Downloaded from rstb.royalsocietypublishing.org

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

The Transition from Rostro-Carinate Flint Implements to the Tongue-Shaped Implements of River-Terrace Gravels

J. Reid Moir

Phil. Trans. R. Soc. Lond. B 1920 **209**, 329-350
doi: 10.1098/rstb.1920.0008

Email alerting service

Receive free email alerts when new articles cite this article - sign up in the box at the top right-hand corner of the article or click **here**

To subscribe to *Phil. Trans. R. Soc. Lond. B* go to: **http://rstb.royalsocietypublishing.org/subscriptions**

This journal is © 1920 The Royal Society

Downloaded from rstb.royalsocietypublishing.org

VIII.—*The Transition from Rostro-carinate Flint Implements to the Tongue-shaped Implements of River-terrace Gravels.*

By J. Reid Moir.

Communicated by Sir Ray Lankester, *K.C.B., F.R.S.*

(Received October 19, 1917,—Read December 13, 1917.)

[Plates 51–57.]

The object of this communication is to describe and figure accurately seven flint implements of peculiar form, which have been found in certain ancient valley gravels in different parts of this country, and to put forward an explanation of the meaning and significance of these specimens, which appears to the author to be reasonable and in accord with probability.

A Detailed Description of the Colour, Condition, etc., of the Seven Specimens, together with an Account of their Provenance.

List of Specimens.

1. The Savernake transitional specimen No. 1.
2. The Savernake transitional specimen No. 2.
3. The Dawley transitional specimen.
4. The Mildenhall transitional specimen.
5. The Clapton transitional specimen.
6. The Ipswich transitional specimen.
7. The Axminster transitional specimen.

1. The Savernake Transitional No. 1 (Plate 51, figs. 1, 2, 3, 4).—Found in a gravel pit at Knowle Farm, Savernake. The specimen, which is yellowish-brown in colour, has been fashioned by the removal of large flakes, and a number of cracks are observable in its mass. The flint, which shows but few signs of having been abraded by rolling by water, exhibits, nevertheless, some evidence of contusion on its edges, and this is especially marked on the upper dorsal ridge. A small number of incipient cones of percussion (due to the impact of other stones) are visible upon its flake-scars, and with a lens a few small striæ are observable upon its surfaces, which exhibit, moreover, a moderate amount of glaze.* The natural cortex of the flint has been left at the posterior region of the implement, which is also marked by the presence of a considerable cavity, which must have been present in the original nodule of flint from which the specimen was fashioned. A small patch of cortex is

* The term "glaze" is used to denote the naturally-produced bright, smooth surface exhibited by many ancient flint implements. The cause or causes giving rise to such surfaces, are at present unknown.

The Royal Society is collaborating with JSTOR to digitize, preserve, and extend access to *Philosophical Transactions of the Royal Society of London. Series B, Containing Papers of a Biological Character.* www.jstor.org

Downloaded from rstb.royalsocietypublishing.org

present also upon the dorsal surface of the implement. This specimen, together with that next to be described, was acquired by the Reverend H. G. O. KENDALL from the workmen at the Knowle Farm pit, and very kindly presented to the author. The gravel at Knowle Farm occurs at a height of approximately 450 feet O.D., and 40 to 50 feet above the base of the neighbouring dry valley.

2. THE SAVERNAKE TRANSITIONAL No. 2 (Plate 52, figs. 1–4).—This specimen, which exhibits signs of considerable abrasion due to rolling by water, is light chestnut-brown in colour, and the flake-scars which have been formed by the removal of large flakes do not exhibit a marked glaze. A considerable number of incipient cones of percussion, and small criss-cross striæ, are developed upon the flaked surfaces of the implement. In places where the striations are most numerous, the flint has assumed a bluish-white coloration. The specimen exhibits patches of cortex upon its right and left lateral, dorsal, and ventral surfaces. Several cracks are observable in its mass, and a rectangular fracture, induced in all probability by one of these lines of weakness, is to be seen at the posterior region of the implement.

3. THE DAWLEY TRANSITIONAL (Plate 53, figs. 1–4).—Found in 1893, in "Odell's Pit," Dawley, situated near West Drayton, in the Thames Valley. The specimen was recovered by the late Mr. ALLEN BROWN at a depth from the surface of 21 feet. The gravel in which the implement occurred rested beneath a deposit of brickearth, and has been identified as forming part of the 100-foot terrace of the Thames.* The specimen, which is ochreous-brown in colour, has been fashioned by the removal of large flakes. It exhibits a considerable amount of abrasion, and the dorsal ridge has suffered extensive contusion, caused possibly by use. A few incipient cones of percussion and some well-marked striæ are observable upon some of its flake-scars, which show also a peculiar pitting of the surface. The implement does not exhibit a marked glaze, and a patch of cortex is to be seen towards the posterior end of the left lateral surface. One or two cracks are present in its mass. This specimen, together with the two next to be described, have passed into the author's possession, owing to the kindness of the late Dr. W. ALLEN STURGE.

4. THE MILDENHALL TRANSITIONAL (Plate 54, figs. 1–4).—Found in the famous implementiferous gravel bed at Warren Hill, near Mildenhall, Suffolk. This specimen was originally in the possession of the late Mr. WORTHINGTON G. SMITH, who, it is supposed, acquired it from one of the workmen in the Warren Hill pit. The implement exhibits over much of its surface the peculiar mottled yellow and black coloration present on a large number of the Warren Hill flints. The other portions of its surface are a lightish brown in colour, while some later edge-flaking is patinated a light blue. This specimen has been fashioned by the removal of large flakes, and has suffered some amount of abrasion due to rolling by water. A considerable number of incipient cones of percussion and a few small striæ are developed upon the flaked surfaces, which exhibit a moderate amount of glaze.

* 'Memoirs Geol. Survey,' "The Geology of the London District," pp. 89–90.

Downloaded from rstb.royalsocietypublishing.org

The posterior region of the implement is composed of unflaked cortex, and one or two cracks are observable in the mass of the flint.

5. The Clapton Transitional (Plate 55, figs. 1–4).—Found in a bed of implementiferous gravel at Clapton, in the Thames or Lea Valleys. The specimen was originally in the possession of the late Mr. Greenhill, whose collection of flint implements was purchased by the late Dr. W. Allen Sturge. The Clapton gravel bed forms, apparently, part of the 50-foot terrace of the Thames Valley.* The implement, which shows considerable abrasion due to rolling by water, exhibits a dark red-brown coloration over parts of its surface and a lighter brown in others. The surfaces of the specimen, which are well glazed, bear a few incipient cones of percussion and some well-marked striæ. Under a lens the large flake-scars show a peculiar pitted appearance, and several cracks are developed in the mass of the flint. A small patch of cortex is observable at the posterior region of the implement.

6. The Ipswich Transitional (Plate 56, figs. 1–4).—Found by a workman, employed by the author, in a bed of implementiferous gravel situated in a shallow valley upon the plateau to the East of Ipswich. The gravel occurs at a height of about 120 feet O.D. The specimen, which has been fashioned by the removal of large flakes, exhibits various colours, ranging from a putty shade to ochreous-brown, upon its surfaces. It is extensively abraded and rolled and a few incipient cones of percussion are observable upon the flake-scars. The implement is considerably striated, and a few cracks are developed in its mass. It is only very slightly glazed and has a patch of cortex at the posterior region.

7. The Axminster Transitional (Plate 57, figs. 1–4).—Found in the well-known gravel pit at Broom near Axminster, Somersetshire. The bed in which the implement occurred rests at a height of about 150 feet O.D. (Evans, "Ancient Stone Implements of Great Britain," second edition, p. 639). The specimen was acquired from a workman in the pit by Mr. A. S. Barnes who kindly presented it to the author. The implement which is considerably abraded is formed of chert and is greyish-yellow in colour. The flake-scars are of medium size and exhibit only a slight glaze. A patch of "cortex" is observable at the posterior region of the specimen.

The foregoing details, and the excellent drawings of the implements accompanying this paper, executed by Mr. Leonard Squirrell of Ipswich, will, it is hoped, enable the reader to form an accurate mental picture of the seven specimens which form the subject matter of this communication.

It is clear from the evidence afforded by their provenance that these seven implements are of a considerable antiquity, and this view is further supported by evidence of a different character. In each case, with the exception of the Axminster specimen (Plate 57, figs. 1-4), the bold and somewhat rough flaking responsible for the form of the implements is of the kind associated with a comparatively early stage in

* 'Memoirs Geol. Survey,' "The Geology of the London District," p. 91.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Downloaded from rstb.royalsocietypublishing.org

man's efforts to shape flints to his needs. Further the colour and condition of the flints are of an antique order, and finally each of the specimens has been found in association with other implements exhibiting the same method of flaking, and of a similar colour and condition which, by their form, are referable to the earliest palæolithic, river-drift series. The chert specimen from Broom pit though, apparently not so ancient as the others, is, nevertheless, by its form assignable to an early stage in the history of river-drift man. It seems clear then that these seven implements may, with some amount of certainty, be regarded as of early palæolithic age.

The Peculiar Form of the Implements.

If reference is made to the illustrations of the seven specimens under consideration (Plate 51, figs. 1–4), (Plate 52, figs. 1–4), (Plate 53, figs. 1–4), (Plate 54, figs. 1–4), (Plate 55, figs. 1–4), (Plate 56, figs. 1–4), (Plate 57, figs. 1–4), it will at once be noticed that all of them exhibit in profile a marked beak-like appearance. This likeness to the beak of an accipitrine bird is caused by the downward curvature of the dorsal ridge and its junction with the much straighter ventral surface. A further reference to the illustrations will show that the specimens found at Knowle Farm Pit, Savernake (Plate 51, figs. 1–4, and Plate 52, figs. 1–4), at Warren Hill (Plate 54, figs. 1–4) and in the Thames Valley (Plate 53, figs. 1–4 and Plate 55, figs. 1–4) are all furnished with a more or less flat ventral surface, and that each of them, especially towards the anterior region, are approximately triangular in section. The implements, on the other hand, found at Ipswich (Plate 56, figs. 1–4), and at Axminster (Plate 57, figs. 1–4), do not exhibit the flat ventral surface. In fact this surface has been replaced by a ventral ridge and the section of the implements has become roughly rhomboidal.

In 1911 Sir Ray Lankester described before the Royal Society the series of flint implements found beneath the Pliocene Red Crag of Suffolk, to which he gave the name of "rostro-carinate." Of these particular specimens he states*: "In the Pre-Crag implements the anterior narrow edge, though tending to the vertical, is strongly curved and gives the implement the form of the beak of an accipitrine bird. The form of this region of the implement may also be compared to that of the prow of a boat (the boat being turned keel upwards). We distinguish (keeping the prow or beak to the front) an upper or dorsal plane, a lower or ventral plane, a right lateral and a left lateral surface, a posterior surface or stern, usually very irregular, heavy and roughly shaped as though for holding in the hand, and an anterior surface, narrowed to the form of a keel and ending in a beak (hence we call the implement 'rostro-carinate'), as a consequence of the oblique direction and convergence of the lateral surfaces, which approach one another so as to leave only a narrow keel-like ridge between them. We usually see this keel or 'carina' reaching forward from the broad, middle and posterior portions of the upper surface of the implement, as a very

* 'Phil. Trans.,' B, vol. 202, pp. 294–295.

Downloaded from rstb.royalsocietypublishing.org

distinct and leading feature in its sculpture." Sir Ray Lankester illustrates the foregoing remarks by means of three diagrams showing the ideal form aimed at by the makers of the Pre-Crag rostro-carinate flint implements, and the author has copied these diagrams which are shown in fig. 1.

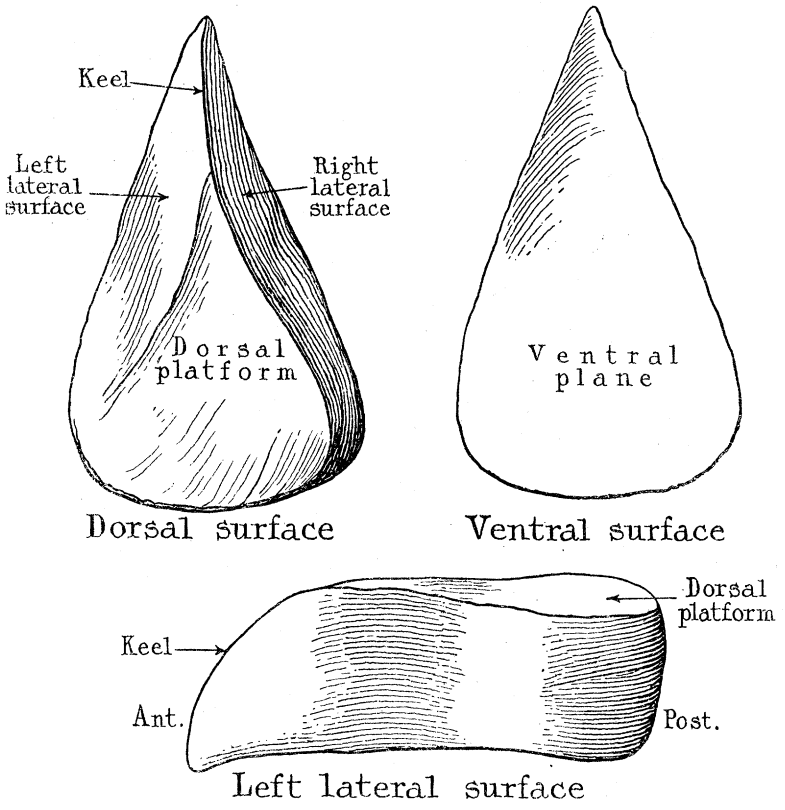


Fig. 1.

If the reader will now apply Sir Ray Lankester's description of a rostro-carinate flint implement to the specimens illustrated (Plate 51, figs. 1–4; Plate 52, figs. 1–4; Plate 53, figs. 1–4; Plate 54, figs. 1–4; Plate 55, figs. 1–4), it will be realised that these implements, though of palæolithic river-drift age, are of the rostro-carinate type, but they are better made and more highly evolved than those found below the Red Crag and in other pre-river-valley deposits. The two other specimens illustrated (Plate 56, figs. 1–4) and (Plate 57, figs. 1–4), though exhibiting the beak-like profile, cannot be regarded as true rostro-carinates owing to the fact that they do not possess the more or less flat ventral plane. Four views of each of the seven implements are given and their various characteristics are indicated clearly (Ant. = Anterior and Post. = Posterior). A sectional drawing of each specimen is also provided.

An Explanation of the Peculiar Form of the Seven Specimens.

In giving an explanation of the peculiar form of the seven specimens under examination, it is necessary, first of all, to deal with the question of flint flaking. To

Downloaded from rstb.royalsocietypublishing.org

be able to flake flints with a hammer stone successfully, it is needful to either select a stone with a natural flat surface upon which flake-removing blows may be delivered with precision, or to produce such a surface by means of a heavy blow with the hammer-stone. This flat surface is necessary, because the hammer-stone cannot generally "get home" on a rounded surface, but glances off ineffectually. The production of a flat surface, or "striking-platform" as it is called, is of fundamental importance in flint flaking, and it is not surprising, therefore, to find that through the whole period when flint implements were in use its paramount necessity was recognised. The Pre-Crag rostro-carinate implements afford an excellent example of such recognition. As has been already pointed out, the section of a rostro-carinate implement is more or less triangular.

The base of the triangle represents the broad ventral surface, and this surface, in the author's opinion, is simply a flat striking-platform upon which blows were delivered in the formation of the sharp keel or carina, which is represented by the apex of the triangle. But, in addition to the ventral surface, the rostro-carinate implements very often exhibit a well-marked dorsal platform, and this, in the author's opinion, may be regarded as the remains of another striking-platform. In many experiments in the flaking of flint which have been carried out, he has found it to be necessary in producing a symmetrical rostro-carinate to deliver blows upon the dorsal surface as well as upon the ventral. Hence it is necessary, in setting out to fashion such an implement from a nodule of flint, to provide two striking-platforms, a dorsal and a ventral. The author would like to here state that the discovery of the necessity for the production of two such striking-platforms in the formation of a symmetrical rostro-carinate implement was first made by Sir Ray Lankester. In his account of a remarkable implement of this type, found by Mr. W. G. Clarke, Sir Ray Lankester states that in his opinion it is probable that the ancient flint-worker who fashioned this particular specimen "having selected a good sound flint nodule of first-rate quality . . . proceeded to break it by two great cleaving blows into a *tabular* form. . . ."*

The author acting upon this suggestion carried out experiments with several large rounded nodules of sound flint, and found that it was possible to produce, by flaking, a piece or "chunk" of tabular flint from such nodules, as had been adumbrated by Sir Ray Lankester. In fig. 2 a diagram is given showing how such production is accomplished. The continuous line represents the outline of the rounded nodule of flint. A heavy blow is struck at the point A, and the line of fracture, shown by the dotted line (the direction of the force responsible for the cleavage is indicated by an arrow), continues to the point B. The portion of the flint nodule above the line A–B is thus removed, and a flat surface produced. Another heavy blow is then delivered at the point C, and the line of fracture continues to the point D. The portion of the flint

* "Description of the Test Specimen of the Rostro-carinate Industry found beneath the Norwich Crag," Roy. Anthr. Inst., 'Occasional Papers,' No. 4, p. 8.

Downloaded from rstb.royalsocietypublishing.org

nodule below the line C–D being thus removed, a second flat surface is produced. Having accomplished this, a by no means easy task, it is possible to proceed to the fashioning of the rostro-carinate implement.

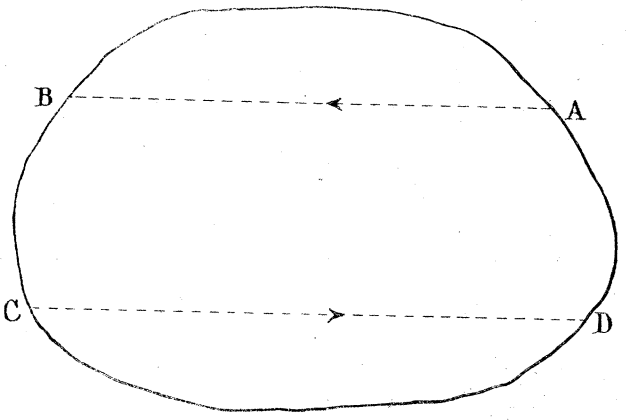


Fig. 2.—Production of Tabular Flint from Rounded Nodule.

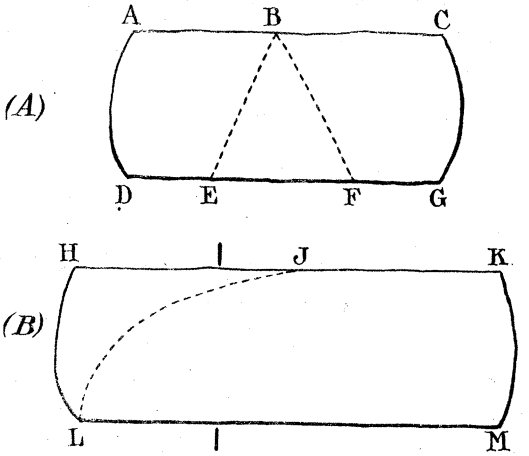


Fig. 3.

If reference is now made to fig. 3A, which shows the piece of tabular flint and a rostro-carinate in section, it will be realised how such an implement is produced. Blows are delivered upon the flat lower surface between D–E and F–G, and upon the flat upper surface between A–B and B–C. These blows result in the formation of the triangular section of the rostro-carinate as indicated by the dotted lines E–B–F, and remove the portions of the tabular piece of flint contained within the continuous and dotted lines A–D–E–B and B–F–G–C. In fig. 3B the piece of tabular flint and the rostro-carinate implement are shown in profile, and the curving keel of the implement is indicated by the dotted line L–J. It will be noticed that the original flat lower surface L–M remains as the ventral plane of the rostro-carinate, while a portion only of the original flat upper surface H–K is retained and forms the dorsal platform of the implement. This portion lies between J and K.

