

IMPLEMENTS OF SUB-CRAG MAN IN NORFOLK.

BY W. G. CLARKE.

Read at Norwich, March 13th, 1911.

Few English deposits have aroused more disputation among geologists than the Crag beds of Norfolk and Suffolk, and on many of the points raised there is as yet no general agreement. This more particularly applies to the sands, gravels, and clays associated with the Norwich Crag, one school considering them part of the Crag formation and therefore Pliocene, and another believing them to be glacial and Pleistocene. Doubt on this matter has had an important bearing on the discovery of Sub-Crag implements in Norfolk, though I believe that the evidence is now incontrovertible. With regard to the basement-bed of the Crag, whether of the Coralline, Red, or Norwich Crag, which appear to have been successive deposits in the order given, the geological evidence as to position and antiquity—though not as to the conditions under which it was deposited—is not disputed. Mr. F. W. Harmer, F.G.S., says* :—"In consequence of a combined movement of elevation in the southern part of this region, and of subsidence towards the north, the whole Crag basin moving as on a pivot, its southern margin was gradually shifted, the sea retiring towards the north. The upper Crag beds, originating upon or near the shore as beaches or shoals in shallow water, indicate successive stages of this movement. Hence it is that the older of these deposits are to be found in the south of the Crag area, the newer in the north." The basement-beds of the Coralline, Red, and Norwich Crag therefore represent successive phases in the encroachment of the sea on the land, and the last-named may not have been deposited until after the Coralline and Red Crags had been laid down.

As to the method of deposition Mr. Clement Reid, F.L.S., F.G.S. referring to the Norwich Crag series, says† :—"Its basement bed consists of a layer of more or less rolled flints with a few pebbles of quartz and quartzite, embedded in a clayey or sandy matrix, and has been termed by Mr. Gunn the 'Mammaliferous Stone Bed,' from the fact that so many bones have been obtained from it." Further he says :—"Although perhaps comprising relics of some old land surface destroyed during the formation of the Crag, it is hardly possible that the shore-bed represents an ancient soil, or that any portion of the chalk itself is an old land-surface." The absence of Miocene deposits in Great Britain is strong evidence for considering that this country was then a land-surface, which may have so continued until the development of the early Pliocene mammalia, and the gradual encroachments of the Crag sea. The remains of such mammals would, under

* Dutt's "Norfolk Broad's," p. 300.

† "The Pliocene Deposits of Britain," p. 117.

such conditions, naturally be found in the first succeeding bed, which is the basement-bed of the Crag. Those identified from the Norwich Crag have been an admixture of land and marine forms including *Bos*, various species of *Cervus*, *Elephas antiquus*, *Falc.*, and *meridionalis*, Nesti, *Equus caballus fossilis*, Rütim, *Felis pardoides*, Owen, Hippopotamus, *Hyæna antiqua*, Lank., *Mastodon arvernensis* Croizet and Jobert, *Trogontherium Cuvieri*, Fischer, *Ursus*, Dolphin and Whale. If man existed on the same land-surface as the land mammals, and chipped flints for use, those flints would naturally be in the same bed as the remains of the mammalia, and that is where they do occur. The types found in the vicinity of Ipswich where the basement-bed rests on the London clay were described by Mr. J. Reid Moir, in the first part of these "Proceedings"; my remarks will be limited to the description of similar implements found in Norfolk where the basement-bed rests on the chalk.

Bearing in mind the succession of the Crag beds, it is quite possible that when the Crag Sea was cutting into the old land-surface in South Suffolk and depositing sandbanks and molluscan debris on the mammalian remains and flint implements washed into the stone bed, the more northern land-surface in Norfolk was still occupied by representatives of the same race of man as previously dwelt in the more southern part of the area. As the Crag Sea gradually cut in more to the northward and ultimately flowed over the site of Norwich, implements from this surface would be preserved in like manner. Indeed it is difficult to know where else they could have been preserved. Only in those areas where flint was abundant, and where the bed resting directly on the chalk was saved by the thickness of Crag above from being ploughed away by glaciers, would it be possible for the implements to be preserved undisturbed.

