

very likely natural weatherings. Referring to Dr. Hyde Clarke's suggestion he had, he said, at different times considered the number and arrangement of stones in circles, but had never been able to formulate any rule, or come to any satisfactory conclusion. He thought it not unlikely that the erection of stone monuments was begun by a pre-Celtic race, but the evidence of the objects found in them showed that they had been used and he believed constructed down to if not beyond the commencement of the Roman occupation. It was perhaps, surprising that the traditions mentioned by Dr. Garden, and similar though fainter traditions in other places, should have survived, as they must have done, for more than a thousand years: but to suppose that they had been handed down as traditions from a pre-Celtic period, say three thousand years ago, was surely too much to ask anyone to believe. There was no doubt a want of direct evidence as to the use of stone monuments by the Druids, but that proved nothing, and he thought that such evidence as they had showed that the stone monuments were used by the Celts with the approval of their Druidic priesthood. The question of the transport of large stones had been dealt with by him in a paper on the "Devil's Arrows" published in the *Journal of the Institute* in November, 1878. He was much indebted to Dr. Evans for the reference to the church of San Stefano at Rome.

On PALÆOLITHIC IMPLEMENTS from the DRIFT GRAVELS of the SINGRAULI BASIN, SOUTH MIRZAPORE.

By J. COCKBURN, Esq.

DURING Christmas week, 1883, I was partially rewarded for a long and tedious journey in a country without water and without roads, by discovering a locality where palæolithic implements abounded. So numerous were they that I collected in three days five hundred implements, besides a vast collection of rude flakes and spalls amounting in all to twelve sack loads.

The implements themselves are undistinguishable from those found by Messrs. Foote and King in the laterite of the North Arcot district in Madras; those by Mr. Hacket in the Narbadda gravels; those of Mr. W. T. Blanford from Hyderabad; and those of Mr. Ball from Orissa. They, however, differ in being composed of a great variety of rocks, while all those hitherto found were either quartzite or vein quartz.

The majority of the implements in the Hinouttee locality were found on undulating ground, covered with shingle, over a frontage of a mile and a half along the south bank of the Balliah Nadi. The width of the exposed surface of Talchirs along this frontage varies from a quarter to half a mile, and between the villages of Hinouttee and Amaharee.

The first implement was discovered where the main track to the corundrum mines of Pipra crosses the Balliah Nadi.

Here it lay on the denuded surface of black Talchir needle shales, mingled with shingle, boulders, and other *débris* of what was once a gravel bed. The majority of the specimens were found in these positions.

Here and there the Talchirs have been cut into shallow ravines and the sides and bottoms of all gullies are strewn and often piled with heaps of boulders and shingle.

These boulders present a remarkable variety of colour, green,¹ white, red, purple, and black predominating. The Talchir boulder bed is also exposed at most points, and the coloured boulders and gravel in question have been partly derived from the decomposition of the needle shales in which the boulders are embedded and partly from a superincumbent gravel bed to be described further on.

This gravel bed has yielded implements from Hinoutee to Mahree² on the Bichee Nadi, or over a strip of country twelve miles long from east to west, and four miles broad.

A slight sketch of the physical character of the country will here be necessary.

The Singrauli Basin in South Mirzapore is the only locality in the North-West Provinces where rocks of the Gondwana system occur.

Like other such areas it may be described as a basin-shaped depression in older metamorphic rocks (gneiss and jasperous quartzites) occupied by Talchir and Damuda formations, but the latter in British Singrauli have been almost entirely removed by denudation except six or eight miles of a range which forms the north-west boundary of this corner of Singrauli, extending from Aundhi Hill, lat. 24° 12' 21", long. 82° 43' 51", to Kota Puchum.

This range is composed of a characteristic soft, gritty sandstone, Barakar, which occasionally passes into a feeble conglomerate containing oval white and green quartz pebbles from half an inch to two and a half inches in diameter.

It is largely worked into millstones by aboriginal Bhuyars³ who block the stones into shape with small iron axes.