In the Norwich test specimen of the rostro-carinate industry described by Sir Ray Lankester the method outlined above appears to have been carried out in almost every detail. A diagrammatic drawing of the left lateral surface of this implement is given in fig. 4, and a comparison of this illustration with fig. 3B will show how nearly the profiles of the two rostro-carinates resemble each other.

The author is of opinion that the sharp keel or carina of the rostro-carinate implement was the object at which the ancient workmen were aiming. They required a good cutting edge for various purposes, and the curving keel of the rostro-carinate gave them what they wanted. In a paper published recently,* the author has shown that with the wish to provide a longer cutting edge the sharp keel was gradually carried further and further back towards the posterior region of the implement, and

* 'Journ. Roy. Anthrop. Inst.,' vol. 46, pp. 197–220 (1916).

Downloaded from rstb.royalsocietypublishing.org

that this extension of the keel was accompanied, inevitably, by the reduction in size of the dorsal platform. He also drew attention to the fact that from the Pre-Crag

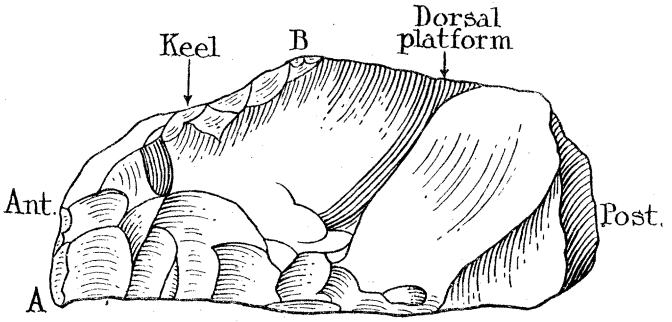


FIG. 4.—Left Lateral Face of Norwich Test Specimen. (Somewhat reduced in size.)

period onwards the width of the ventral plane suffers a marked reduction. The Post-Crag rostro-carinates, in fact, show an ever-increasing tendency to be compressed from side to side. In the Middle Glacial Gravel of Suffolk, a deposit later in age than the Red Crag, a series of rostro-carinates has been found which shows clearly the characteristics above described. A diagrammatic drawing of one of these rostro-carinate implements from the Middle Glacial Gravel is given in fig. 5, and it will be seen

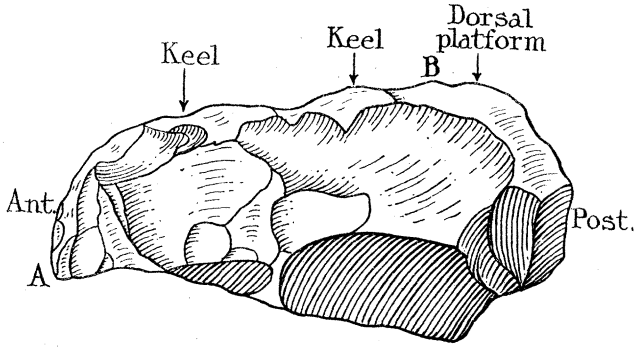


FIG. 5.—Left Lateral Face of Rostro-Carinate from Middle Glacial Gravel, Ipswich. (Somewhat reduced in size.)

that in the Norwich test specimen (fig. 4) the point B, which represents the furthest extension of the keel towards the posterior region (the keel commences at the point A), is situated about in the middle of the dorsal surface of the implement, whereas in the Middle Glacial specimen the backward extension of the keel is greater, and in consequence the distance between A and B is more extended. This extension of the keel towards the posterior region of the implement was carried on until in many cases the dorsal platform disappeared entirely, and the implement from Clapton (Plate 55, figs. 1–4), already described, affords an excellent example of this type. It is the author's opinion that in these implements the flat ventral surface rested against the palm of the hand when being used, while the sharp keel was used as a cutting and scraping edge. Implements of the type found at Clapton (Plate 55,

Downloaded from rstb.royalsocietypublishing.org

figs. 1–4) have been collected for some years and classed as palæolithic "side-choppers," but whether this designation is correct or not, it seems clear that they are simply "compressed" rostro-carinates, in which the keel has been extended to the posterior region, and which, in consequence, do not exhibit any dorsal platform.

We may suppose that having at length produced an implement with a cutting edge extending the whole length of one side of the flint he had fashioned, it occurred to the ancient flint worker that it would be an advantage to make another cutting edge opposite to the first one, and extending the whole length of the other side of the flint. We know that this was accomplished because the pointed and ovate palæolithic implements with two cutting-edges can be brought forward in evidence. The question is, how was it accomplished?

The author has experimented extensively in the flaking of flint, and he has found that the only way in which it is possible to provide a rostro-carinate with a cutting edge *directly opposite* to the keel or carina is to flake away each side of the ventral plane, and so to produce a sharp edge. In fig. 6 the triangle formed by continuous lines shows the section of a rostro-carinate implement, the apex A represents the keel while the base B–D represents the flat ventral plane. To produce a cutting edge at C, opposite to A, it is necessary to deliver blows principally upon the ventral surface between B–C and between C–D. In this process the portions of the rostro-carinate limited by continuous and dotted lines, and indicated by the numerals 1 and 2, are removed, and the resulting implement assumes in section a roughly rhomboidal form. Fig. 7 shows the edge-view of a palæolithic implement (continuous lines) as it would appear when the necessary portions of the ventral plane of the rostro-carinate had been flaked away. The outline of the ventral plane is indicated by dotted lines. If any representative series of palæolithic river-drift implements is examined it will be seen that the majority exhibit a more or less rhomboidal section, and it is the author's opinion that the earliest river-drift implements were evolved from the rostro-carinate type in the manner indicated. The author has himself produced, by flaking, an implement of river-drift type by first of all fashioning the flint into a rostro-carinate, and then proceeding to transform the flat ventral plane into a cutting edge. But he does not wish to claim that the ancient flint workers in making a pointed "palæolithic" implement always began by flaking the flint into a rostro-carinate form. He wishes only to suggest that the knowledge of the necessity for the provision of two flat striking-platforms in the making of a pointed palæolithic implement was acquired by the makers of the rostro-carinate specimens, and that this knowledge was handed on and preserved by the peoples who lived after them. But it is necessary to emphasise the fact that the method of preparing a nodule of flint for the production of a rostro-carinate is precisely the same as that needed for the production of a pointed palæolithic, river-drift implement. The flint is first of all shaped to a tabular form as in the case of the rostro-carinate (figs. 3A and 3B), and in fig. 8A the tabular piece of flint and the palæolithic implement are

Downloaded from rstb.royalsocietypublishing.org

shown in section. In the formation of the rhomboidal outline blows are delivered upon the upper flat surface of the piece of tabular flint between A–B and B–C, and

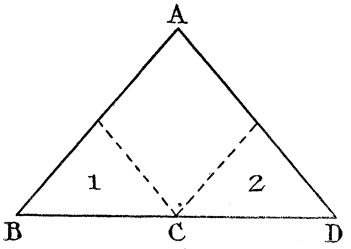


FIG. 6.

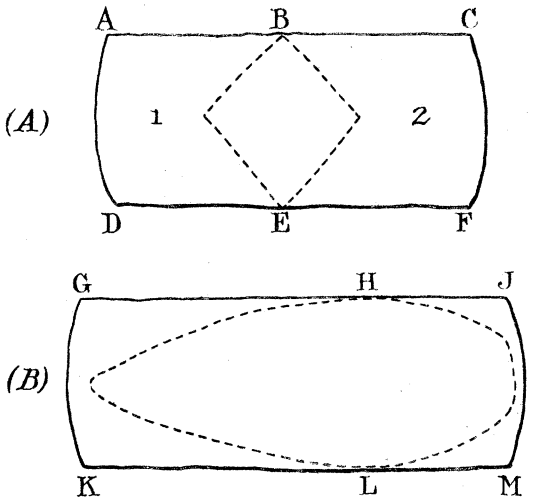


FIG. 8.

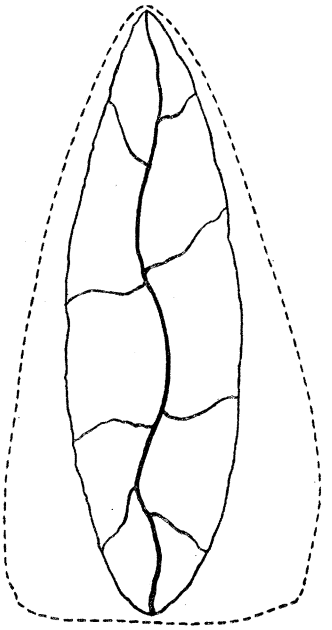


FIG 7.

upon the lower flat surface between D–E and E–F. In this process the two portions of the tabular flint limited by continuous and dotted lines, and indicated by the numerals 1 and 2, are removed. In fig. 8B the piece of tabular flint and the palæolithic implement are shown in profile, and it will be noticed that the only portion of the original flat surface G–J is retained at H, and the only portion of the surface K–M is retained at L. At these two points, H and L, a small flat area of the original surfaces will be seen intersecting the edges of the palæolithic implement, and in many specimens from the river-drift these vestiges of the large original striking-platforms are observable towards the posterior region of the implements. Sometimes, as would be expected, only one such platform is to be seen, and many palæolithic implements of the latest river-drift type do not show them at all. Their retention or elimination depended solely upon the amount of trouble taken by the ancient flint worker in finishing his implement. These restricted areas of the large striking surfaces have been known to archæologists as lateral platforms but their significance has not been fully recognised. When the palæolithic implement is regarded, as is usually the case with the point uppermost, such platforms are correctly

Downloaded from rstb.royalsocietypublishing.org

described as being lateral. But if these implements are posed in the rostro-carinate manner (as in fig. 8B), then the small platforms become dorsal or ventral as the case may be, and their true significance can be recognised. The ovate palæolithic implements, which are simply specimens having a rounded cutting edge instead of a point, very often exhibit, as would be expected, remains of the large original striking-platforms.

Many pointed palæolithic implements, especially those referable to the earliest river-drift deposits, very frequently show in profile a quite marked beak-like appearance. The author has found, in fashioning a flint into the form of a pointed palæolithic implement, by the method already described, that quite unconsciously the rostro-carinate profile is preserved, and he supposes that the efforts of the ancient flint workers had occasionally a similar result. But if, as is supposed, the palæolithic implements were evolved from the rostro-carinate type, then it is only natural that the outline of the parent form should at times make itself manifest.

It thus seems reasonable to conclude that the early palæolithic, river-drift implements are directly evolved from the more ancient rostro-carinate specimens (the author wishes it to be clearly understood that he does not at present associate the later Mousterian, Aurignacian, Solutrean, and Magdalenian cultures with this evolution), and we may proceed to examine the seven implements which it is the main purpose of this paper to describe, and to ascertain whether they support this theory of evolution.

Before, however, proceeding to such a description it may be well to again emphasise the fact that these seven specimens have all been found in deposits of gravel well known as yielding numerous specimens of the earliest examples of the handiwork of river-drift man. These seven specimens also exhibit the same colour and other conditions of surface exhibited by the normal implements from the gravel beds, and it appears necessary to conclude therefore that they are of the same age as the aforesaid normal palæolithic implements.

1. *The Savernake Transitional Specimen No.* 1 (Plate 51, figs. 1–4).

This implement, as will be seen from the four views illustrated, possesses all the characteristics of a rostro-carinate, as set forth earlier in this paper. The views of the right and left lateral surfaces (figs. 1 and 2) show the well-known beak-like profile (in the drawing of the right lateral surface the artist has tilted the implement over somewhat so that a portion of the ventral plane—darker shading—is visible). Fig. 3 shows the more or less flat ventral plane, while fig. 4, which illustrates the dorsal surface of the specimen, shows the keel sweeping back from the anterior region to the dorsal platform, which in this case is somewhat marred by a cavity evidently present in the original nodule of flint from which the implement was made. The implement is, moreover, more or less triangular in section. We may regard this specimen then as a true rostro-carinate showing flaking of a more advanced order than the Pre-Crag

Downloaded from rstb.royalsocietypublishing.org

and other early examples of this type, and its presence in the valley gravel at Knowle Farm affords evidence that occasionally the palæolithic flint flakers made typical rostro-carinate implements.

2. *The Savernake Transitional Specimen No.* 2 (Plate 52, figs. 1–4).

This specimen, also from Knowle Farm, Savernake, exhibits some remarkable characteristics. The drawings of the right and left lateral surfaces (figs. 1 and 2) show the well-marked beak-like profile. The remains of the narrow flat ventral plane are shown in the drawing of the ventral surface of the implement, and occur immediately under the point of the beak. The remainder of the ventral plane has been flaked away (fig. 3) and it seems evident that the intention was to provide a cutting edge in place of this ventral plane. The drawing of the dorsal surface shows also that the keel extends but a little way back from the point of the beak, while the dorsal platform is of considerable extent as indicated by the two widespread dotted lines (fig. 4). The author has studied this specimen very carefully and considers that it represents an unfinished implement. The intention of the ancient flint flaker was to produce a pointed palæolithic implement, but for some reason his work was never completed. This specimen demonstrates the correctness of the description given above (p. 337) of the manner in which a palæolithic implement was made, and its beak-like profile shows that, in this method of manufacture, the flint assumed at one stage the rostro-carinate form. The two sectional drawings show clearly the dual character of this implement. That taken through the line B–B is more or less triangular and, therefore, of the rostro-carinate order. The section through the line A–A shows the beginnings of a cutting edge at the point C, while the upper, dorsal platform is seen to be almost intact. At the posterior region of the implement too an attempt has evidently been made to produce a cutting edge, and this feature, unknown in any Pre-Crag or other early rostro-carinates hitherto discovered, shows distinct palæolithic affinities. This implement presents then characteristics of the rostro-carinate specimens and the earliest pointed river-drift palæoliths, and it may be regarded as a transitional form between these two types of flaked flints.

3. *The Dawley Transitional Specimen* (Plate 53, figs. 1–4).

This implement found at Dawley in the Thames Valley is an excellent example of the highly-evolved rostro-carinate of the early river-drift palæolithic deposits. Such specimens as these were found years ago and preserved as examples of what are known as "palæolithic side-choppers." It is possible, as has been already pointed out, that this designation is correct because the flat ventral plane would afford a comfortable surface for prehension, while the sharp keel might be used for chopping and cutting purposes. But an examination of the four drawings of the specimen will show that we are dealing with an undoubted rostro-carinate. The right and left lateral surfaces (figs. 1 and 2) exhibit the usual beak-like profile, the narrow ventral

Downloaded from rstb.royalsocietypublishing.org

surface (fig. 3) though formed by several flake-scars, is more or less flat, while the dorsal surface (fig. 4) shows the keel extending from the anterior region to the much truncated remains of the dorsal platform situated at the posterior end of the implement. All of which characteristics, though in a highly evolved degree, are typical of the rostro-carinate industry. The sectional drawing is roughly triangular, which is in accord with the above determination. We may regard this specimen as affording evidence that, as at Knowle Farm, Savernake, the early river-drift men of the Thames Valley occasionally made rostro-carinate implements, and it should be noted that as in Specimen No. 2 from Knowle Farm (Plate 52, figs. 1–4) a rough cutting edge, in the early palæolithic manner, has been formed at the posterior end of the implement.

4. *The Mildenhall Transitional Specimen* (Plate 54, figs. 1–4).

This implement from Warren Hill, Suffolk, represents, in the author's opinion, a similarly unfinished specimen to that from Knowle Farm, Savernake, already described (p. 340). The right and left lateral surfaces (figs. 1 and 2) are beak-like in profile; the narrow ventral surface (fig. 3) shows towards its anterior limit evidence of the first attempts to produce a cutting edge, while the dorsal platform is of considerable extent as indicated by the widespread dotted lines (fig. 4). The keel, in consequence, does not extend very far back towards the posterior region (fig. 4). The section taken through the line B–B shows the triangular form of the rostro-carinate type, while that through the line A–A shows the dorsal and ventral surfaces to be left almost intact. This specimen, then, appears to afford evidence that, as at Knowle Farm, Savernake, the early river-drift men of N.W. Suffolk fashioned their pointed implements on what may perhaps be termed the rostro-carinate plan.

5. *The Clapton Transitional Specimen* (Plate 55, figs. 1–4).

This specimen found at Clapton may, like the implement from Dawley in the Thames Valley, be classed as a highly evolved rostro-carinate. The right and left lateral surfaces and the comparatively narrow ventral surface (figs. 1–3) are all in accord with this determination. The dorsal surface (fig. 4) exhibits the keel extending continuously from the anterior to the posterior region, accompanied by the inevitable disappearance of the dorsal platform. The sectional drawing is triangular in form.

We have thus arrived at the stage as shown by this specimen, when the keel of the rostro-carinate extends continuously from one end of the dorsal surface to the other, and this marks the culminating point in the production of this type of implement. In the fashioning of an implement having two opposite cutting edges a change is made from the simple triangular section to one roughly rhomboidal. The method by which this change was in all probability accomplished has been already described (p. 337) and a diagram given (fig. 6) in illustration of this description. But it must be remembered that diagrams are ideal, while the ideal in manipulating a

Downloaded from rstb.royalsocietypublishing.org

refractory and peculiar material like flint is seldom attained. Though, therefore, in the diagram mentioned (fig. 6) the author has shown the second cutting edge at C to be immediately under the keel at A he does not wish to convey the impression that such accuracy was often attained by the ancient flakers of flint. As a matter of fact the point C may be located almost anywhere along the line B–D, and the truth of this statement will become manifest in the implements now to be described.

6. *The Ipswich Transitional Specimen* (Plate 56, figs. 1–4).

This Ipswich specimen, though a very early palæolithic, river-drift implement, possessing two cutting edges, presents certain characteristics strongly reminiscent of the rostro-carinate form. The right and left lateral surfaces (figs. 1 and 2) show a well-marked beak-like profile, while the massiveness of the posterior region of the implement is such as is usually seen in rostro-carinate specimens. It is when we turn to the ventral and dorsal surfaces, however, that the importance and interest of this Ipswich implement becomes manifest. An examination of the drawing of the ventral surface (fig. 3) shows clearly that the maker of this implement intended to form his cutting edge in a straight line from the anterior to the posterior region. He began his task well and the cutting edge is seen to take a straight course posterior-wards for about an inch and a half from the anterior region. Then for some reason or another, it swerves suddenly to the right, and curves gradually to the posterior extremity of the implement. When the drawing of the dorsal surface is examined it is seen that this asymmetry of the cutting edge presents a very similar form. Again we see the cutting edge taking a straight course posterior-wards for a little distance, and then swerving off to the right. The author can only explain this peculiarity by suggesting that the ancient flint flaker was not quite master of his work, as it would have been quite possible to have made both the dorsal and ventral cutting edges straight. It does not seem possible that the asymmetry of these edges could make the implement more useful or a better cutting instrument, whereas it seems reasonable to suppose that straight cutting edges would have increased its efficiency. If it were feasible to regard the two areas (indicated in the drawings by crosses, figs. 3 and 4) as the remains of the original dorsal and ventral surfaces of the implement, and to say that the anterior portions of these two surfaces were in process of being transformed into cutting edges, while their other portions remained intact, our difficulties would disappear. But it is not feasible to come to such conclusions in regard to these surfaces. The two areas indicated by crosses on the dorsal and ventral surfaces are by no means flat, as is shown in the sectional drawing. Moreover, by the manner of the truncation, and direction of the blows forming the flake-scars which compose these two dorsal and ventral areas, it is clear that they have been struck from pre-existing flat surfaces which in the formation of the two cutting edges have been entirely flaked away. If reference is now made to fig. 9 and to the sectional drawing (Plate 56) it will be seen that this implement is roughly rhomboidal

Downloaded from rstb.royalsocietypublishing.org

in section. In fig. 9 an outline of the section (continuous line) is placed in a more or less triangular "frame" (dotted line). If a comparison is made between this

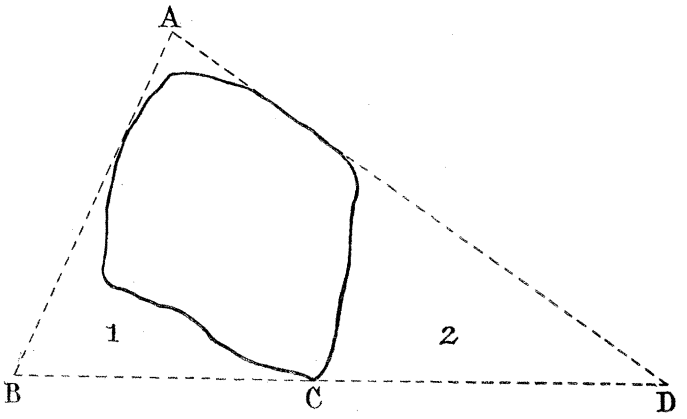


FIG. 9.

diagram (fig. 9) and the ideal diagram shown above (fig. 6), it will be seen that there is not any very fundamental difference observable. In the ideal diagram the point C is immediately under A, while in the other (fig. 9) this is not so. But in both cases the areas indicated by the numerals 1 and 2 have been removed by flaking after the flint had been shaped into the triangular form of the rostro-carinate implement. Altogether this curious, unsymmetrical specimen seems to combine the characteristics of a definite double-edged palæolithic implement, with many rostro-carinate affinities, and the author regards it as an excellent example of a very early clumsy palæolithic implement just emerging, so to speak, from the rostro-carinate stage, and showing in consequence many evidences of its parentage.