Implements of this type I first found at Eaton in 1905, and then described* them as Eolithic and below glacial beds. I subsequently found them in other localities beneath the same gravels and sands, but owing to the diversity of opinion among geologists of repute as to the age of the superincumbent beds, it was not until Mr. J. Reid Moir had discovered similar implements under Suffolk Crag that I considered it probable these also were Pliocene, and then removed all doubts by finding them at the base of shelly Crag. Whether these gravels and sands are lower glacial or upper Crag may still be a moot point, but I believe that wherever the "stone-bed" occurs with its contained implements and their characteristic patinas it may safely be assumed to be pre-Crag. In any case there can be no doubt that there is no deposit between the "stone-bed" and the chalk, and in a district where there is a considerable thickness of Norwich Crag it seems difficult to understand why all the beds above the chalk should be glacial, with no representatives of the Crag series, when in a

* Trans. Norfolk and Norwich Naturalists' Society, Vol. VIII., p. 216.

pit a short distance away and on the same level, undoubted Crag occurs to a considerable depth.

Those who consider these beds belong to the drift series describe them as formed by the first rush of waters from the advancing glaciers, and certainly before the arrival of the great glaciations which deposited the contorted drift and chalky boulder clay. The fact, however, that many of the sub-crag implements are deeply striated, evidently by glacial action, and that they lie under beds of delicate shells, in many cases unbroken, shows they must have been subjected to some early Pliocene glaciation. Two specimens are worthy of mention. One Eaton implement has its flat base covered with striations, the two chief being each $1\frac{1}{2}$ -in. long and $\frac{1}{8}$ -in. wide. A specimen from the Harford Bridge Pit, Eaton, is also covered with striations, one deep one having a length of $3\frac{1}{2}$ -in. An examination of the implements makes it apparent that they were first chipped, then striated, and subsequently patinated. This disposes of the theory of those who believe that the chippings were caused by waves and currents at the edge of the Crag Sea, the shell deposits following as the sea cut further inland. It is obvious that the striation (subsequent to the chipping) could not have been caused under such conditions.

In the ten Norfolk pits in which I have examined the "stone-bed" and found implements, the latter have very strong resemblances in chipping, patination and form, so much so that I think it is impossible to produce an implement from any pit which cannot be matched in general appearance by an implement from some other pit. Indeed the variation in the Norfolk examples does not seem to be so great as in those from Suffolk, though the chipping itself is in many cases finer. The "stone-bed" varies in thickness from a few inches to about 3 feet, and where there are "pot-holes" in the chalk, as at Whitlingham, they are lined with the flints. Most of them still retain their cortex unbroken and have apparently undergone neither rolling nor hattering. Those which have been chipped by man can usually be picked out with ease by their freedom from crust and by their peculiar patina. Several different patinas may be distinguished and 90 per cent. of the implements fall into one or the other of the following groups:—

- (a) Ochreous, similar to that of many Drift palæoliths, and with lustre.
- (b) Mottled, with or without striations showing bluish-grey on a lustred ochreous patina.
- (c) Bluish-grey without lustre, striated, much battered, probably affected by infiltrated sea-water during the deposition of the Crag.
- (d) Mottled mahogany.

Most of the implements have flat bases different in appearance from naturally-fractured surfaces, and exactly resembling those on Palæolithic and Neolithic specimens, and on the "quarters" of the Brandon flint-knappers. In implements from all pits 86 per

cent. are flat-based, 40 per cent have bulbs of percussion, and 3 per cent. erailleures. Most have some fragment of the original crust remaining, but on a few it has all been flaked away, both sides being covered with flaking. Some of this is very fine, the flakes being narrow and rippled. On a Little Hautbois specimen the top of a prominent arête has been removed by two narrow rippled flakes side by side, one 3 ins. and one 2 ins. in length. In two Whitlingham implements of similar type the bulb has in each case been removed by two adjoining parallel flakes, in the one case 3 in. by $2\frac{1}{2}$ in., in the other $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in. In some the secondary chipping is so good that if the implements were described as "Drift" palæoliths, the fact that the chipping was human would not be doubted by anyone having a practical knowledge of flint implements.