The cultivated portion of Singrauli forms an alluvial depressed plain, on the margin of a great coal basin, about 12 miles long and four in width. The alluvium is for the most part modified

¹ No marks of polishing or scratching were noticed on the boulders from the Talchir boulder bed, although I disinterred several boulders on purpose, and carefully examined them.

² No more than half a dozen specimens were found at Mahree.

³ Some of the Bhuyars have a close resemblance to Australian aborigines in feature and form of skull. But here and there individuals with Aryan features were noticed. These people continue to use bows and poisoned arrows.

regur under rice. Except in ravines in the vicinity of the Reyr River,¹ this alluvium is no where thick, and may be said to uniformly overlie a compact Talchir sandstone. I had exceptional opportunities for testing the depth of this alluvium at points where no exposures occur, owing to the official enquiries I was required to make regarding wells. The alluvium varies from eight to 20 feet in depth at various points between Hinoutee and Mahree, and while the Talchir sandstone forms a stratum nearly impervious to water, it is a serious obstacle to well-sinking. The wells only contain from three to four and half feet of water but this supply is pretty constant.

In ravines in the vicinity of Gharwar Gaon the alluvium is in places 50 feet thick; clay cliffs 30 feet high occur. Below one such cliff I obtained the fossil tibia and portions of the femur of the left pelvic limb of a large *Bos*. These bones were undistinguishable from those of an adult male *Bos gaurus*, with which I compared them in the Indian Museum.

As might be expected from the shallowness of the alluvium, the minor streams in this tract have cut their way into the Talchir rocks. Beautiful exposures of the glacial boulder bed occur at various points, and pot holes are as usual common. As a stream approaches the Reyr it cuts deep, narrow rifts into the Talchir sandstone, full of pellucid water. When still closer to the Reyr, as the declivity increases, gneiss takes the place of the Talchir, which is nowhere thick. Throughout the alluvial basin of Singrauli, wherever cut into by watercourses or streams, a well-defined gravel bed, from a foot to three feet in thickness is found at the base of the alluvium, resting immediately upon the Talchir rocks.

This is the implement-bearing gravel bed, or specimen drift, the subject of this paper. The village of Mahree, in the vicinity of the Bichee Nadi, forms the extreme eastern point where the implements have been obtained, while Hinoutee forms the extreme western point. In places the gravel bed is reduced to a mere string of pebbles, occasionally, even when 18 inches thick, and exposed for 25 or 80 feet, I have failed to obtain *conclusive* fragments of human manufacture, and in some few places the gravel bed was not observed at all, but this is very exceptional.

The gravel bed is, as a rule, pierced in well-sinking, and the minor forms of the gravel are usually visible round the mouth of the well, *if it is a new one*. The wells are of small diameter, three to four feet, and the gravel conglomerate, firmly cemented

¹ Here several flat oblong polished celts of diorite were obtained by me in the ravines, and two singularly sharp bevelled fragments of the cutting edges of polished celts, which were in all probability broken in use. I have constantly found such chips in Banda.

as it is with carbonate of lime, is not easily broken up with the rude tools at the command of the villagers. Whatever the cause I have only found two rude and doubtful fragments which bore evidences of human workmanship brought up in this way. They have since become mixed with the rest of the collection.

The first axe-head picked up was, strange to say, one of the most perfect found: a rapid search was rewarded by the discovery of a pile of specimens weighing over a hundred pounds, and as I was only accompanied by a single attendant I was obliged to make a selection of these, and leave the remainder behind. The next day I pitched my tent on the spot and began my inquiries.

From the large number of implements, and from various other considerations, I concluded that the spot where they were found had been the seat of a manufactory and that the implements had not been drift-borne from over extensive areas. Thus, the whole of the gravel stratum is not equally prolific of implements; indeed they are rare elsewhere. The spalls (*i.e.*, chips) struck in the manufacture of these implements, and the huge primary flakes from which they were manufactured are found here; and I consider that the bulk of my specimens (say 95 per cent.) are unfinished implements.

The implements show signs of rolling, and weathering, and occasionally bear deposits of carbonate of lime. They are very unequally worn, some having the edges sharp, others being much worn and rounded. When broken across on purpose, they show that the material has altered in colour to the depth of a tenth of an inch and often more. The amount of wear and weathering on the celts is the same as that exhibited by fragments of similar rocks in the shingle.