7. *The Axminster Transitional Specimen* (Plate 57, figs. 1–4).

There is no need to write very much in reference to this symmetrical palæolithic implement from Somerset. The drawings of the right and left lateral surfaces

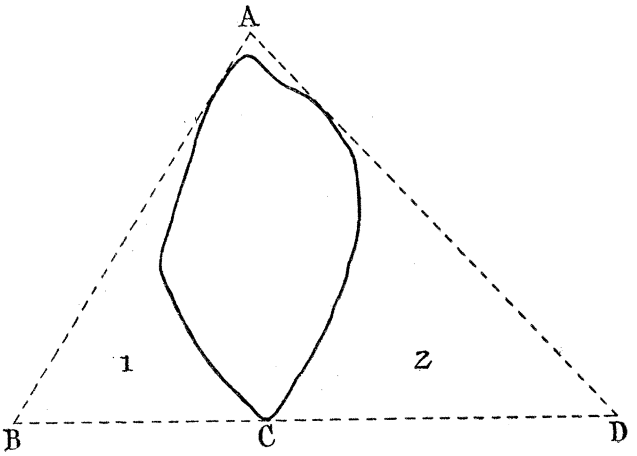


FIG. 10.

Downloaded from rstb.royalsocietypublishing.org

(figs. 1 and 2) demonstrate that in profile it has a marked beak-like appearance, while the views of the ventral and dorsal surfaces (figs. 3 and 4) show that the cutting edges take a straight course from the anterior to the posterior region. In section the implement is roughly rhomboidal in form, and in fig. 10 it will be seen that its symmetry is such that the point C is immediately under A as in the ideal diagram above (fig. 6). This specimen is of interest as an example of an early symmetrical palæolithic river-drift implement still retaining the rostro-carinate profile.

Conclusion.

The foregoing examination of the seven implements has demonstrated that in early river-drift times, rostro-carinate implements of a highly evolved type were in use contemporaneously with the normal pointed, palæolithic specimens.

These river-drift rostro-carinates exhibit more elaborate flaking, and keels more extended towards the posterior region of the implements than is found in earlier examples of this type. The dorsal platform of the later type of rostro-carinates has either been eliminated by the extension of the keel to the extreme limit of the posterior region or has become much reduced in size. It appears also that the rostro-carinate implements from Pre-Crag times onwards underwent a process of compression accompanied by a reduction in width of the ventral plane, and that this reduction culminated in the production of a cutting edge in place of the more or less flat ventral surface. With the production of a second cutting edge, opposite to the primary keel or carina, the earliest river-drift, palæolithic implement made its appearance. The section of the rostro-carinate implement is triangular, the base of the triangle representing the flat ventral surface, and when this surface was transformed into a cutting edge the section of the resulting implement became roughly rhomboidal. The manner in which the change from the triangular to the rhomboidal form was brought about has been described (fig. 6), and two of the specimens illustrated (Plate 52, figs. 1–4, and Plate 54, figs. 1–4) appear to be unfinished and to exhibit, as would be expected, characteristics of the rostro-carinate and early river-drift implements. The specimen found at Ipswich (Plate 56, figs. 1–4), though a very early river-drift implement of pointed type with two cutting edges, was seen to possess some well marked rostro-carinate characters, and it appears to have been made by someone inexpert in the fashioning of such specimens. The apparently dual character of this implement would lead to the conclusion that at this period the earliest river-drift palæolithic specimens were being made, and that the inexpertness of the flint flaker is in consequence not unexpected.

It was seen that the pointed palæolithic implement of the river-drift was made in fundamentally the same way as the rostro-carinate, that is, the original nodule of flint was so fractured as to offer two large and more or less flat striking-platforms, upon which flake-removing blows could be struck with precision (figs. 8A and 8B). These striking-platforms in the rostro-carinate implements form the dorsal and ventral

Downloaded from rstb.royalsocietypublishing.org

planes, while in the palæolithic implements they appear as small platforms intersecting the cutting edges, and situated towards the posterior region of the specimens. The early palæolithic implements, in many cases, exhibit a beak-like profile, which, together with the afore-mentioned platforms, afford evidence of their derivation from a rostro-carinate shaped flint.

It will be noticed that the seven implements selected for illustration and description come from widely separated localities, and this fact, apart from any other, would appear to shut out any possibility of these specimens being merely chance products due to some abnormal method of fashioning flint implements practised by some isolated community of early river-drift people. We appear to be dealing with a widespread and, as the author believes, inevitable method of implement making. For, in addition to the seven specimens here described, he has seen and handled many specimens of early river-drift "side-choppers," in reality highly evolved rostro-carinates, in the following public and private collections. In the British Museum (Bloomsbury) there are two from Shrub Hill, Norfolk; one from Aylesford, Kent; three from Swanscombe, Thames Valley; one from Brandon, Suffolk; two from Hill Head, Southampton; and one from Kent's Cavern, Torquay (8-foot level). In the Ipswich Museum there are three from Suffolk (Warren Hill, Lakenheath, Mildenhall); and one from Canterbury. Dr. W. Allen Sturge, of Icklingham Hall, also informed the author that his vast collection contained several examples of this type of implement.

The author has found that the symmetrical river-drift implements with two cutting edges which still retain the rostro-carinate profile are even more numerous than the so-called "side-choppers." The late Sir John Evans in his well-known book "Ancient Stone Implements of Great Britain," second edition, figures five such specimens (Nos. 429, 436, 448, 445d, 458), and the author has seen many others in public and private collections.

Sir Ray Lankester has drawn the attention of the author to the fact that the *shape* of the palæolithic implement bears the same relation to the rostro-carinate as does a flat-fish (plaice) to a dog-fish. The section of a dog-fish and a rostro-carinate is roughly triangular (fig. 11), while the section of a palæolithic implement and a flat-fish bear a great resemblance to each other (fig. 12). Sir Ray Lankester lays

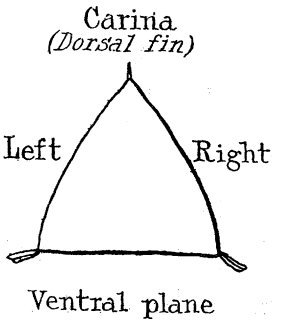


Fig. 11.—Section of Dog-fish and Rostro-Carinate.

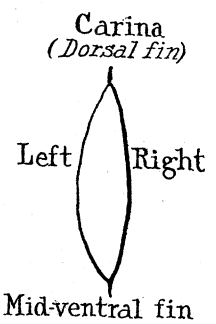


Fig. 12.—Section of Plaice and Palæolith.

Downloaded from rstb.royalsocietypublishing.org

stress on the remarkable fact that the *symmetry* of the palæolithic implement is like that of the flat-fish, produced by removing flakes from each side of the rostro-carinate, which takes the place of the "compressing" by which the flat-fish is shaped. We should naturally *expect* that the palæolith would be produced by *depressing* the rostro-carinate, as the flattened skate is produced (fig. 13), but it is

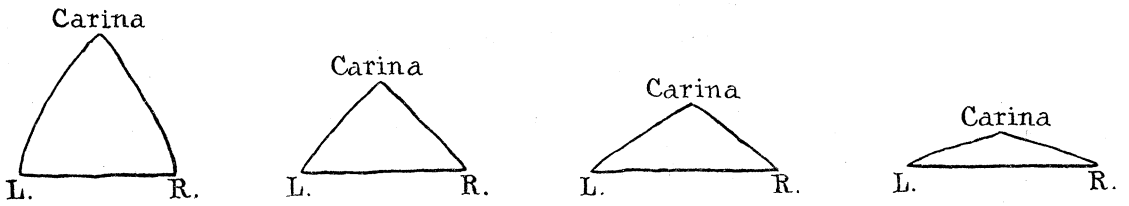


FIG. 13.

not. It is produced as the plaice is produced by converting the right and left *sides* of the original form into new dorsal and ventral surfaces, or, as one may say, remoulding the whole shape, so that the original dorsal carinal ridge becomes one edge of a new dorsal surface, and the rest of the flint is trimmed to a new symmetry accordingly (fig. 14).

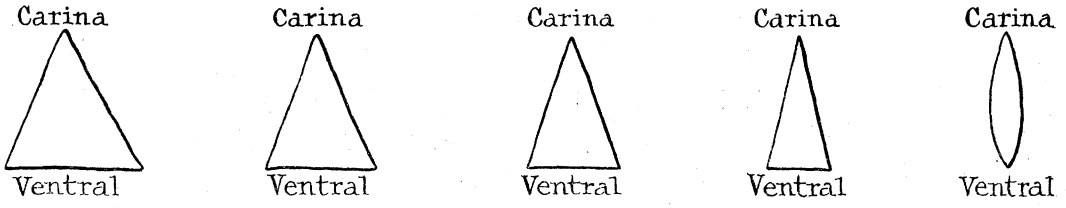


FIG. 14.

Sir RAY LANKESTER considers that the word "Platessiform" might be applied in future to all the palæoliths derived from rostro-carinates, or they might be called "Latero-carinate," meaning that the carina had taken a lateral position, and with this view the author is in agreement. In this paper no attempt has been made to deal with the geological considerations involved in the relative ages of the most ancient valley gravels, and the Pre-Crag and other deposits from which the earliest rostro-carinates have been derived. Such a subject could only be discussed with any profit by expert geologists, familiar with the beds in which the implements have been found. But such geological considerations, though of importance, are distinct and separate questions, and cannot influence in any way the reality of the evolution described in this communication.

[*Note Received October* 16, 1918.—Since the above was written the author's attention has been directed to a series of palæolithic flint implements,* occurring in

* These were first described by Mr. HENRY BURY, see 'Proc. Prehis. Soc. E. Anglia.,' vol. 2, Part 2, pp. 365–374.

Downloaded from rstb.royalsocietypublishing.org

some abundance in the deposits of the Chellian period, which do not exhibit the usual rhomboidal section referred to in this paper. The particular specimens dealt with in this note are triangular in section and thus approximate even more closely to the rostro-carinate form than do those implements which exhibit a rhomboidal section. The nodules of flint from which these specimens with triangular section were made were operated upon in two different ways. (1) By detaching a large flake from one end, and directing flake-removing blows upon the flat surface thus produced in forming the upper, dorsal portion of the implement, and (2) by splitting the nodule into two pieces, in the direction of its greatest length, and manipulating one or both of these pieces in the manner described above. In nearly every case the posterior end of the implements exhibits unflaked cortex which appears to have been left to allow of comfortable prehension, while very frequently the lower ventral surface shows flake-scars caused by blows delivered upon the side of the latero-ventral edges. But it is somewhat difficult to understand why such flakes were removed, as the specimens which exhibit the flat, untrimmed ventral surface appear to be in every way as useful for cutting and thrusting purposes. Fig. 15 illustrates an implement of triangular section from

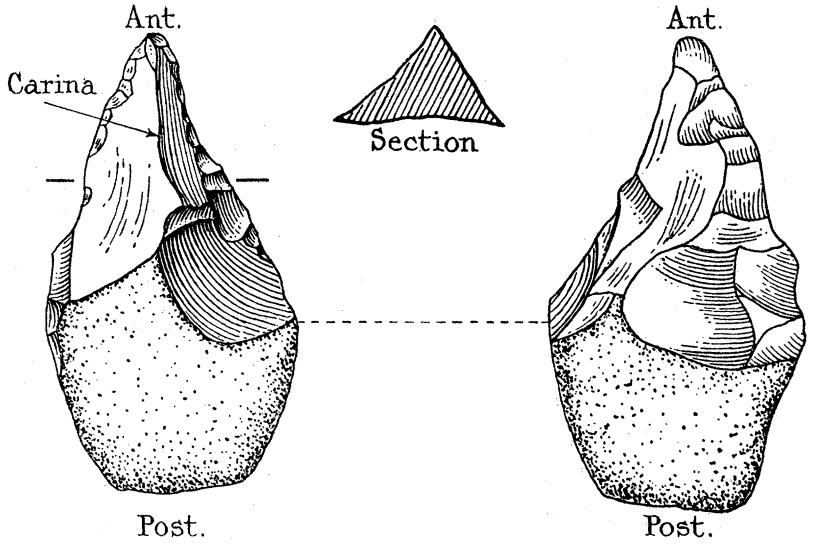


FIG. 15. (Somewhat reduced in size.)

a terrace-gravel of the Thames Valley, which has been made from a small nodule of flint, and the ventral surface of which has been flaked in the manner described. Fig. 16 illustrates an implement (also from the Thames Valley) of the same general type which has been made from one-half of a split nodule, and the ventral surface of which has been left unflaked. These and similar specimens have been known to archæologists as "flat-faced palæoliths," but this would seem to be an unsatisfactory title. They are in reality rostro-carinates in which the carina has become depressed, and it is of interest to note that their development from the ancestral form follows a similar course to the development of the skate from the squaloid fishes. This is shown

Downloaded from rstb.royalsocietypublishing.org

diagrammatically in fig. 17, and it will be seen to be quite different from the manner in which the plaice was developed (fig. 14), which method, as we have seen, approximates very closely to the development of the palæoliths of rhomboidal section, from the rostro-carinates. For these palæoliths with triangular section Sir RAY

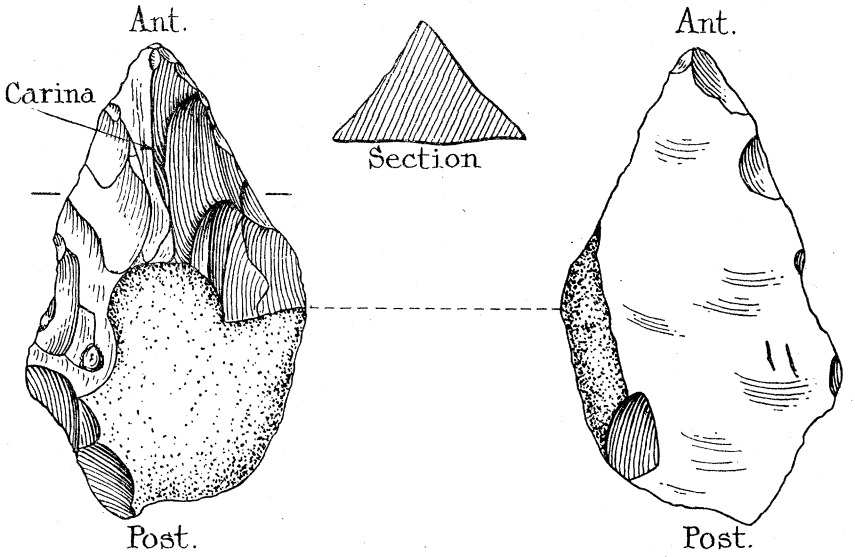


FIG. 16. (Somewhat reduced in size.)

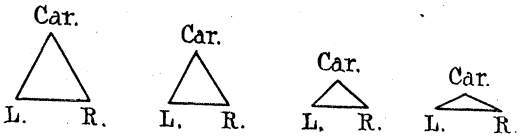


FIG. 17.

LANKESTER suggests the name "Batiform." Thus it seems that in the early palæolithic period two methods of implement making were in vogue, both intimately related to the manner in which the rostro-carinates were fashioned. The author has ascertained by experiment that the implements exhibiting a triangular section are more easily made than those of which the section is rhomboidal.]

Downloaded from rstb.royalsocietypublishing.org

DESCRIPTION OF PLATES.

All Plates are reproduced from accurate drawings executed by Mr. Leonard Squirrell of Ipswich. The size of the figures on the Plates compared with the implements themselves is stated for each Plate. Four views of each implement are given as well as outline sections.

[*Note.*—All the specimens figured in the Plates, and in text-figs. 15 and 16, have been presented to the Department of British and Mediæval Antiquities and Ethnography of the British Museum, Bloomsbury.]

Plate 51.

(Actual size.)

Specimen recovered from gravel pit at Knowle Farm, Savernake, Wilts, by Rev. H. G. O. Kendall, who presented it to the Author. Line of section indicated by vertical lines in fig. 1.

Plate 52.

(84/100 actual size.)

Another specimen from same gravel pit as above, also found and presented by Rev. H. G. O. Kendall. Positions of sections indicated by vertical lines in fig. 1.

Plate 53.

(73/100 actual size.)

Specimen found 1893 in Odell's Pit, Dawley, near West Drayton, Midd., in the Thames Valley, by the late Mr. Allen Brown. Line of section indicated as before.

Plate 54.

(84/100 actual size.)

From gravel pit at Warren Hill, Mildenhall, Suffolk, found by the late Mr. Worthington G. Smith. Lines of the sections indicated as before.

Plate 55.

(Actual size.)

From gravel pit at Clapton, N.E. London, in the Thames or Lea Valleys. Found by the late Mr. Greenhill. Line of section indicated as before.

Downloaded from rstb.royalsocietypublishing.org

PLATE 56.

(Actual size.)

Found by a workman, employed by the author, in a gravel pit situated in a shallow valley on the plateau, east of Ipswich. Line of section indicated as before.

PLATE 57.

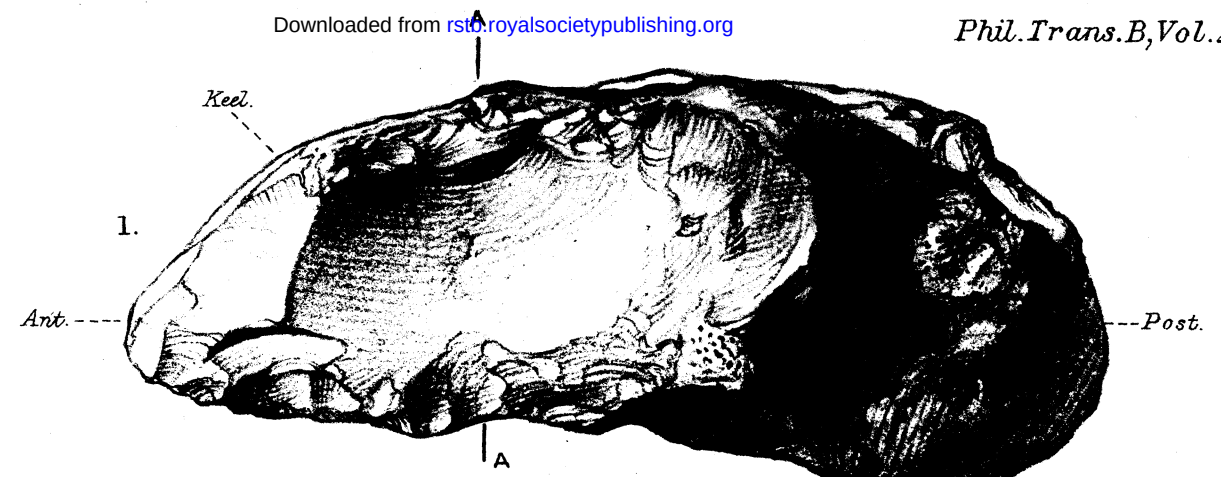
(84/100 actual size.)