If Nature can break massive flints in half by a blow delivered at a certain spot so as to make a bulb of percussion, then flake both surfaces of the flint, put secondary chipping on the edges, and shape so as to resemble the scrapers of Neolithic man, Nature's work with flint must be considered boundless, and much of the science of prehistoric archæology a myth. Our tests of the genuineness of Neolithic and Palæolithic implements are largely those applied to sub-Crag implements, and if the latter respond in the same manner as the former, it seems difficult to urge that the one set is the work of man, and the other of the operations of Nature.

The reasons for considering the chipping on these sub-crag flints to be human, and not the result of natural forces were set out in Part I., pp. 35—37. To those who still urge that given certain conditions, flaking and chipping of this character could be produced by Nature, it may be pointed out that the restriction of these conditions to the brief geological time necessary for the deposition of the stone-bed is itself remarkable; that the absence of similar forms from the glacial gravels and flinty beaches of the East of England, and from the chalky beaches (with flints) of the South of England, where the conditions invoked are most nearly found is astonishing. The fact that it is possible to select certain flints from the stone-bed as showing man's handiwork is put forward as evidence against them. That a student is able to select humanly-chipped flints from Palæolithic gravels, or Neolithic implements from the thousands of flints on a "breck" is considered to be evidence in their favour. Why the difference?

EATON. In 1905 I obtained and described* flints which I considered had been intentionally chipped by man, from the lime-pit at Eaton, Norwich. Most of the implements were found in a narrow bed of flints resting on the chalk, some 30 ft. from the surface, though occasional specimens were found in the more disturbed beds above, mostly in a stratum about 16 ft. from the surface, the 30 feet above the chalk consisting of sands and

* Trans. Norfolk and Norwich Naturalists' Society, Vol. VIII., p. 216.

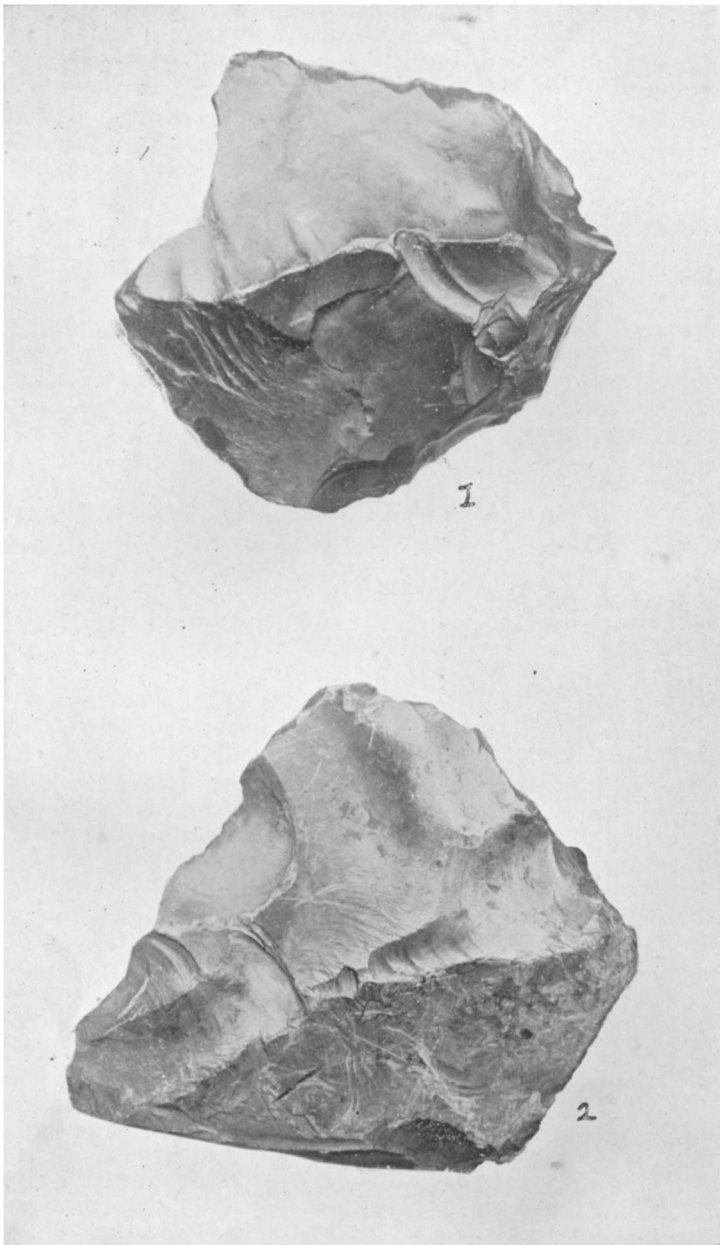
gravels. Most of the implements are formed from a half or smaller portion of a flint pebble, and only in a few instances has the flat under portion been chipped. Generally most of the crust is left on the top and the chipping has been done round the edges of the flint. There are on practically every implement signs of genuine flaking, some of the narrow strips of flint thus removed being nearly 3 inches in length. There are scrapers of irregular form, the chipping being at the end opposite to the bulb of percussion and on the other face of the implement as in Neolithic examples; big borers, the point being made by chipping a hollow on each side; massive square-ended implements; and others with a strong likeness to the Palæolithic *coup-de-poing*. Many others are of shapes which do not fall into any system of classification. The patinas are of the *a*, *b*, and *c* types; I have seen no specimen of *d*. Five of my examples have no cortex remaining, as the whole of it has been removed by flaking and secondary chipping. (One is shown in Plate XVIII., Fig. 2.) Mammalian remains have been found (so I was informed by the workmen) in the stone-bed, as also in the Harford Bridge pit in the same parish where I first obtained implements in 1906. These, and subsequent specimens found, were of the *b* and *c* patinas.