No trace of fossil animal remains was found in the immediate vicinity.

The celts were found *in situ*, both in exposed sections of the gravel and in sinking pits, where the superincumbent alluvium is from two to three feet thick.

The amount of concretionary deposit on celts naturally weathered out is less than on those won by digging.

All the rocks which occur in the Talchir boulder bed are represented in the collection.

No polished implements occurred mingled with the roughly chipped; nor any implements formed of feldspathic rocks, or of jade. Stone hammers occur in the proportion of about 3 per cent. Flakes are found, but they are very coarse, and possibly doubtful.

About 12 feet of alluvium occurs at various points, but on carefully examining it no implements were found. There are

no indications of celts or rude flakes in the Talchir boulder bed itself. In two or three cases there are chips on the broad ends of the lanceolate specimens which seem to have been caused by use, but as a rule the broad end is unfinished and often bears a piece of the crust of the original pebble. The pointed end, on the contrary, is nearly always finished.

It will now be necessary to give a description of the composition and nature of the gravel.

The gravel stratum varies from two and a-half feet in thickness to one foot in parts. This in the Hinoutee locality is composed of boulders, pebbles, subangular fragments, cubical fragments, masses of limestone, &c. The boulders vary from 18 inches in diameter to tiny pebbles an inch in diameter. The whole is loosely cemented into a mass by carbonate of lime. In places, as opposite Amaharee, the cementing matrix is exceedingly hard and difficult to dig into. Here the superincumbent alluvium is from twelve to fourteen feet thick, and the gravel stratum projects some ten feet into the river's bed in a bold promontory, having so far resisted the erosion of the river, and offering an exceptionally fine field for observation. The gravel here, as elsewhere, rests directly upon the Talchir boulder bed, the lower strata of the gravel actually touching it. The rocks which occur in the gravel are almost identical with those in the Talchir boulder bed, and I find I have noted them as parti-coloured jaspers, jasper-conglomerate boulders, pink gneiss, hornblendic gneiss, porphyritic gneiss, tourmaline granite, lumps of epidote and epidotic granite, pegmatite, vein quartz, quartzites of all colours, cherts, and even graphitic schist.

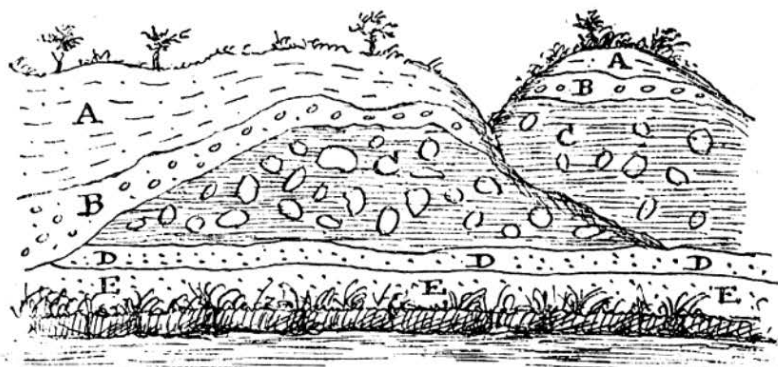
I cannot identify the quartzite with any existing upper Vendhian¹ quartzite beds with which I am acquainted in the country between Uргоorh Ghat and Burdhee. The first implement found *in situ* was a hundred yards lower down than the projecting bed. Here a magnificent section of the drift gravel is exposed for the distance of a quarter of a mile along the east bank, covered with alluvium from 10 to 14 feet thick.

The specimen, an unfinished hache, lay with a portion of the worked point projecting, firmly cemented in the hard mass. Its position was slightly below the middle of the mass, and it required to be chiseled out with a cold chisel and hammer. It is uniformly covered with a fine deposit of carbonate of lime, except on the projecting portion.

The following section will give some idea of the relations of the gravel bed, Talchir, and superincumbent alluvium. The

¹ The lower Vendhians seem everywhere to give way and disappear with far greater rapidity than the upper Vendhians. This is very noticeable in the Banda district.