From gravel pit at Broom, near Axminster, Somerset. Presented to Author by Mr. A. S. BARNES. Line of section indicated as before.

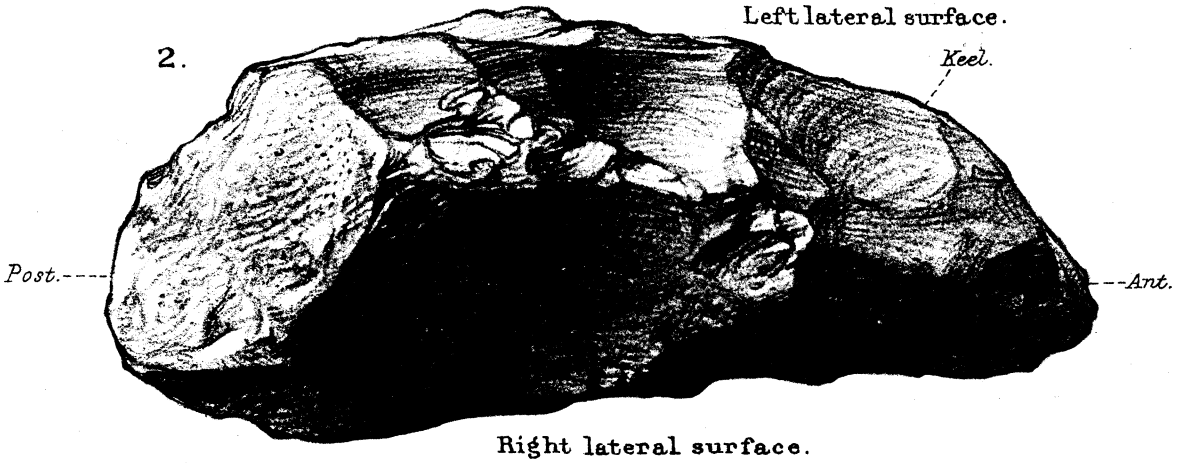
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Downloaded from rstb.royalsocietypublishing.org

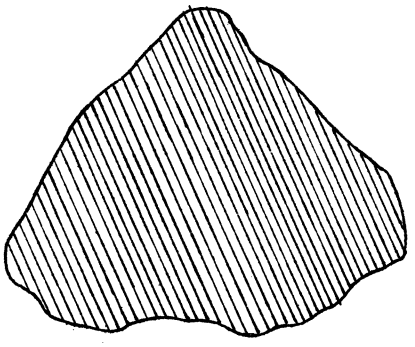


Left lateral surface.

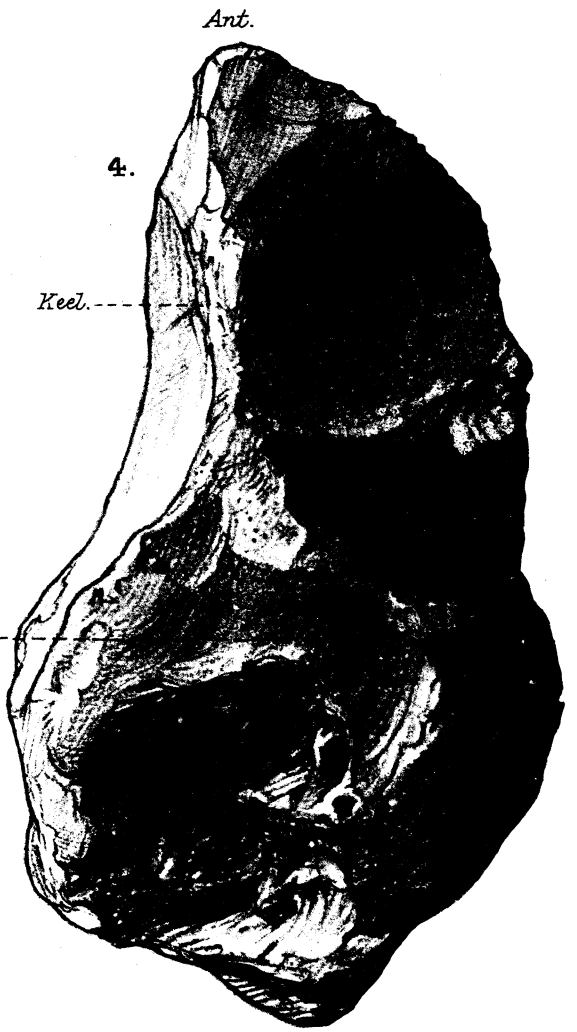


Right lateral surface.

Ventral surface.



Section. A–A.



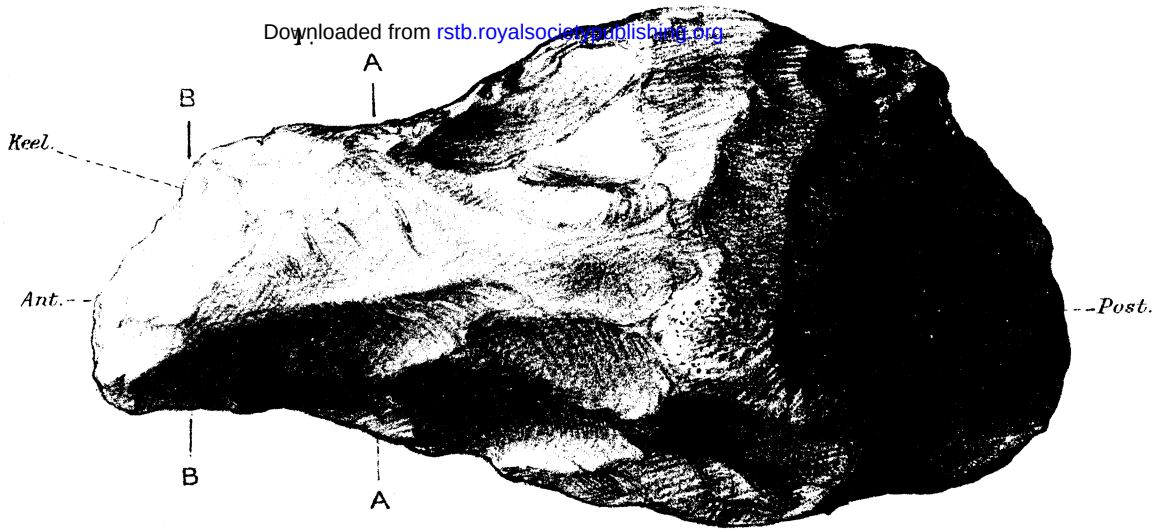
Dorsal surface.

Huth coll.

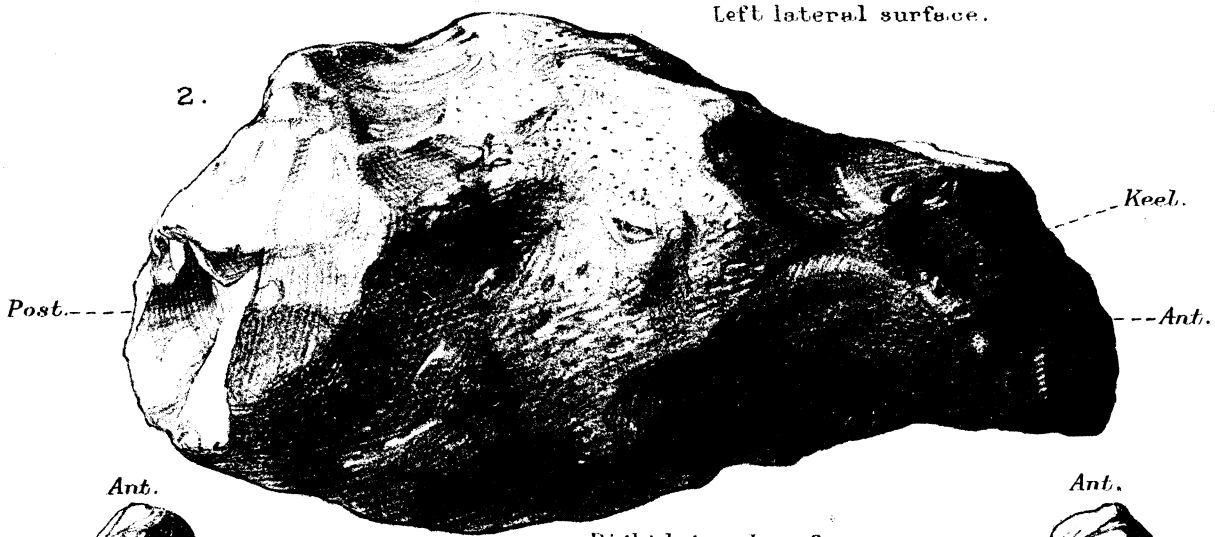
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

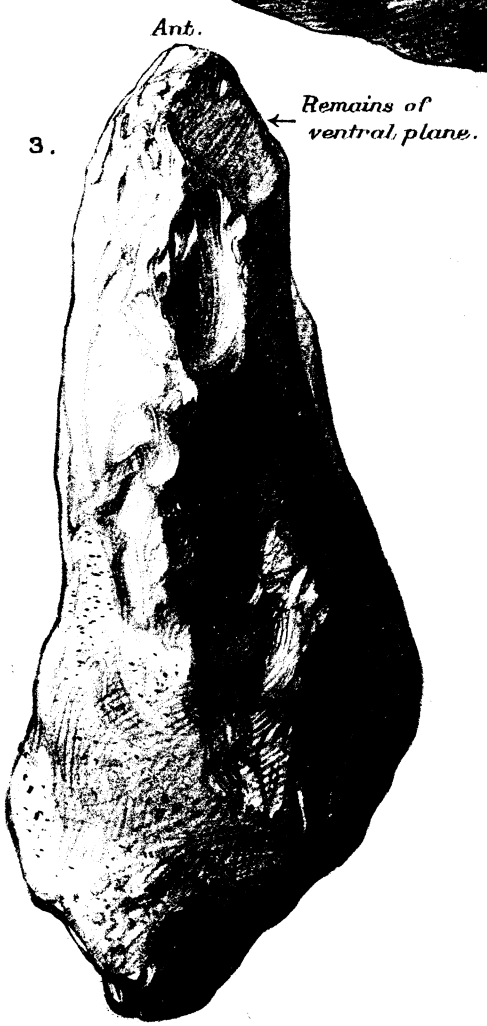
Downloaded from rstb.royalsocietypublishing.org.



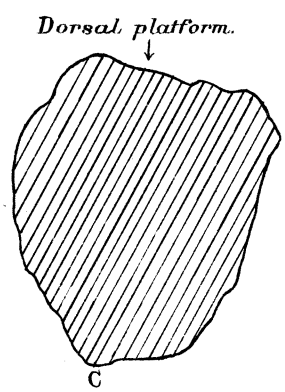
Left lateral surface.



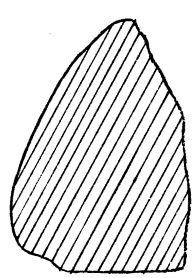
Right lateral surface.



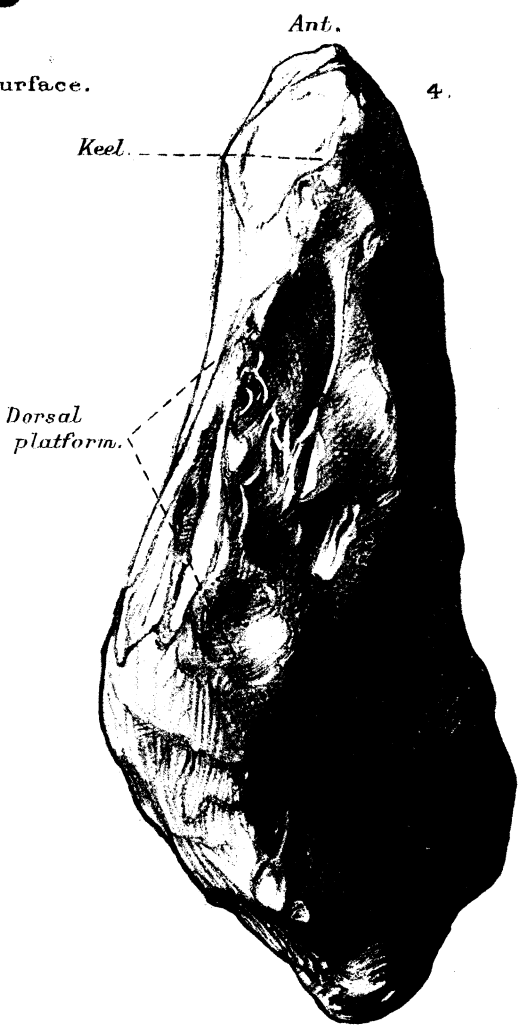
Post.
Ventral surface.



Section A–A.



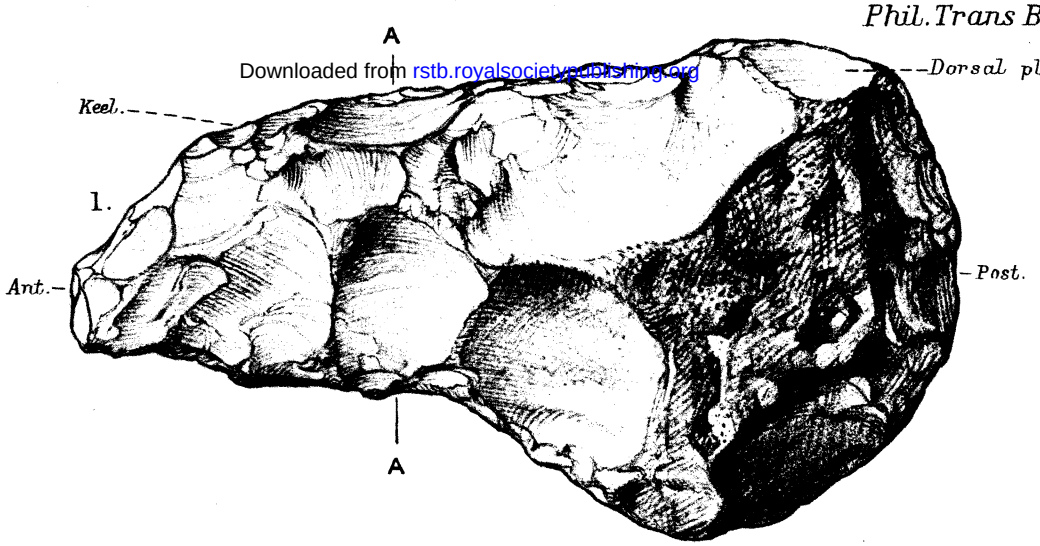
Section B–B.



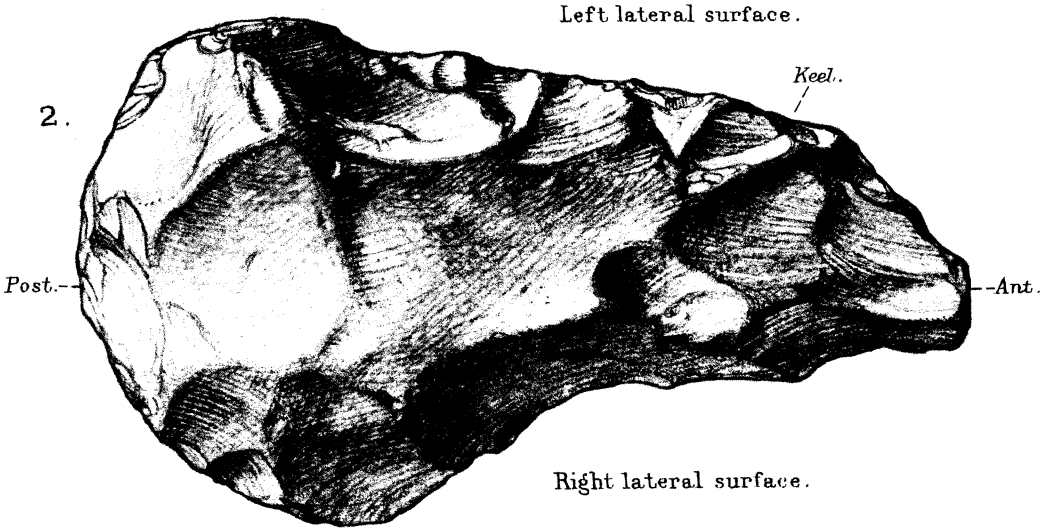
Post.
Dorsal surface.

Phil. Trans B, Vol. 209, Pl. 53.

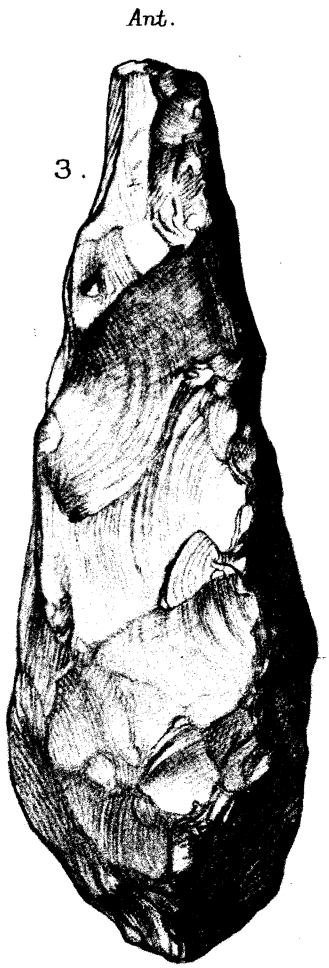
Downloaded from rstb.royalsocietypublishing.org



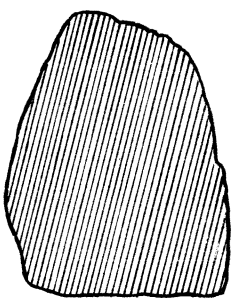
Left lateral surface.



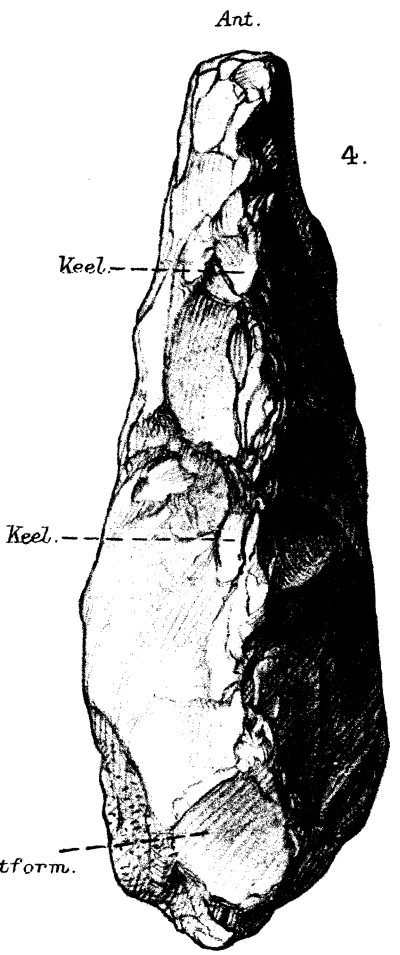
Right lateral surface.



Ventral surface.



Section A–A.