EARLHAM AND HEIGHAM. In 1906 I also found implements of the same types and patinations in a similar bed resting on the chalk in pits by Dereham Road, Norwich, one adjoining the "Woodlands," and the other at the "Stone Hills."

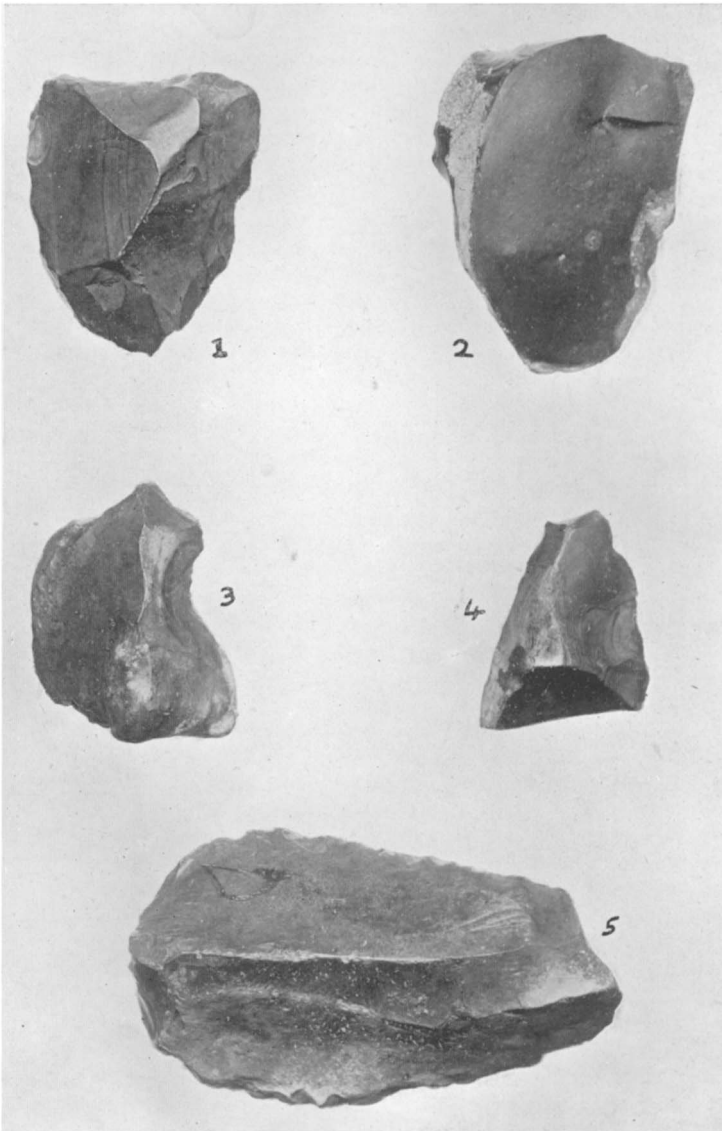
LITTLE HAUTOIS. Among the talus in a disused pit at Little Hautbois, in July, 1907, Mr. Walter Rye and I found several implements with well-defined flaking and chipping, and forms and patinas similar to those from Eaton, the *b* type being most common. There was no means of determining from which bed they came, but in 1881, Mr. H. B. Woodward, F.R.S., mentioned* irregular beds of sand and gravel resting on the chalk. In the same slope only a few hundred yards away the Crag stone-bed was noted, "capped by sands, seams of laminated clay, and pebbly gravel."

