modern conditions of mass production and distribution. Common tools of daily life differ considerably in form from county to county; and even in neighbouring dales and moorland valleys. It is, therefore, only to be expected that the products of people in different Palæolithic group-settlements will differ through the influence of local conditions; the skill of the worker; and local, or family tradition.

These feature and minor differences in form are very

noticeable at the end of the Upper Palæolithic in the Midland area we are discussing. Certain forms predominate on one site and are comparatively scarce on another. The Willoughton Cliff site, for instance, is extraordinarily prolific in burins, whereas in the middle zone of Mother Grundy's Parlour, which is of equivalent age and in other features bears a close resemblance to Willoughton, burins are comparatively scarce. Many other instances could also be cited.

As the end of Pleistocene times approached these differences between contemporary industries are observed to become still more marked and at the close many of them exhibit features of degradation until ultimately stimulated into renewed life by the infiltration of outside influences at the dawn of the Mesolithic Age.

Finally, I wish to express my thanks to the Trustees of the Lord Leverhulme Fellowships and to the British Association for the Advancement of Science, for the financial assistance which had made these researches possible. Also to the Hilton Gravel Company, the Willington Gravel Company, and the Attenborough Gravel Company for facilities so readily granted to me for examining the sections; to my friend, W. H. Hanbury, F.G.S., for his unfailing encouragement and assistance in working the Trent Valley gravels; and to the Society of Antiquaries of London for permission to reproduce Figs. 2 to 5.

NOTES.

J.R.A.I.—"*Journal,*" *Royal Anthropological Institute.*
P.S.E.A.—"*Proceedings,*" *Prehistoric Society of East Anglia.*
P.S.—"*Proceedings,*" *Prehistoric Society.*
A.J.—*The Antiquaries Journal.*

(1) Solomon, J. D., " The Glacial Succession on North Norfolk Coast." *Proc. Geologists' Assoc.*, Vol. 43, p. 241.

(2) Boswell, Prof. P. G. H., *P.S.*, Vol. 2, p. 149.

(3) Breuil, Henri. *Rev. de Géog. Physique et de Géol. Dyn.* Vol. vii, 1934. *L'Anthropologie*, xli., 1931; xlii, 1932. *La Belgique, L'Anthropologie*, lxiv, 1934.

(4) Armstrong, A. Leslie. Reports, British Association, 1925—1938.

(5) Armstrong, A. Leslie. " Excavations in the Pin Hole Cave, Creswell." *P.S.E.A.*, Vol. vi, No. 25.

(6) Armstrong, A. Leslie. " A Bull Roarer of Le Moustier Age, from Pin Hole Cave, Creswell Crags." *A.J.*, Vol. 16, p. 322.

(7) Armstrong, A. Leslie. " Exploration of Harborough Cave, Brassington, Derbyshire." *J.R.A.I.*, Vol. 53, p. 402.

(8) Armstrong, A. Leslie. " Excavations at Mother Grundy's Parlour, Creswell Crags." *J.R.A.I.*, Vol. 55, 1–6.

(9) Armstrong, A. Leslie. " Pin Hole Cave Excavations —Discovery of an Engraved Drawing of a Masked Human Figure." *P.S.E.A.*, Vol. 6, p. 3.

(10) Armstrong, A. Leslie. Upper Palæolithic and Mesolithic Stations in N. Lincs. *P.S.E.A.*, Vol. 7, p. 130.

(11) Armstrong, A. Leslie. " An Upper Aurignacian Station on the Lincolnshire Cliff." *Proc. International Congress of Prehistoric and Protohistoric Sciences*, London, 1932.

(12) Armstrong, A. Leslie. " A Late Upper Aurignacian Station in N. Lincolnshire." *P.S.E.A.*, Vol. 6, 26.

ADDENDUM

January, 1943.

THE HIGH LEVEL GRAVELS.