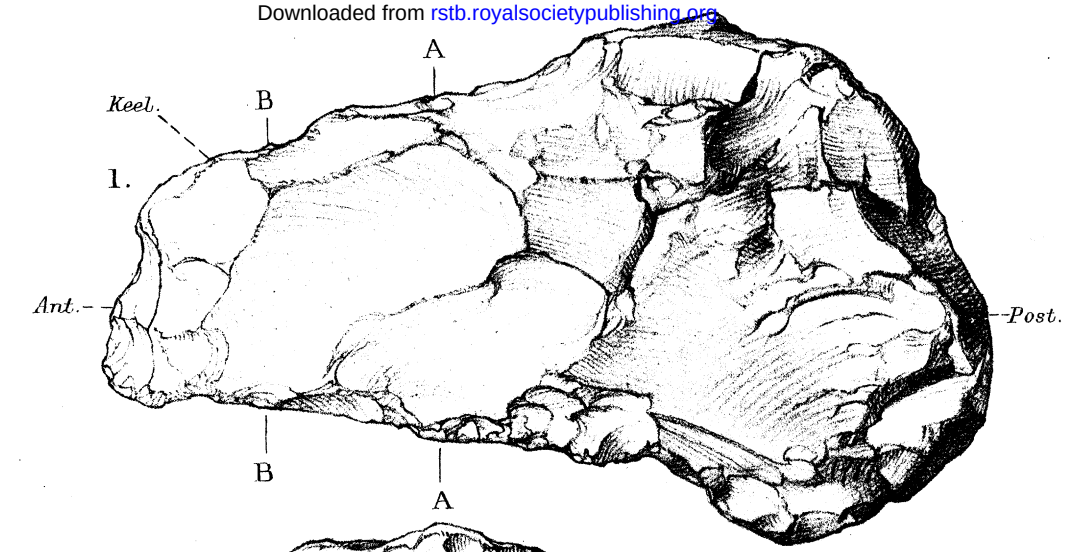


Dorsal surface.

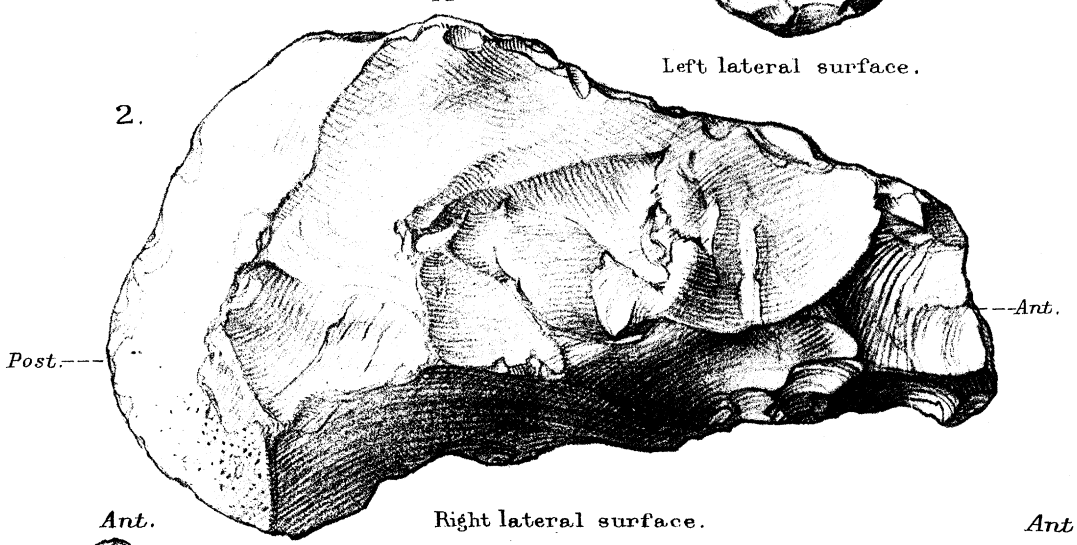
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

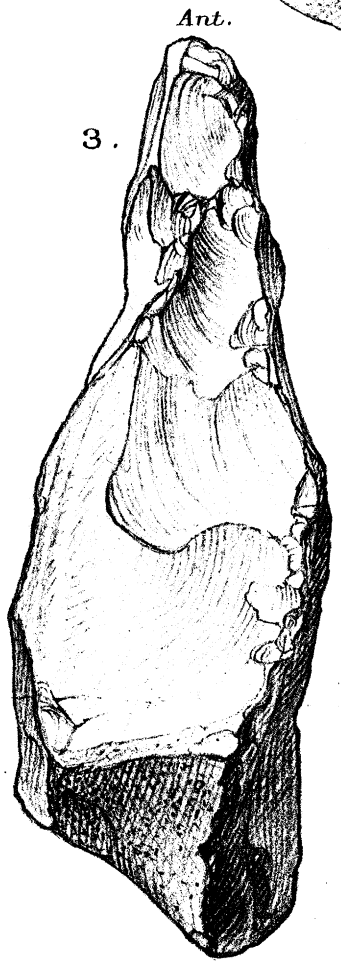
Downloaded from rstb.royalsocietypublishing.org



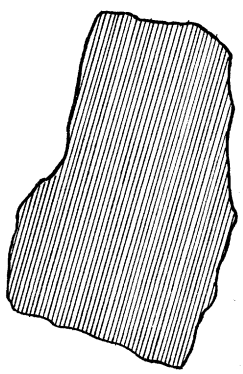
Left lateral surface.



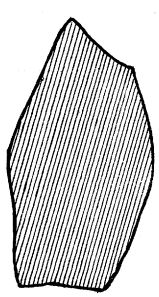
Right lateral surface.



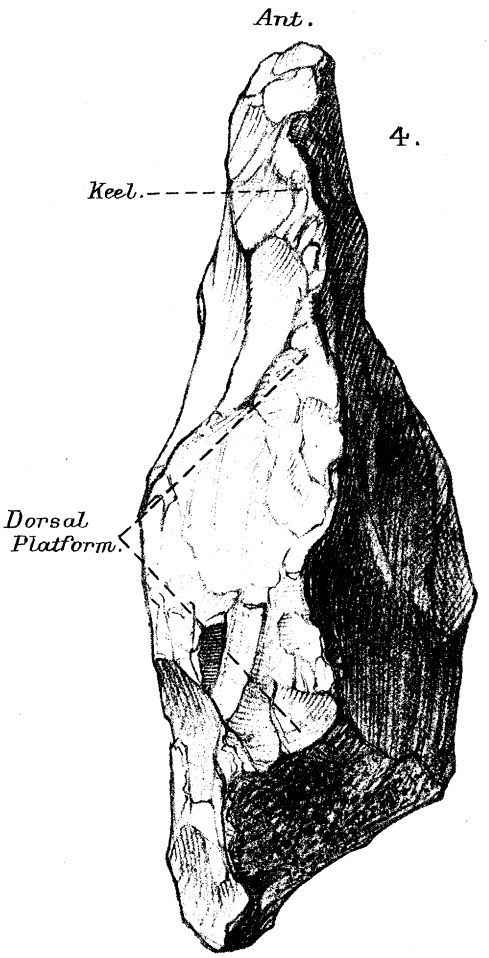
Post.
Ventral surface.



Section A–A.



Section B–B.

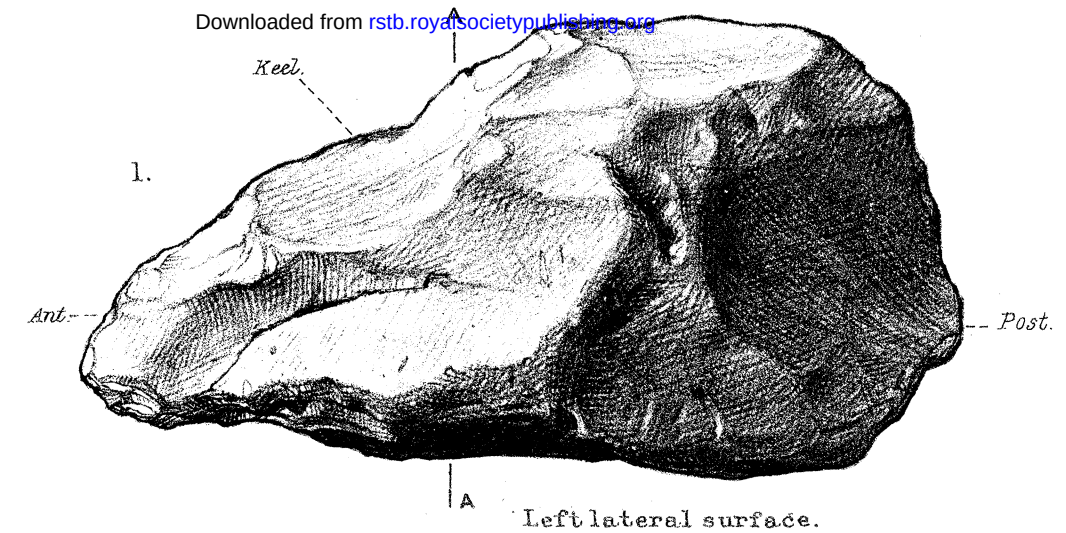


Post.
Dorsal surface.

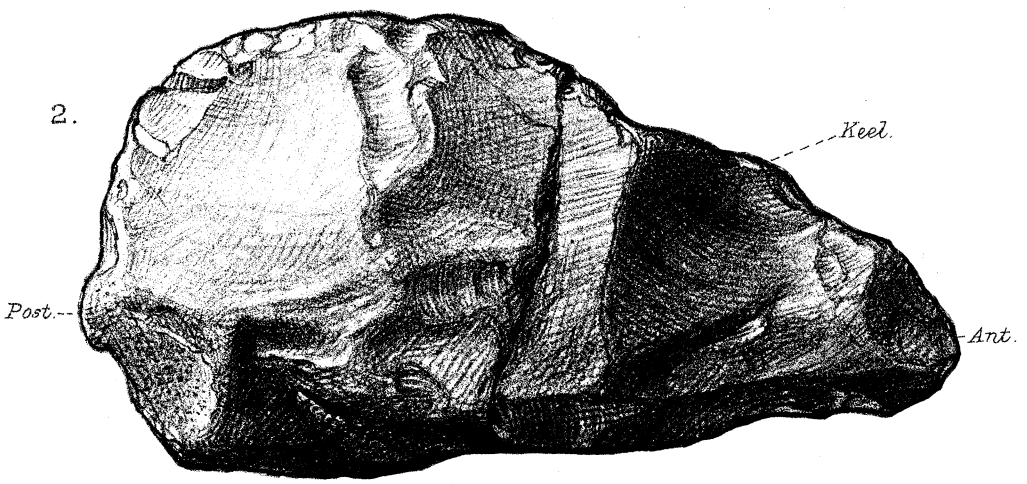
Huth coll.

THE MILDENHALL TRANSITIONAL

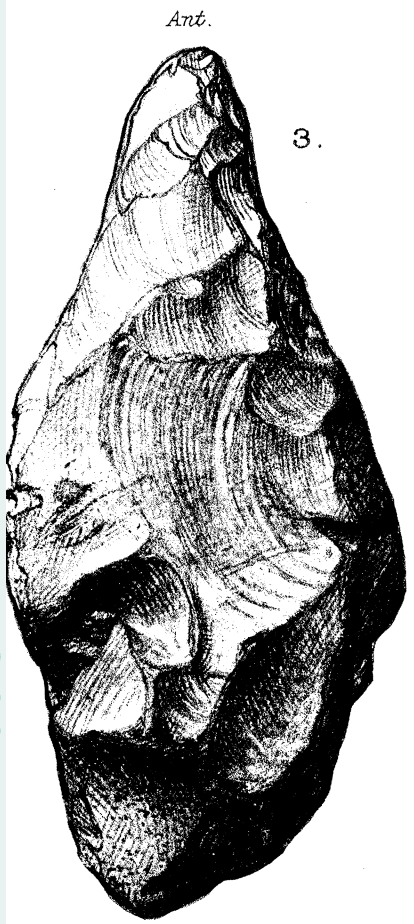
Downloaded from rstb.royalsocietypublishing.org



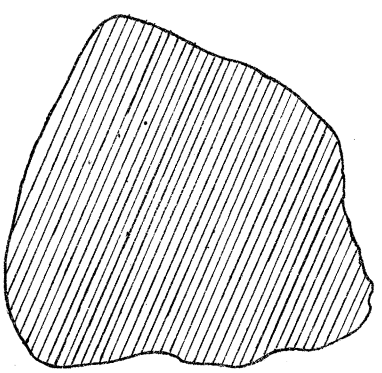
Left lateral surface.



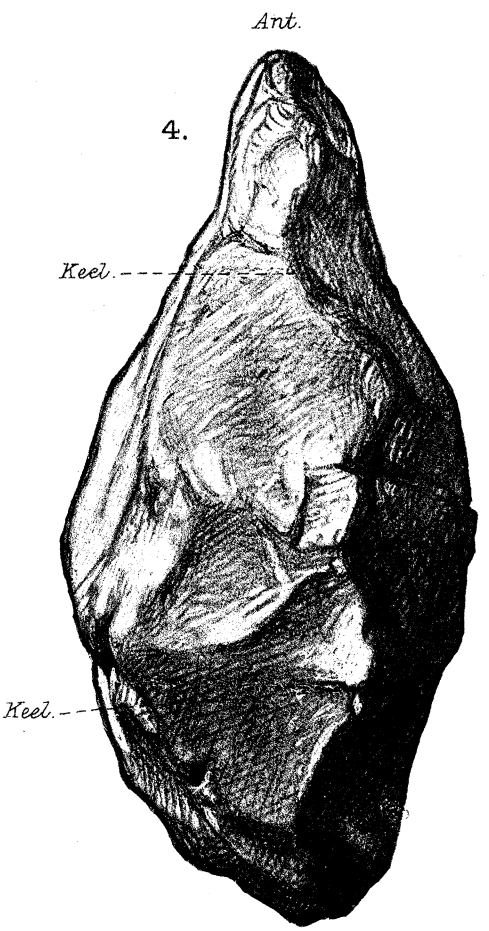
Right lateral surface.



Ventral surface.



Section. A–A.



Dorsal surface.

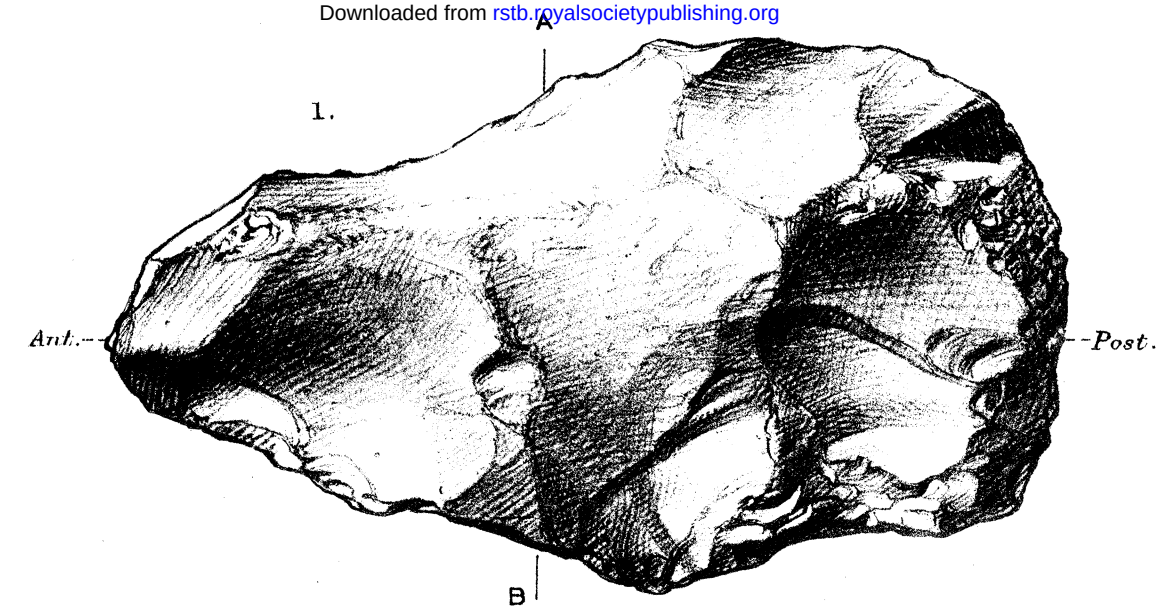
THE CLAPTON TRANSITIONAL.

Huth coll.

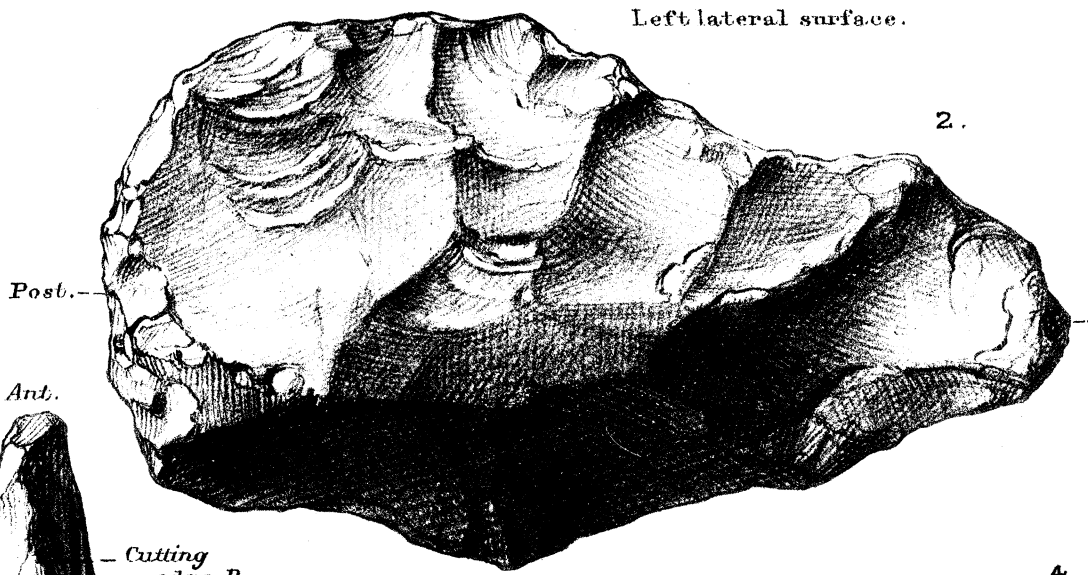
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

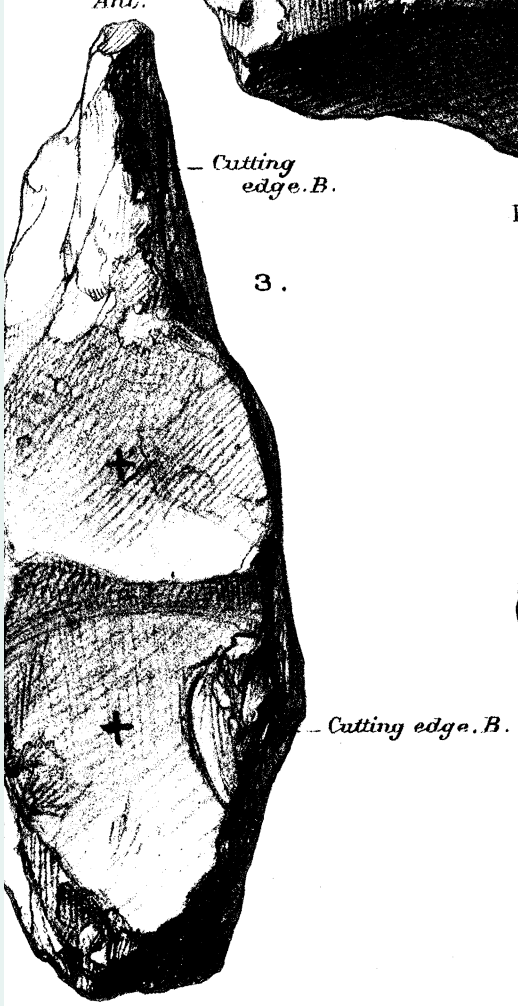
Downloaded from rstb.royalsocietypublishing.org

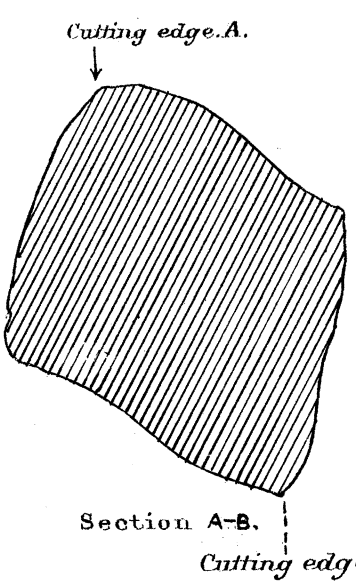


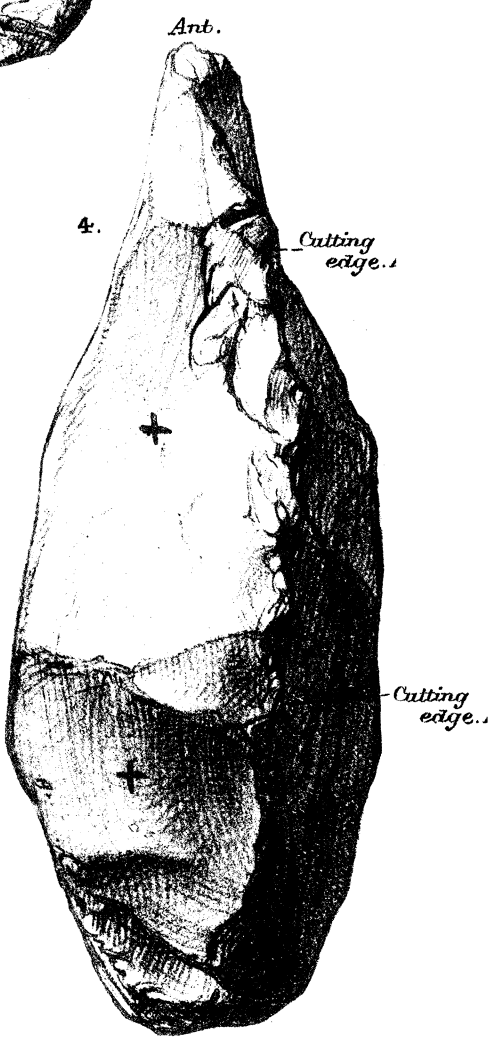
Left lateral surface.