FLORDON. Implements of the same type were found by Mr. W. H. Burrell, F.L.S., and myself in October, 1908, in the parish pit at Flordon. These were in a narrow "stone-bed" resting on the chalk and topped by sands and pebbly gravels (with loam and chalky boulder clay above), described by Mr. H. B. Woodward, F.R.S. as upper Crag. Of the specimens obtained one had an *a* patina, one a *c*, and one was black with excellent edge chipping and deep striations; the remainder were of the *b* patina. The ochreous-patinated implement is small, with fine edge-chipping on one side, and almost any collector would pass it as a palæolith. (Plate XIX., Fig. 1.) Another Flordon implement is shaped like an iron axe-head with flaking ridges on one surface and edge-chipping on three sides, the chipping on the fourth being on the flat side, as it is in an Eaton specimen. A small and well-chipped implement is shown in Plate XIX., Fig. 3.

* "Geology of the Country around Norwich," p 56..



Norfolk Sub-Crag Implements. 1.—Whitlingham. 2.—Eaton.



Norfolk Sub-Crag Implements. 1, 2, 3, 4. —Flordon. 5.—Whitlingham.

SWANNINGTON. From a very narrow "stone-bed" resting on the chalk at Alderford Common, Swannington, I obtained a few implements of the *b* type of patina in 1909, but the exposure was small and has since been covered over.

WHITLINGHAM. In an address to the Norwich Geological Society on November 5th, 1878, the President (Mr. H. B. Woodward, F.R.S.) said:—"I was somewhat astounded to pick out of the stone-bed of the Norwich Crag a flake containing a good bulb of concussion, while some time ago a very suspicious looking flint was obtained by Mr. Whitaker from the Norwich Crag at Whitlingham. Mr. Skerchly has since pointed out to me that in my specimen the flake was produced by one blow."* These were obtained in a pit now filled in and planted, but the present pit which was first opened about 1892 is in the same ridge, which along its whole length from Trowse to Bramerton is highly fossiliferous, and is considered one of the typical Norwich Crag localities. In my desire to see the "stone-bed" beneath fossiliferous Crag, it was therefore to Whitlingham that I turned.

In April, 1910, I obtained well-flaked implements from a stone-heap at Whitlingham, but did not then find them *in situ*, though confident that they came from the "stone-bed." On February 3rd, 1911, however, I found the "stone-bed" was being worked, and obtained implements from the bed itself, at least two of which were in contact with the fossil shells of the Crag immediately above it. From the stone-heaps I also obtained other implements which the testimony of the workmen and my own experience indicated must have come from the "stone-bed." Four kinds of flints are obtainable in this pit—those from the chalk which are always distinguishable by their white cortex; those from the upper beds of the Crag, which consist of pebbles; those from the clay strata in the Crag, which are blue-black and rolled; and those from the "stone-bed"—"pavers," the workmen call them—which are generally angular. Each kind of flint is so characteristic that there is no difficulty in telling from which stratum it comes. Nor can there be any doubt that here the "stone-bed" is below the Norwich Crag, for there is now above it some 25 feet of regularly stratified sand and gravel with thin seams of clay, the first-named containing a fair quantity of typical Crag shells, with many thousands of broken specimens. *Trophon antiquus* and *Pectens* are common. Both Mr. H. B. Woodward and Mr. Clement Reid (in works previously quoted) refer to Whitlingham as one of the chief fossiliferous localities for Crag, and give the following section in the old pit:—

Pebbly gravel and sand with seam of shells.	} 15 to 25 feet.
Sand and pebbly gravel with patches of shells.	
Laminated clay and seam of shells.	
Stone-bed.	
Chalk.	