Since this Paper was first published researches relative to the Trent Valley Gravels have continued, though necessarily restricted in extent by war conditions. Work has been concentrated mainly upon the type exposures provided by the Hilton pits, where the war time demand for gravel has led to the opening up of extensive new sections and provided opportunities for intensive research. The results have strengthened and supported the tentative conclusions already put forward and it is now abundantly evident that these gravels are the most important geologically so far known in Northern England; by reason of the tripartite character of the deposit and the archaeological contents of the respective zones. The Hilton sections are, therefore, likely to play an important part in unravelling the tangle of Northern glacial geology and they have already provided evidence that the occupation by Palaeolithic man was apparently quite as extensive in this area of the North Midlands as it is known to have been in East Anglia and the Thames Basin.

It is apparent that amongst the Lower Palaeolithic artifacts there are certain types which appear to be 'local' modifications, or developments of the more traditional and widely distributed forms. I am inclined to believe that these will prove to be typical tools of the Midland area, but a definite opinion cannot be expressed until further collection has been done and the material can be spread out and studied more critically as a whole.

The presence of a hand-axe, both in the Chellean and Acheulian groups, of 'Cleaver' type and a close parallel to the well known 'Cleaver' of the South African Lower Palaeolithic, is of especial interest in view of the great rarity, or believed rarity, of this type of tool in the

English series. It is present to a marked degree, both in typical form and as a modification in which the cutting edge is produced not by the severance of a single flake, but by two or three flakes. The prevalence of this modified ' cleaver ' in the Middle Acheulian group is very marked.

Reference must also be made to an important series of small tools collected, in situ, in Zones ' A ' and ' B ' and clearly belonging to the Chellean and Acheulian cultures; more particularly the latter. These suggest that they are ancestral to well known Upper Palaeolithic artifacts and had they been collected in Zone ' C ' I should have attributed them to the Aurignacian culture. That they rightly belong to the Lower Palaeolithic series is proved not only by their location, but by their patination and respective degree of abrasion. Those in the older group, apparently Chellean, are flake tools exhibiting a bold re-touch. The Acheulian group exhibits more specialisation and a re-touch of good technique. Amongst these are several burins of various types, also tools fabricated from old flakes, stained a deep brown, the later flaking being patinated white, or orange colour; thus testifying to the two period workmanship. I submit that these small, more refined implements, throw new light upon the cultural level attained by Lower Palaeolithic man and, in my opinion, they indicate that this was considerably higher than has been attributed to him upon the evidence of the well known series of large hand-axes and a few flakes which are usually deemed to have comprised his whole outfit of lithic artifacts.

A further feature of interest, which appears to be typical of the Midland Palaeoliths, is the prevalence of " one-sided " implements. One side, usually the lower, consists of an unflaked, or only slightly flaked surface, exhibiting the outer crust of the original flint. This is due to the character of the raw material available, which is commonly in tabular pieces or flattened, cake-like,

nodules. This characteristic in the raw material is probably an explanation of the persistence of rostro-carinate and rostroid forms of hand-axes throughout the Lower series.

THE TERRACE GRAVELS.

I have no further observations to add to those already published in regard to Terrace No. 1 but mention must be made of the fine exposures of Terrace No. 2 gravel in the pit at Stenson, south of Derby, where abraded implements of both Lower and Middle Palaeolithic types have been collected. The pit provides one feature of outstanding geological interest. At certain points the upper level of the gravel exhibits folding and contortion to a depth of three to four feet, similar in character to that exhibited by Zone 'C' at Hilton. This appears to be due to lateral pressure and probably to the same glacial event which produced the dislocations of Zone 'C' at Hilton. The disturbed material at Stenson is river gravel, however, and not glacial drift as is the case at Hilton and the disturbing agency has operated after the deposition of the gravel by the river. Further research is necessary, but a tentative suggestion is that we have there a record of the final glacial activity in the area.

A.L.A.