Right lateral surface.







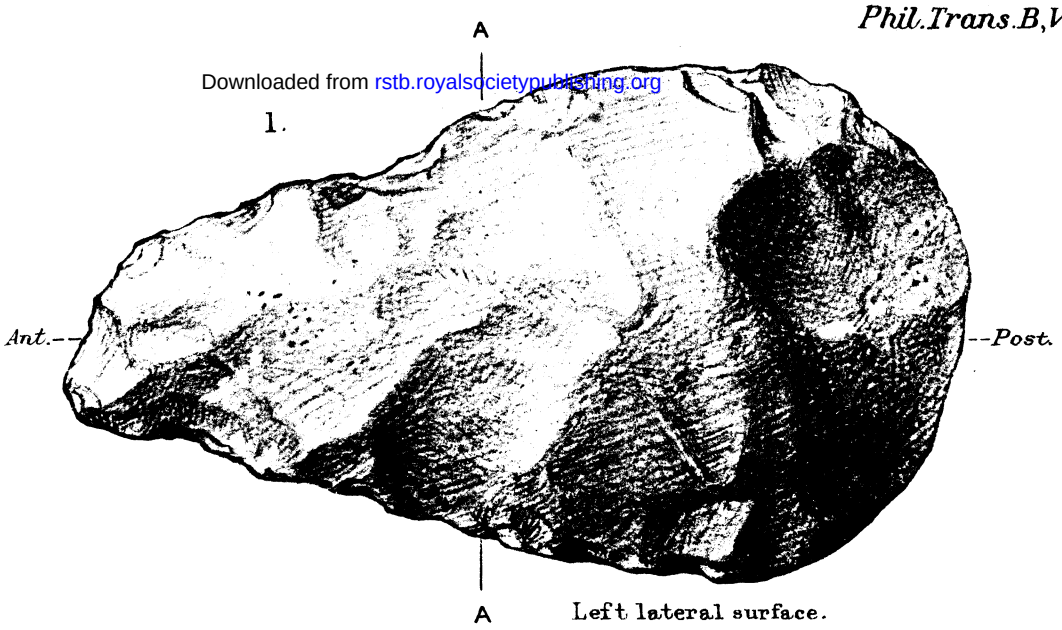
Post.
Ventral surface.

Post.
Dorsal surface.

Phil. Trans. B, Vol. 209, Pl. 57.

Downloaded from rstb.royalsocietypublishing.org

1.

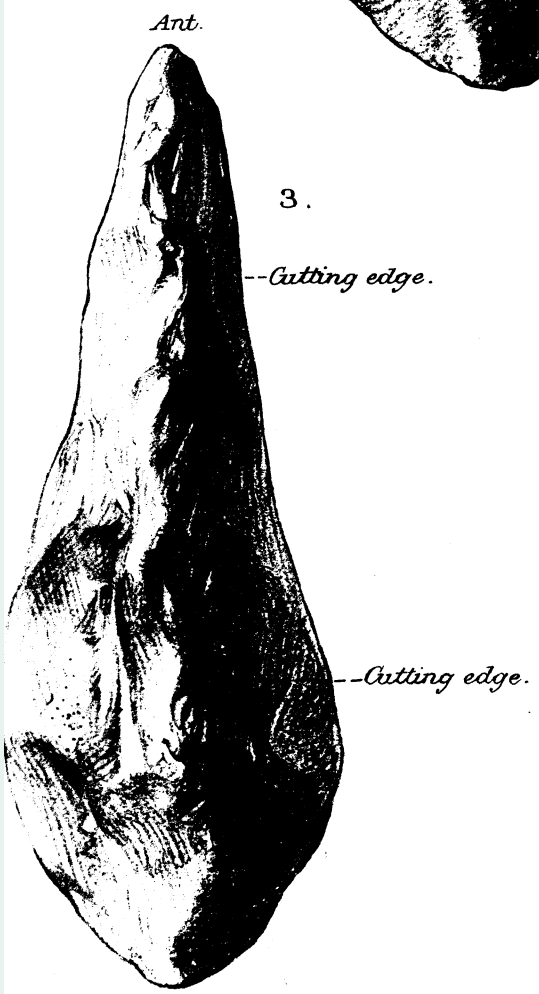


Left lateral surface.

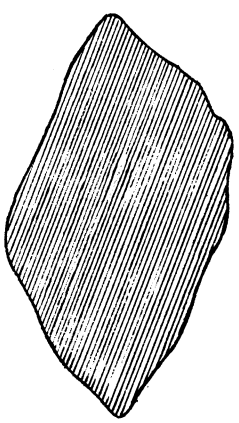
2.

Right lateral surface.

3.

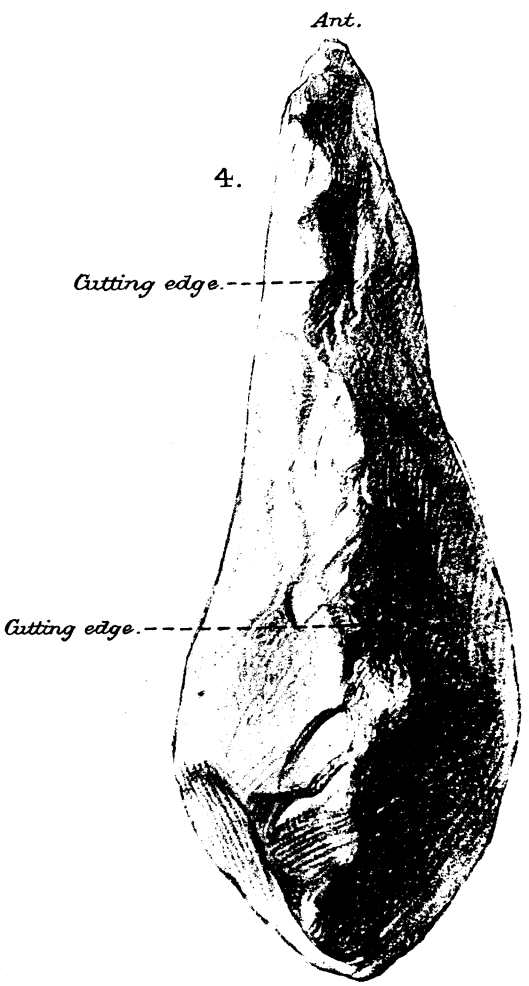


Ventral surface.



Section. A–A.

4.

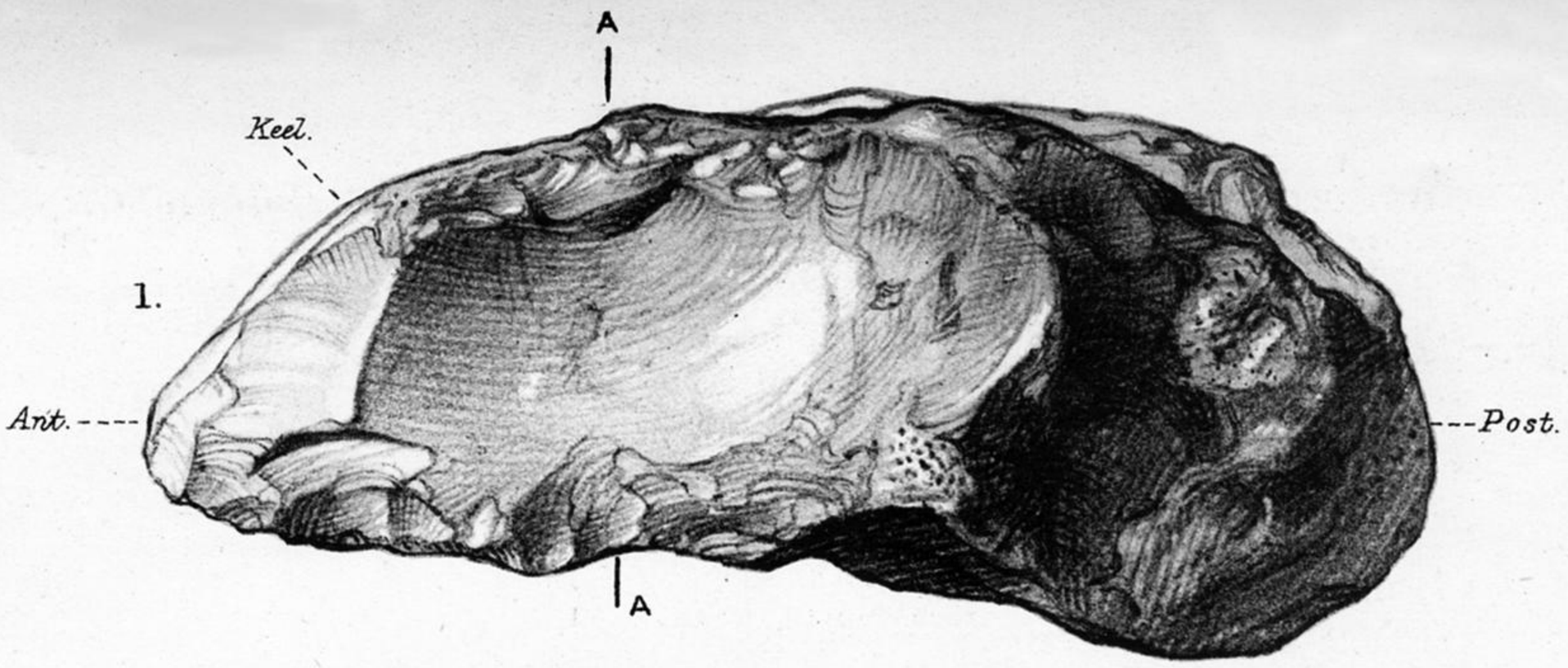


Dorsal surface.

Huth coll.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES



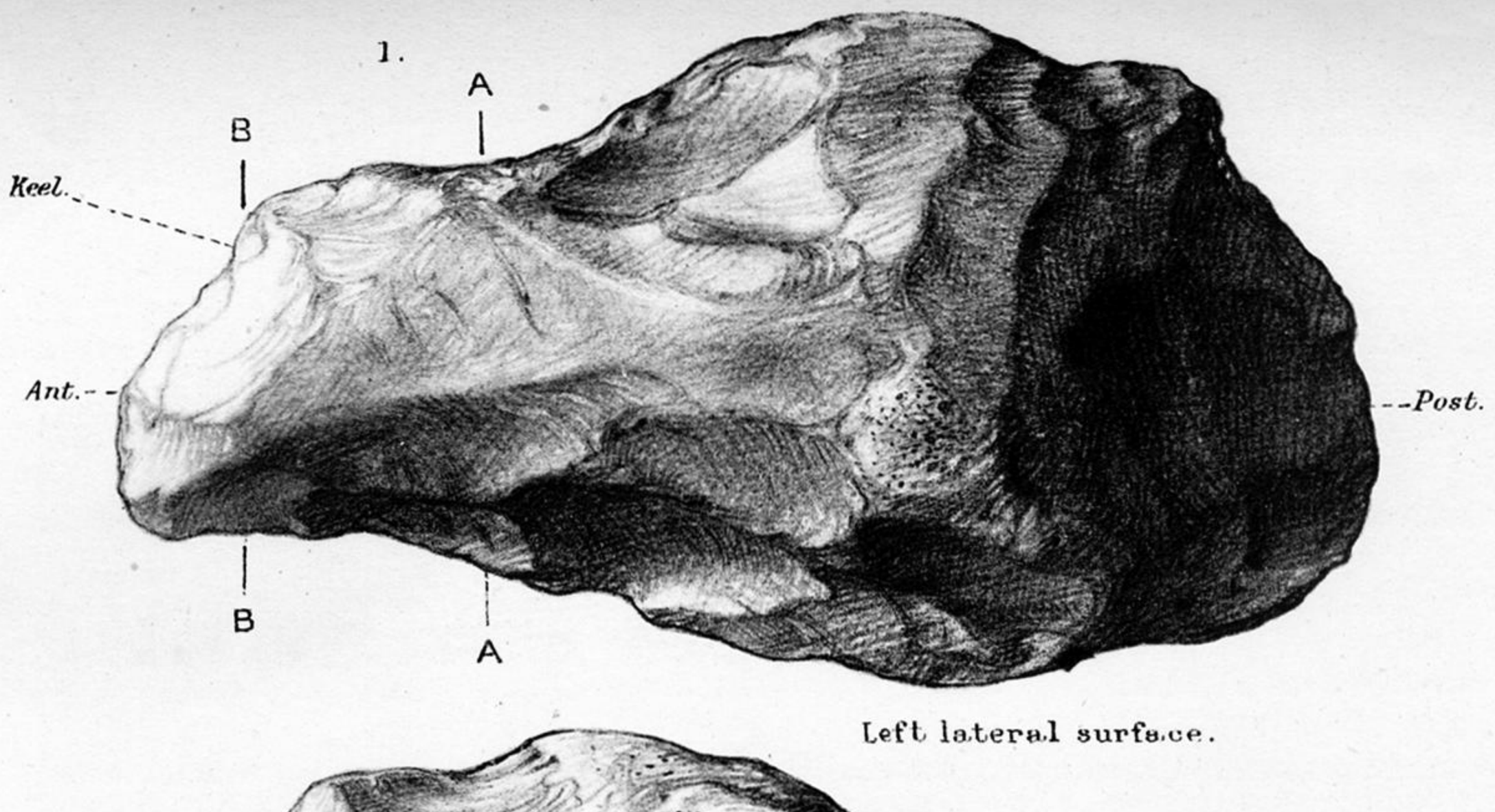
Downloaded from rstb.royalsocietypublishing.org

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

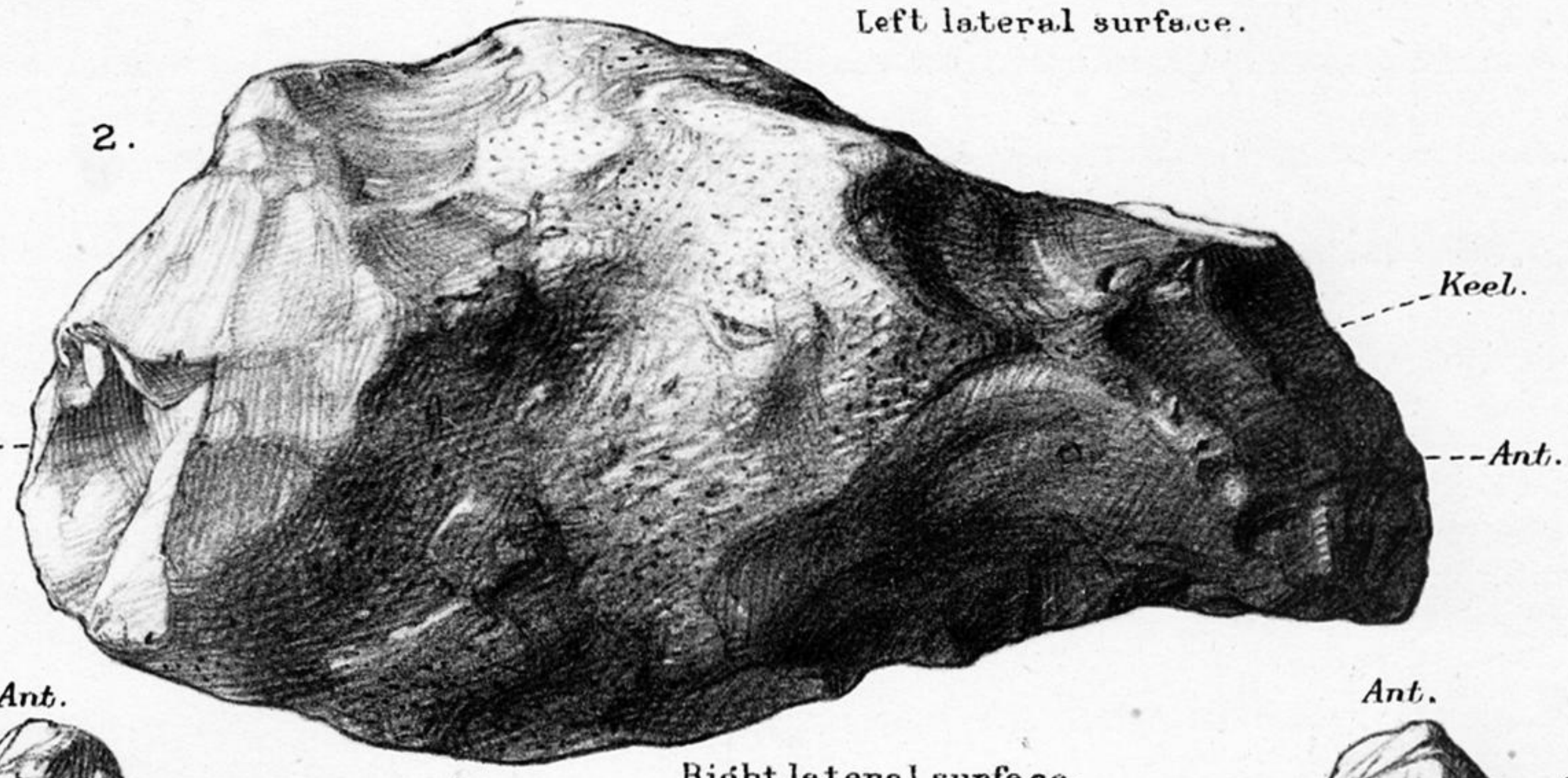
PLATE 51.