* "Proceedings." Vol. I., Pt. II. (1878-9), p. 62.

This section might well describe the western side (now being worked) of the present pit, save that the bed of shells—about 2 feet in thickness—apparently does not occur elsewhere than immediately above the “stone-bed.” But Mr. Clement Reid points out that “No distinctive horizons can be traced out in the upper Crag by the occurrence either of shell-beds or of laminated clay. Diagrams drawn at different times as the beds are worked away, are quite different in detail.”

Mammalian remains are of not infrequent occurrence in the “stone-bed.” From the workmen I procured specimens which Mr. F. Leney has kindly identified as part of an antler of *Cervus Sedgwicki*, part of a shed antler of *Cervus carnutorum* with Crag shells adhering; part of an antler (*Cervus* sp.) showing pedicle, bur, and part of the beam; and the distal end of a metatarsal bone of *Equus caballus*. Mr. H. H. Halls also has the bone of a whale from this bed. I was told that all these (with the exception of the bone of *Equus*, which was found on a higher level) were found either in the “stone-bed” or immediately above it, and their condition is in agreement with this.

The implements are of the *b*, *c*, and *d* patinas, the proportions in the implements I have seen being 50, 6, and 44 per cent. respectively. The general tendency of the types is towards the coup-de-poing (or boucher of Professor Sollas). Some of the flakes are very fine, one with well-defined bulb being 6 inches in length. One implement is flaked all over both surfaces with delicate edge-chipping. (Plate XVIII., Fig. 1.) In a number of cases the tops of arêtes have been removed by long, narrow, rippled flakes. A type of scraper well-known in later deposits is figured in Plate XIX., Fig. 5. Many of the implements are not striated.

THARSTON. While I have only found the “stone-bed” with its contained implements beneath undoubted fossiliferous Crag at Whitlingham, at Tharston Furze Hill pit on February 18th, 1911, I found it beneath beds which Mr. Clement Reid described as fossiliferous Crag, and Mr. H. B. Woodward mentioned that bones had been found in the “stone-bed” and an elephant’s tusk in the gravel 3 or 4 feet above the chalk. Writing to me on February 22nd, Mr. F. W. Harmer, F.G.S., said:—“The stone-bed resting on the chalk at the Tharston Furze Hill is, there can be little doubt, although the sand overlying it is not fossiliferous, of the same age as that underlying the Norwich Crag at Thorpe, Whitlingham, etc. It represents, I consider, the first and littoral stage of the invasion of the region in question by the Crag Sea.” The exposure of the “stone-bed” is small and only a few implements have been found, the patinas being of the *b* and *c* types, mostly the latter.

BRAMERTON. Owing to the eastward dip of the chalk the “stone-bed” at the well-known Bramerton Crag-pit is only exposed for a few yards in the bank of the river Yare, and then only at low water. From this section in April, 1911, I obtained

one good implement, which was covered by sand and shells. Typical Crag shells were resting on the chalk without stones intervening, in part of the section. The implement was of the *d* patina, but dull from long exposure to the river water. Mr. H. W. Cockrill obtained an implement of the same patina, but more lustrous, from this exposure. (Plate XX., Fig. 1.)

BURGH-NEXT-AYLSHAM. At the brickyard a good section of shelly Crag was exposed in March, 1912, and beneath it in the stone-bed a tusk of *Elephas meridionalis* was obtained a short time previously. Mr. H. H. Halls and I obtained a few good implements, but they were much less frequent than in other sections. One is shown in Plate XX., Fig. 2.