Talchir beds are of very uneven thickness, and the dip rolling. For those who are not acquainted with Indian geology the following brief sketch of this characteristic formation is appended.



SECTION ON RIGHT BANK OF THE BALLIAH NADI, OPPOSITE HINOUTEE.

A. Alluvium. B. Gravel, containing the implements. C. Talchir boulder-beds. D. Red sandstone. E. Green sandstone.

The Talchirs form the base of the Gondwana series and rest on metamorphic gneissic rocks: their thickness has been estimated at from five to 900 feet, as a rule, and in the area described, notably, "they form thin, irregular beds, filling up hollows in the metamorphic rocks which latter are often exposed through the Talchirs by denudation" (Griesbach, *Mem. Geolog. Surv. Ind.*, Vol. xiv, p. 14, "Ramkola and Tatapani Coalfield"). The porphyritic gneiss of Pipra is the rock most commonly thus exposed.

The Talchir rocks consist of silty greenish or blackish shales, splitting into angular pieces (being jointed in three directions), or of tolerably compact green and red feldspathic sandstones, occasionally slightly gritty. The terms mudstones and needle shales admirably describe the appearance of the former. The boulder bed is usually green or black silty shale. In this indurated matrix occur pebbles and boulders of all sizes from an oval pebble one quarter of an inch in length to blocks 15 feet in diameter.

The Talchir boulder bed is now generally admitted to be of glacial origin, and is attributed to the close of the palæozoic epoch. It need hardly be said that no single fragment which bore the slightest resemblance to even the rudest implement

has yet been found in the boulder bed, though I have searched it in vain for many miles.

The Talchir boulder bed has been supposed to be of the same age as a very similar formation at the base of the coal-bearing rocks in South Africa. These rocks are described by Mr. Gooch in his paper on the stone age of South Africa ("Journ. Anthrop. Inst.," 1881, page 167), as "fine highly laminated shale with boulders included." It would appear from his geological diagram, that the quaternary alluvium and gravels which have yielded palæolithic implements in such abundance cap this boulder formation at more than one point, but I have not clearly made this out from the letterpress, and may be mistaken. As noted by Mr. Worthington Smith in the discussion that followed the reading of Mr. Gooch's paper, the palæolithic specimens of celts very closely resemble those from Madras, and I may add, the Singrauli gravels.

This brings me to Messrs. Foote and King's discovery of implements in the laterite of the North Arcot District, Madras.

Mr. Foote's discovery was made in 1865, and the results published in the "Madras Journal of Literature and Science," for October, 1866.

Most of his specimens were found in broken-up shingle, the *débris* of a laterite conglomerate composed of quartzite pebbles; but some appear to have been found embedded in solid laterite itself; this appears, likewise, to have contained pebbles.

The laterite conglomerate either rested on metamorphic gneissic rocks, or on rocks which belong to the Upper Gondwana system, the Sri Permatour shales. These shales are of possibly similar age to the Talchir sandstones, and the thickness, composition, and deposit of the laterite gravel is very similar to the Singrauli gravel, substituting lime as the cementing matrix in the place of laterite.

No laterite is found near Hinouttee, but it caps the Pats of Sirgoojah 30 miles south, and even occurs north of the Sone River, near Sookerit, 21 miles south of Chunar, on the Ganges.

I personally compared my specimens with such of Mr. Foote's as were exhibited in the Calcutta Exhibition of 1884, and the specimens are so very similar, that it would hardly be possible to separate them were they mixed together. Every type figured by him is represented in the collection made.

He supposes that the laterite conglomerates and sands were deposited at the bottom of a shallow sea studded with mountainous islands, between which flowed strong and rapid currents, and that the implements were either dropped by accident from rafts or boats, or accumulated by the upsetting of these craft.

He divides his implements into three classes :—

Class I. Implements with one blunt or truncated end; II. Implements with a cutting edge all round; III. Flakes.

Mr. William King, in an appendix to the above paper, was of opinion that certain of the sites were the seats of manufacture, and with this opinion I agree.