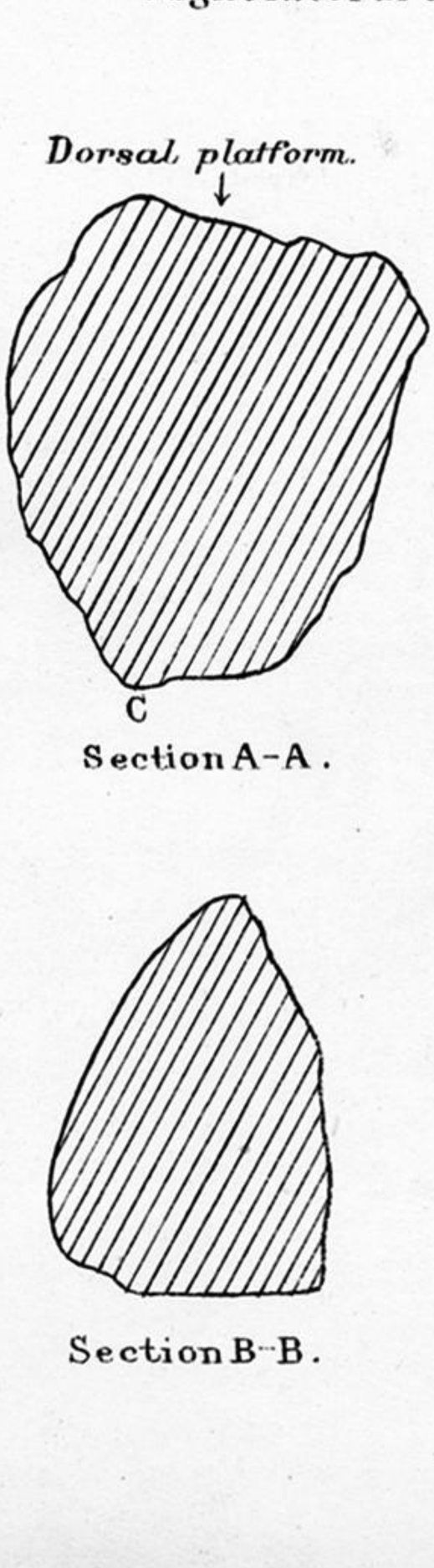
(Actual size.)

Specimen recovered from gravel pit at Knowle Farm, Savernake, Wilts, by Rev. H. G. O. KENDALL, who presented it to the Author. Line of section indicated by vertical lines in fig. 1.

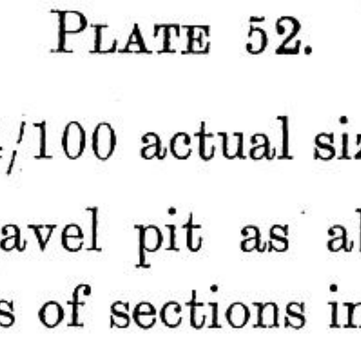


Left lateral surface.



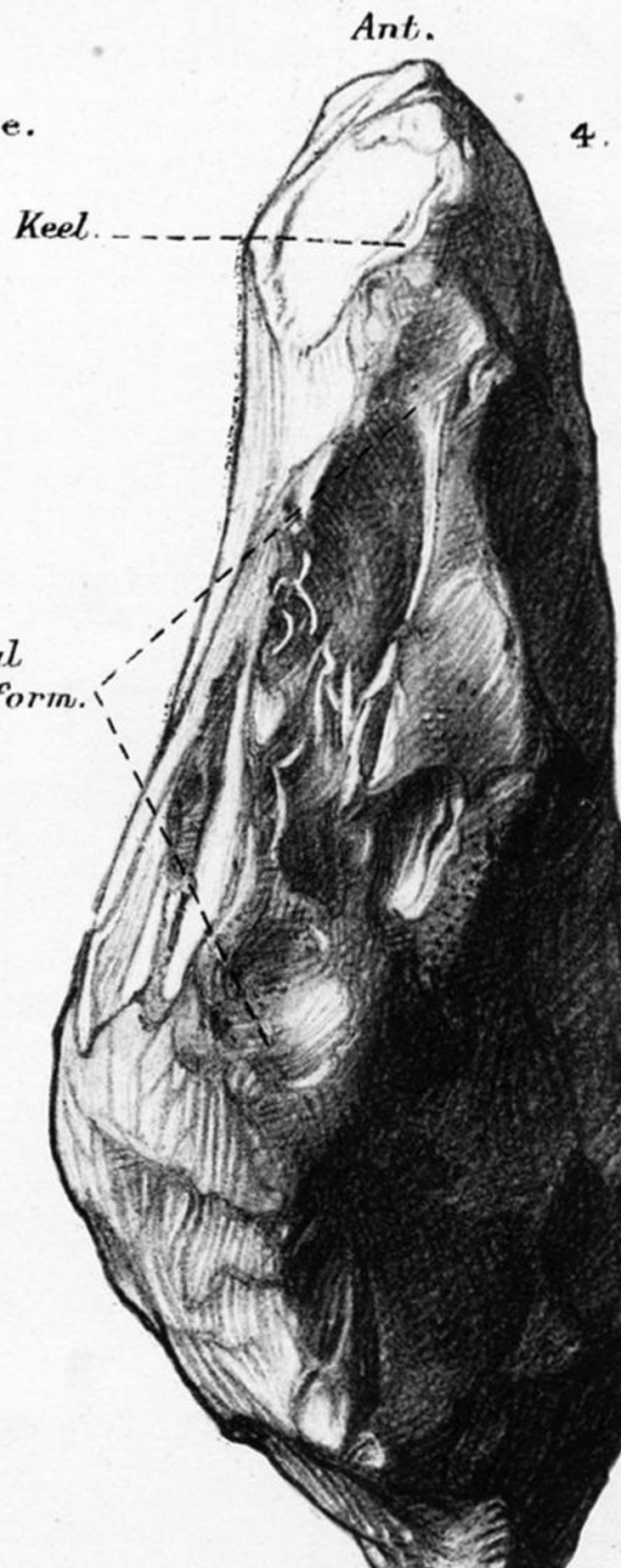


Section A–A.



Section B–B.

Right lateral surface.



Post.
Ventral surface.

Post.
Dorsal surface.

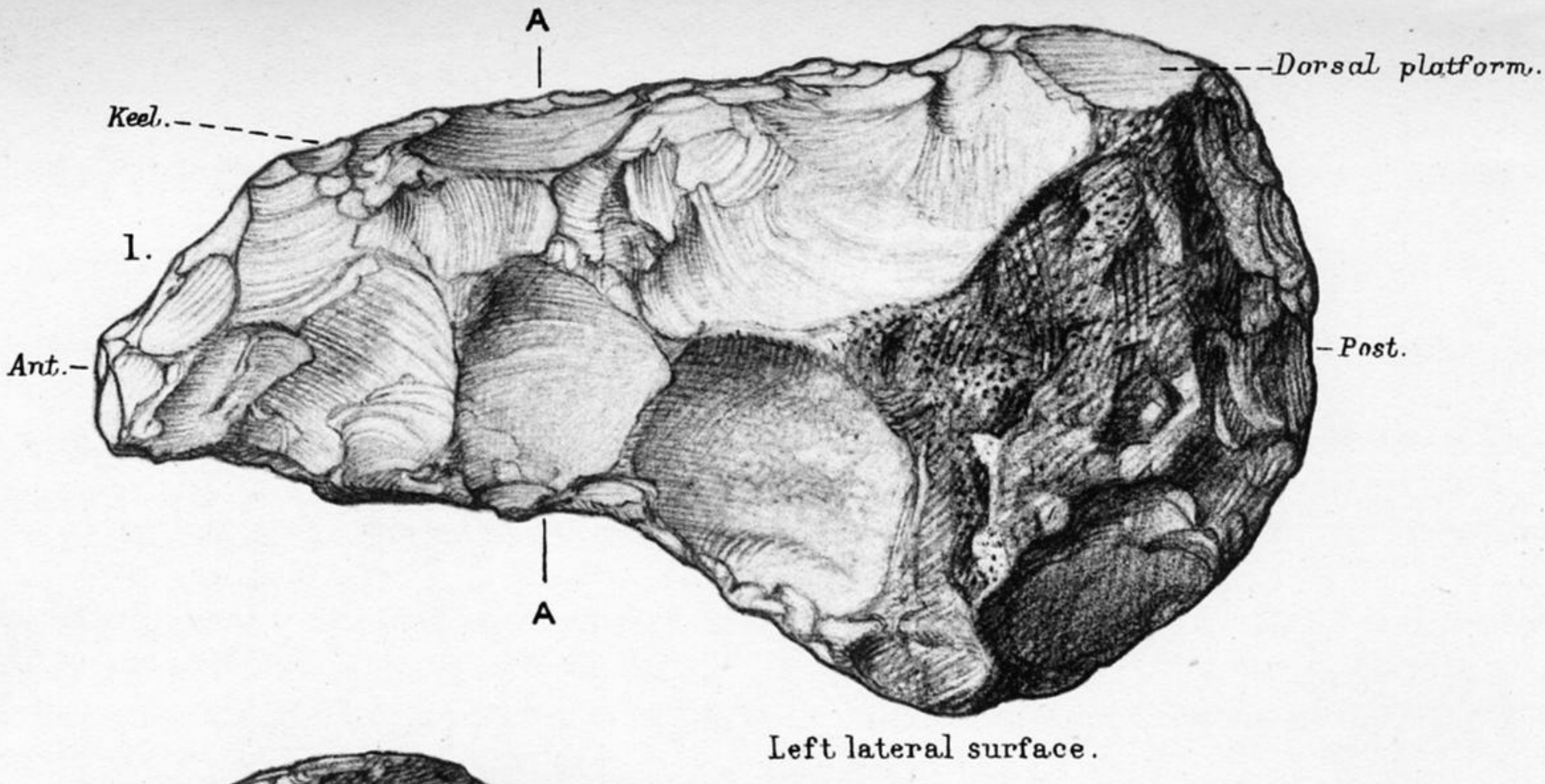
Downloaded from rstb.royalsocietypublishing.org

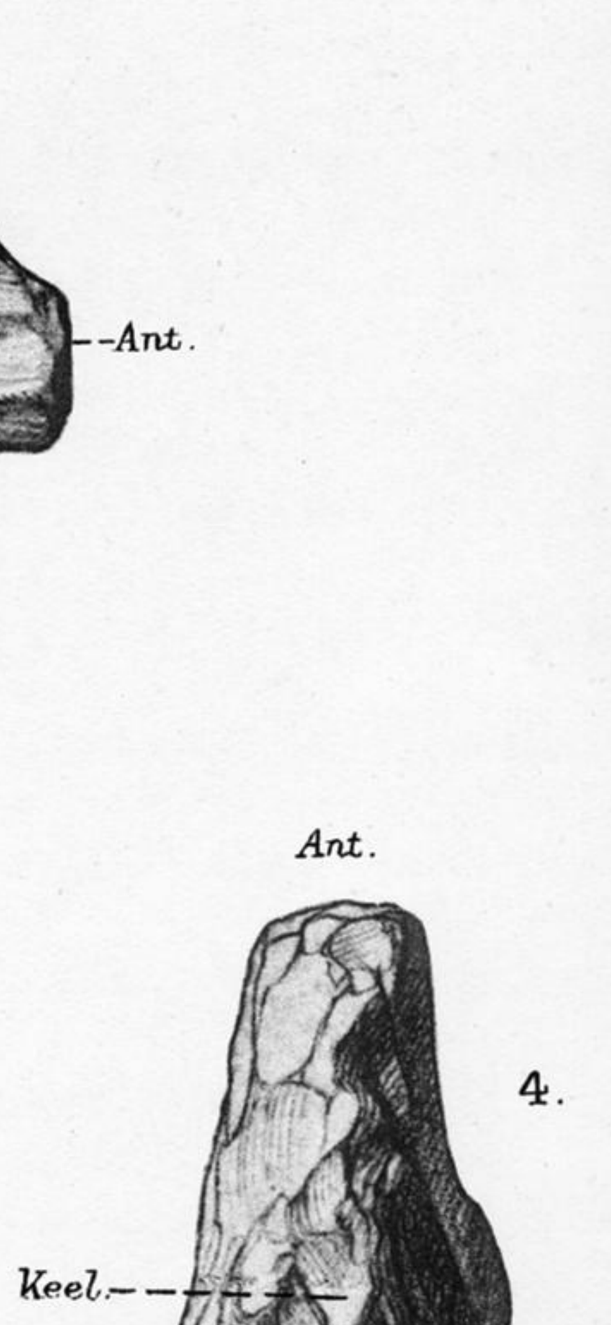
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Plate 52.

(84/100 actual size.)

Another specimen from same gravel pit as above, also found and presented by Rev. H. G. O. Kendall. Positions of sections indicated by vertical lines in fig. 1.





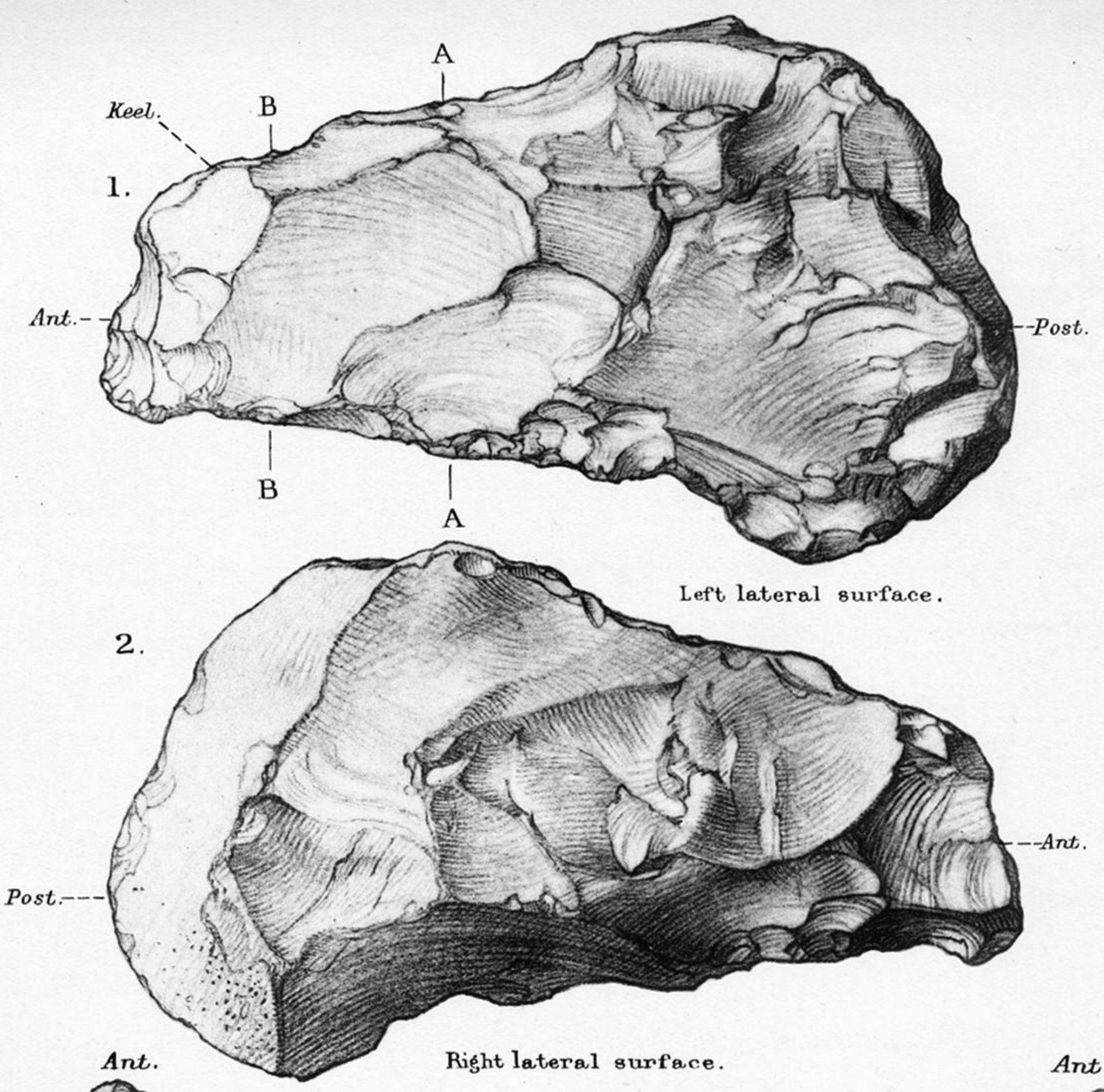
Downloaded from rstb.royalsocietypublishing.org

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PLATE 53.

(73/100 actual size.)

Specimen found 1893 in Odell's Pit, Dawley, near West Drayton, Midd., in the Thames Valley, by the late Mr. ALLEN BROWN. Line of section indicated as before.



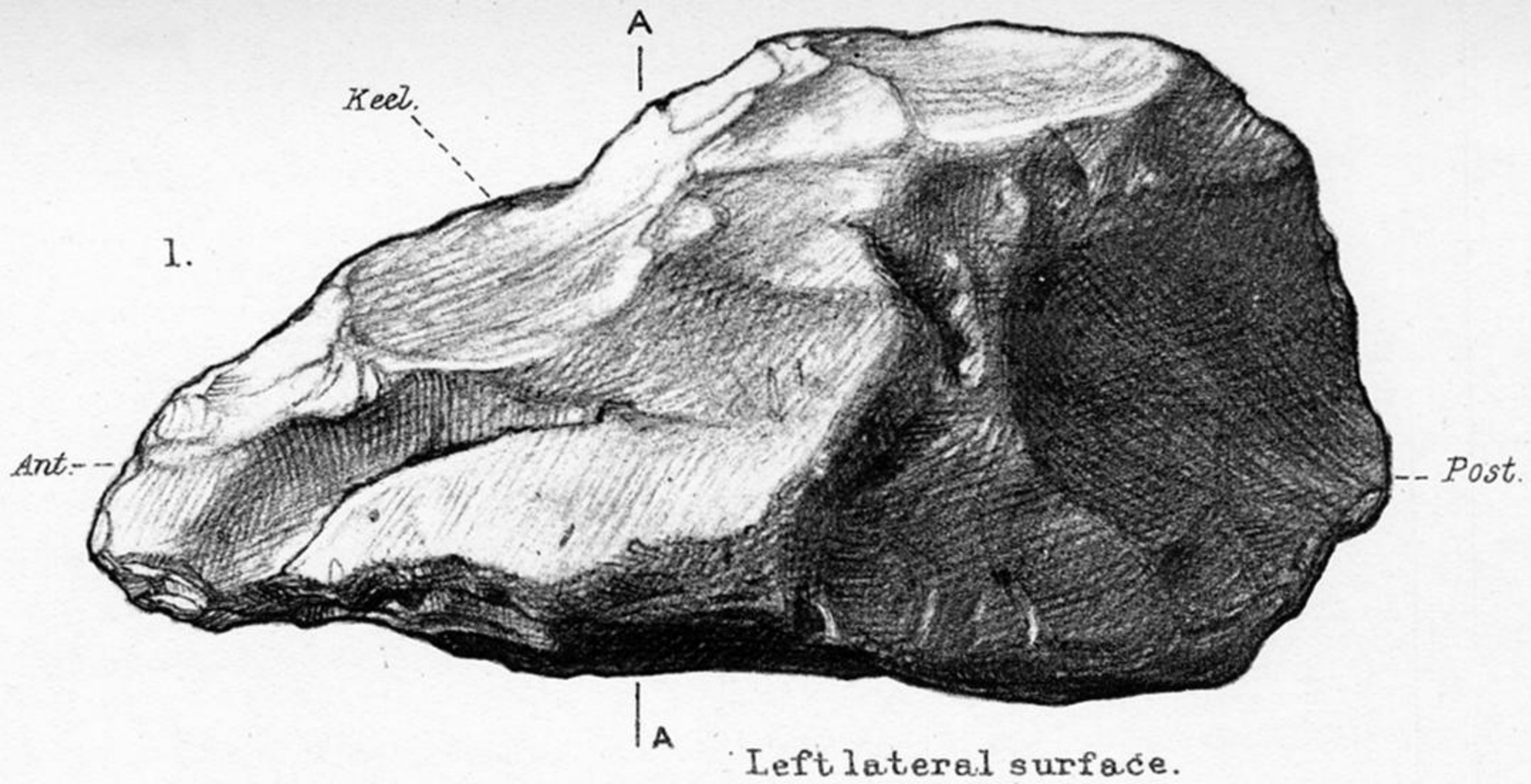
Downloaded from rstb.royalsocietypublishing.org