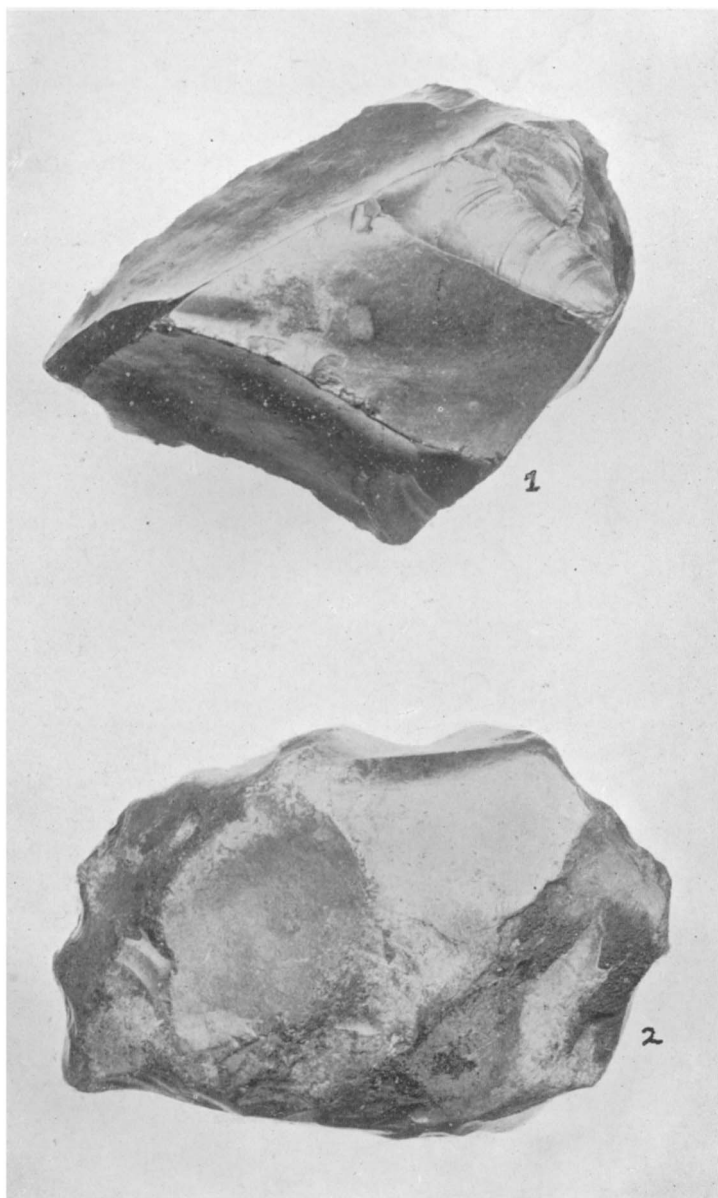
RE-CHIPPED IMPLEMENTS.

On February 4th, 1911, Mr. W. H. Burrell, F.L.S., and I were examining a pit by the roadside between Braconash and Flordon, two or three hundred yards N.E. of the parish pit on Flordon Common. The upper part of the section shows a thickness of about 10 feet of chalky boulder clay. An excavation in the floor of the pit revealed thin strata of fine sand with pebble layers and fragments of fine shells apparently of the same species as those found in the Crag at Whitlingham. The beds are markedly curved, the result probably of disturbance during the deposition of the chalky boulder clay, and from one of these sandy layers Mr. Burrell extracted a remarkable flint. (Plate XIX., Fig. 4.) It is doubly patinated, the main flaking showing one patina—one which is common on sub-Crag implements—and some extremely fine edge chipping the other. The patinas are identical with those on Mr. Moir's Mousterian racloir found in or on the London Clay at Ipswich, and the edge work is very similar. (Part I., Plate VII., Fig. 3.) This worked edge has been slightly rounded, possibly by use, as the remainder of the later work does not look as though it had been rolled. In the same pit on February 18th, I found an unpatinated flint projecting from the face of the section about 5 feet from the top of the Crag, and within a yard of where the other flint was found. Its outline may be due to natural causes, though there is very little crust, but the edge-chipping on the band of crust seems undoubtedly human. (Plate XIX., Fig. 2.) This was in a narrow bed of sand above a layer of small pebbles. From the "stone-bed" in the Flordon pit, I obtained one implement with two patinations as in the first specimen previously mentioned. The older was the lustrous blue-grey patina of the sub-Crag implements (*b* type), the newer (comprising bulb and erailleure, with edge-chipping near the point) black and lustrous.

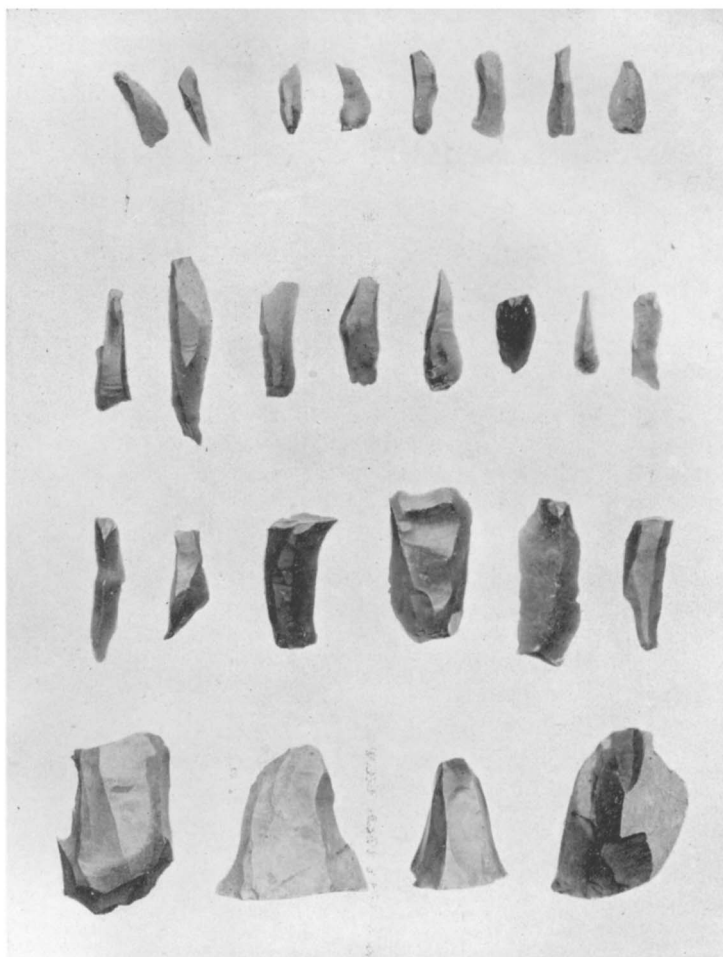
REMANIÉ.

The western boundary of the Crag deposits is very indefinite. A few miles west of Norwich, boulder clay rests directly on the chalk. Glacial action that could grind this vast deposit out of

the solid strata of the chalk would make short work of an 18 inch bed of gravel resting on it, and it is possible that in some areas smashed flints in the contorted drift and the chalky boulder-clay may represent remains of this ancient bed. In some cases the "stone-bed" has been removed by glacial action, and in a pit north of the Ringland Hills I found a portion of the "stone-bed" in boulder clay in a perpendicular position as evidenced by the flint layers. With certain of the flints of so characteristic an appearance there could be no doubt of its age, and from it I obtained several typical sub-Crag implements, mostly of *b* patina, with one of *c* and two of *d*. In those districts where the "stone-bed" and its contained implements has been incorporated with the glacial beds, and these form the subsoil, the possibility of finding typical sub-Crag implements on the surface is obvious. Such have been found by Mr. H. W. Cockrill at Costessey and Salthouse, by Mr. H. H. Halls at Costessey and Westwick, by Mr. Halls and myself at Ringland, Hellesdon, and Surlingham, and by myself at Bawburgh, Weston Longville, and Easton.



Norfolk Sub-Crag Implements. 1.—Bramerton. 2.—Burgh-next-Aylsham. 18/14ths.



Flakes and Cores found in a sand-stratum at Lyng, Norfolk. The second on the top row is a well-chipped pygmy. 1/2.