It still remains to account for the extensive spread of the gravel bed described by me over so large an area, and for the fact that many of the celts show traces of grinding and rounding of edges. It must, however, be remembered that the alluvium is very thin and that it is quite possible that if the existing brooks and streams flowed over the bare Talchir rocks and were proportionally larger, enormous quantities of shingle would rapidly form, from the weathering out of the Talchir pebbles. It is easy to understand how some of the implements would be submitted to greater rolling and grinding than others. The variation in this respect, as will seen from the specimens, is very considerable.

The arguments in favour of the site, Hinoutee, having been the seat of a manufactory are so strong as to outweigh any other consideration. The arguments in favour of the site having been a manufactory are :—

1st. The presence of the raw material which is identical with that of which the palæoliths are made.

2nd. The presence of recognizable stone hammers in the proportion of 3 per cent.

3rd. The presence of spalls, chips, and flakes.

4th. The fact that specimens in all stages of manufacture occur, and that the great majority are obviously unfinished products.

Neolithic manufactories quite as extensive have been observed by me near Kalnegar, Kalyanpur, &c., and are strewn with chert and agate splinters, used-up stone hammers and broken and unfinished implements.

My conclusion is that the implements lie where they were made, subsequent to their manufacture; and that some 20 feet of alluvium thinly scattered with pebbles from one to two inches diameter was deposited over them by aqueous causes, including possible glacial action.

DISCUSSION.

Mr. C. H. READ observed that the implements found by Mr. Cockburn in Mirzapore formed a very interesting series, although he did not think there was among them any new Indian type. They strongly resemble, as the author observed, those found by Mr. Foote, and appear to be made of the same kind of stone. The great similarity that exists between the implements of the Drift gravels, whether in India or Europe, is a very curious point, and

one that does not seem capable of any satisfactory explanation. One of these implements in Mr. Cockburn's series might very well have been found in Suffolk, except that the material is not flint; in shape and colour it absolutely corresponds. Looking at the forms alone, and making some allowance for the difference of fracture between flint and other stones, nearly all the shapes seen here are found in the Drift of Europe. The discoidal implement with an edge all round might, perhaps, be called an exception, for, though this form does occur in England, it is of rarer occurrence.

Mr. J. ALLEN-BROWN remarked on the importance of such a collection as the author had brought before the Institute. As Mr. Read has observed, most of the implements are of well-known palæolithic forms, which have been found not only in the oldest river drift deposits of England, France, and Southern Europe, generally, but also in South Africa, in the Nile Valley, Asia Minor, and India, as well as in the Trenton gravels of North America, which are said to be of glacial origin. The quartzite implements, from the laterite deposits of Madras, closely resemble those in this collection from South Mirzapore, and like the former, it is extremely difficult to determine the age of the specimens. These implements appear to have been found mostly on the surface of the drift gravels and not *in* those deposits: under such circumstances we have no evidence of the fauna which existed at the time they were fabricated, and are, therefore, without one of the most trustworthy tests of antiquity.

Though form alone cannot afford evidence as to age which can safely be relied upon, the persistent occurrence of certain definite forms of roughly-hewn pointed implements and chopping tools (examples of which are in this collection), not only in the oldest river drift, but also in the most ancient deposits of bone caves with extinct quaternary mammalia is remarkable—such a similarity of form, however, may be explained by the assumption, that early man formed his implements naturally on the simplest models.

Some of these instruments are worn as if from use. There is no appearance of abrasion from contact with other stones in a stream, but the angles of fracture, and surfaces of some of them seem to be slightly altered, probably by rain which contains a small amount of carbonic acid, and which may have acted also as a solvent.

With regard to these objects being found near the surface, or upon the gravel deposits, Mr. Allen-Brown could well believe from the evidence which had been presented to him in the Thames Valley Drift, that old land surfaces afterwards covered by gravel and alluvium, may subsequently be exposed by denudation, and that, as a consequence, palæolithic implements may be found on the present surface of the land; though roughly chipped into shape, he regarded the specimens exhibited as finished implements, and it is probable that the spot at which they were found, was inhabited for a long period; there is not enough evidence, the speaker thought, of its having been a manufactory of such objects from the discovery, with them, of a few flakes.