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

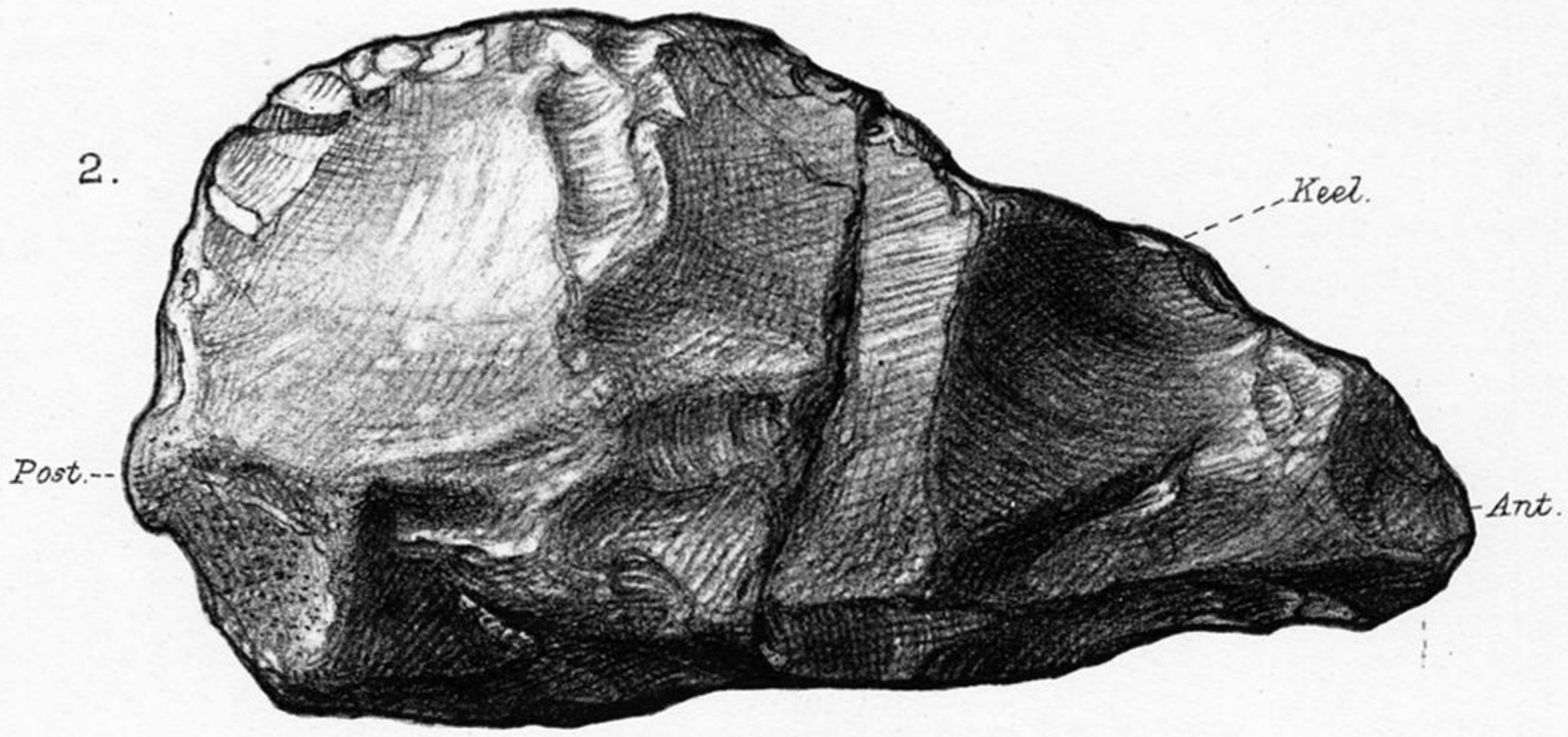
PLATE 54.

(84/100 actual size.)

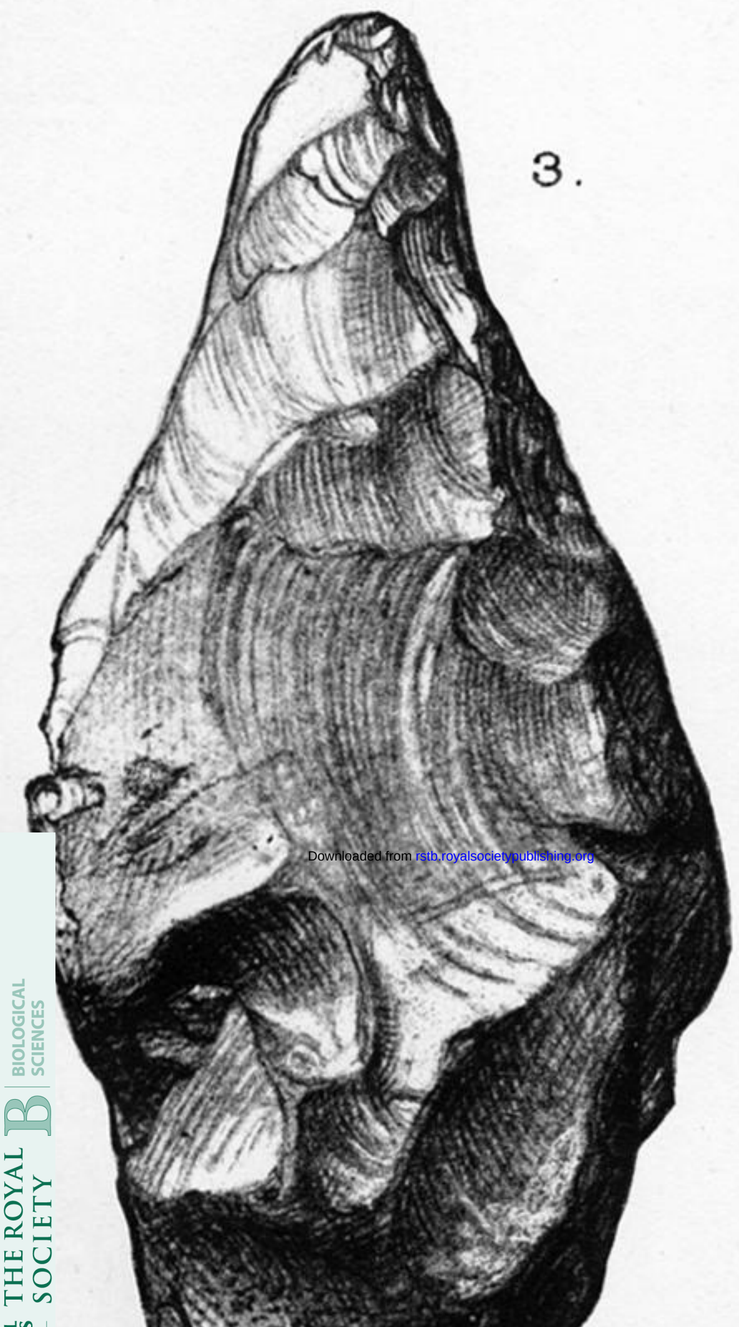
From gravel pit at Warren Hill, Mildenhall, Suffolk, found by the late Mr. WORTHINGTON G. SMITH. Lines of the sections indicated as before.



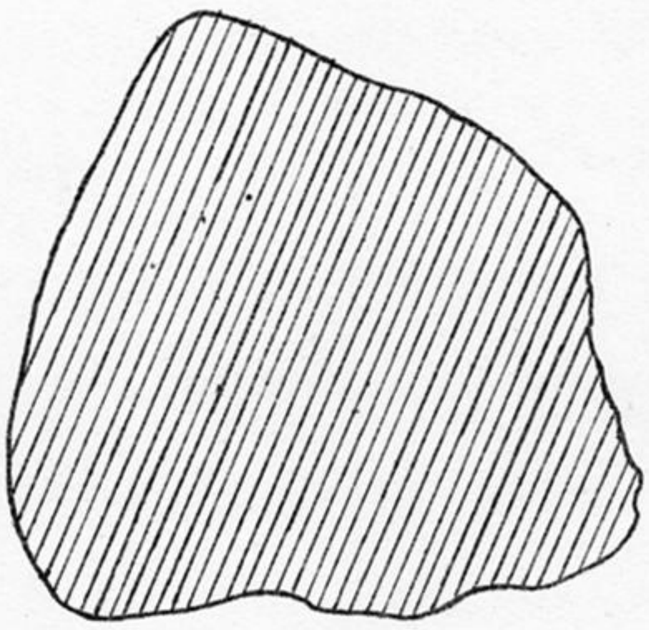
Left lateral surface.



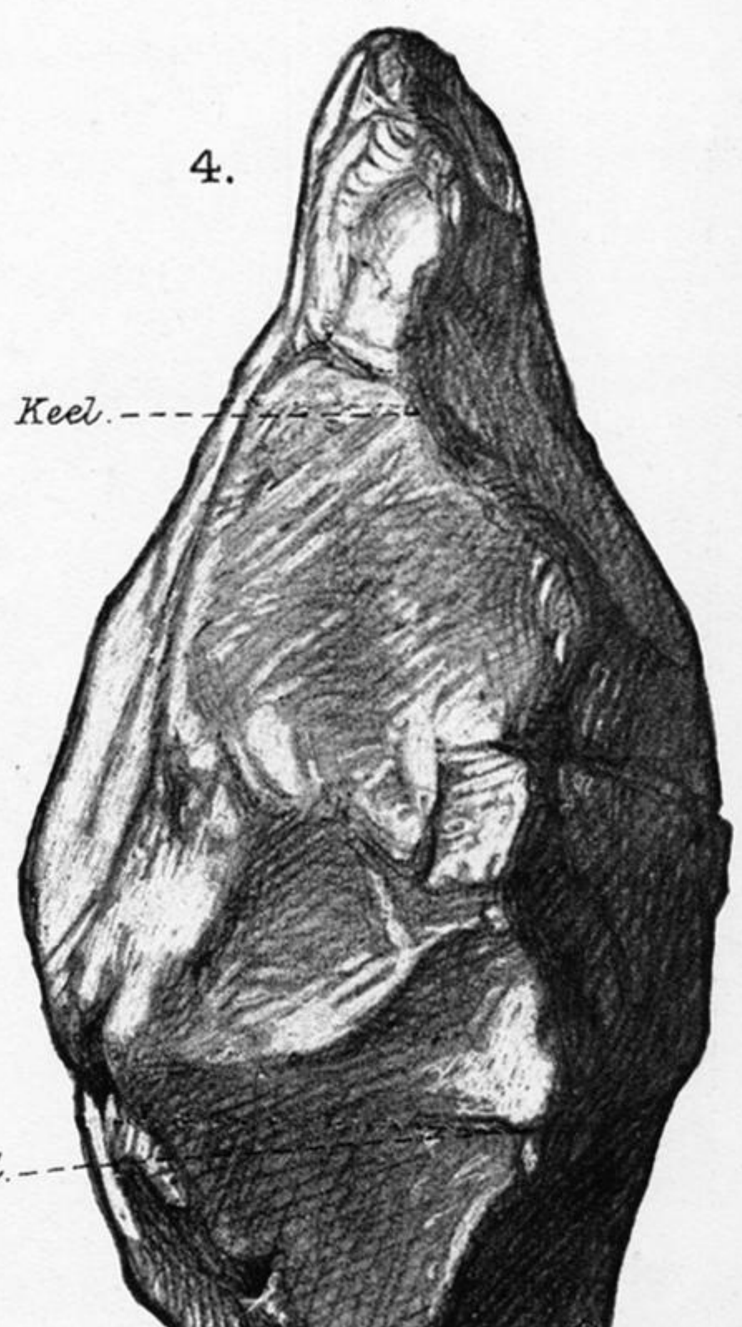
Right lateral surface.



Ventral surface.



Section. A–A.



Dorsal surface.

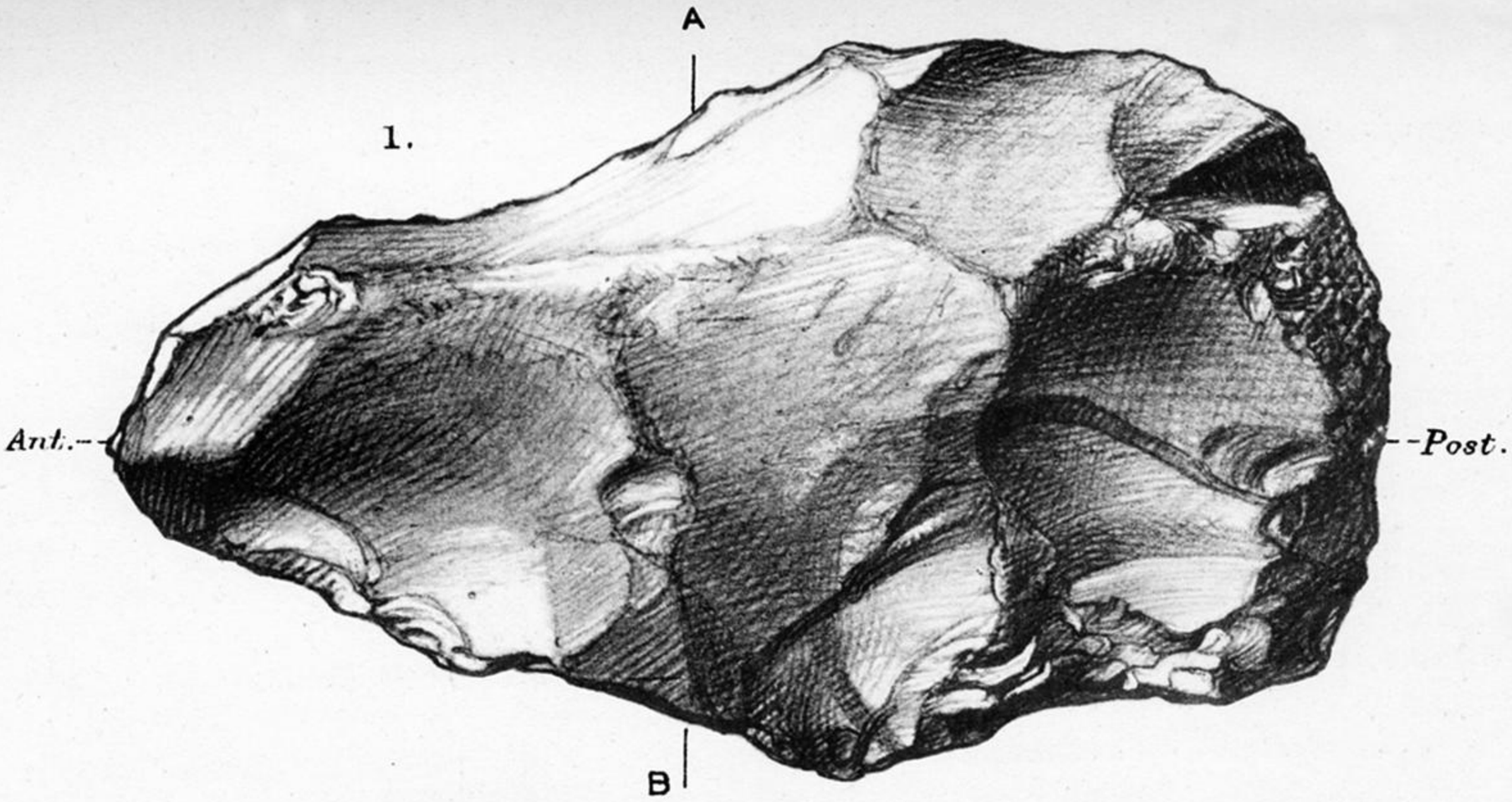
THE CLAPTON TRANSITIONAL.

Plate 55.

(Actual size.)

From gravel pit at Clapton, N.E. London, in the Thames or Lea Valleys. Found by the late Mr. Greenhill. Line of section indicated as before.

Downloaded from rsth.royalsocietypublishing.org
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES



Downloaded from rstb.royalsocietypublishing.org

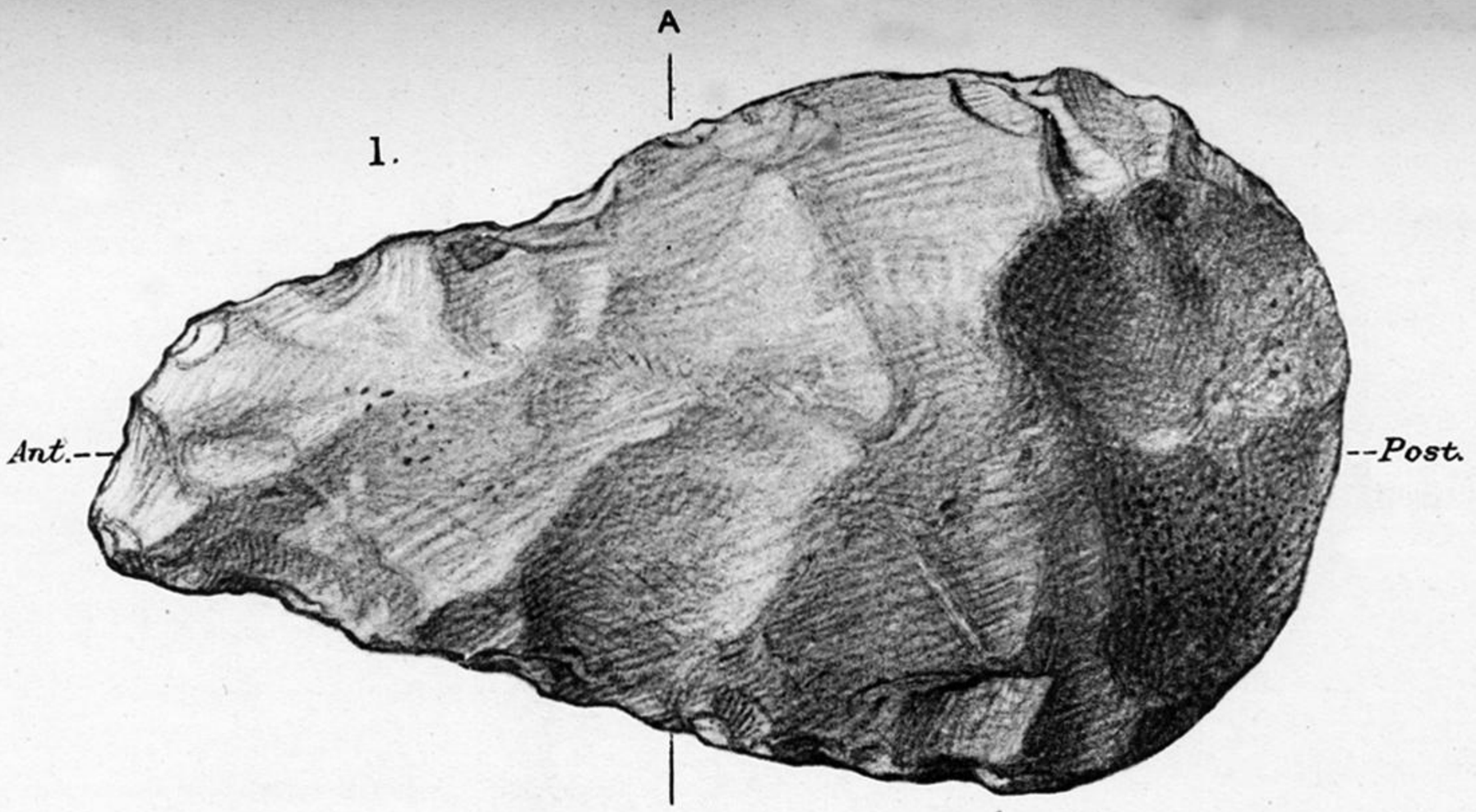
PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

PLATE 56.

(Actual size.)

Found by a workman, employed by the author, in a gravel pit situated in a shallow valley on the plateau, east of Ipswich. Line of section indicated as before.



Downloaded from rstb.royalsocietypublishing.org

PLATE 57.

(84/100 actual size.)

From gravel pit at Broom, near Axminster, Somerset. Presented to Author by Mr. A. S. BARNES. Line of section indicated as before.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES