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IRISH FLINT ARROW- AND SPEAR-HEADS.

BY W. J. KNOWLES.

[WITH PLATES VI-XIII.]

ORIGIN.

PALÆOLITHIC implements show considerable variation in form. They are often leaf-shaped, and, in their outline, very like some arrow-heads found in Ireland and elsewhere. If we treat the Palæolithic and Neolithic periods as continuous, I believe we can show a graduated series of implements, beginning with the largest palæolithic examples, and ending with the smallest neolithic leaf-shaped arrow-heads. The palæolithic implements themselves were not all large. Some were so small that they could have been of little use as implements if held in the hand, but would have been very useful, mounted as spear-heads.¹ In Plate VI are figured a few small palæolithic objects in my own collection from the south of England, France, and Somaliland, and though these were not selected for the sake of variety of outline, but solely to show smallness of size, yet if the outline of some of them is compared with neolithic arrow-heads (Plates IX and X), in some cases almost identity of form will be observed. For example, compare Plate VI, Fig. 1, with Plate X, Fig. 41, and Plate VI, Fig. 4, with Plate IX, Fig. 28. The later implements will be found to be thinner, and more finely chipped than the earlier kinds, but if we take in a long period, and grant continuity, the gradual descent of the small and finely worked from an older series of implements, that are large and show coarser work, seems quite natural. Plate VI, Figs. 1 and 4, are from Côtes-du-Nord, France, Fig. 2 from Wandsworth, and Fig. 3 from Warren Hill, England; Figs. 5 and 6 are from Somaliland, part of the collection of Mr. H. W. Seton-Karr. These latter may be called neolithic by some authorities, but they have the same appearance, as regards weathering and style of workmanship, as the larger implements from the same collection; and I have, therefore, no hesitation, as regards age, in putting the large and small in the same class.

In later palæolithic times we find that the implements had become more highly developed, showed more variety of form, and were at the same time thinner and more finely worked than those in use early in that age. These have a greater

¹ See *Musée Préhistorique*, Plate VIII, Figs. 41, 44 and 46. See also Plate X, Fig. 56.

likeness to neolithic implements found in Ireland than the earlier kinds. I have elsewhere pointed out the likeness of many spear- and arrow-heads, and also of other objects, found in Antrim and the adjoining counties, to implements described as "Mousterien" and "Solutrien" by French archæologists.¹

Flakes came early into use as tools and implements. The first flakes must have been those struck off in the manufacture of large implements; they were mostly short and broad, and similar forms were often repeated. The manner of making flakes into implements was by a slight dressing round the edge, the more pointed kinds forming the Mousterien *pointes*, and the more rounded kinds, the *racloirs*. In Ireland, similar flakes are made into the same kinds of implements, and the Solutrien form of spear-head—the laurel-leaf—is also not uncommon among the Irish neolithic flint implements; the large-pointed flake very often assumes the peculiar six-sided shape of the laurel-leaf implement, and, by slightly dressing round the edges, a perfect spear-point is formed. Many of the larger implements of this kind have, however, been made from boulders, and some show very fine workmanship. As I have pointed out in the paper referred to, I hold that there is a relationship between palæolithic implements of the kind described, which have been found in the south of England, in France, and Belgium, and those of the Neolithic age found in Ireland.

But with no Palæolithic age in Ireland, and with the acknowledged gap between the Palæolithic and Neolithic periods in England, Belgium, and the north of France, how are we to find continuity between the older and newer implements? Dr. James Geikie, I believe, gives the best explanation of this difficult problem. In *Prehistoric Europe* he holds that man was an occupant of our continent during glacial and inter-glacial times, and he answers those who object to his views by saying: "They tell us that Palæolithic implements occur in certain deposits that overlies the great chalky boulder-clay in Norfolk and other places, and these deposits are recognized by them as of post-glacial age, simply from the fact that they rest on boulder-clay. Now this conclusion would be inevitable, if it were true that the great chalky boulder-clay had been laid down during the last glacial epoch. If that were the case, no one could dispute their contention that Palæolithic man lived in England in post-glacial times. . . . We know now, however, that during the Glacial Period arctic and genial climates alternated, and that the great chalky boulder-clay is not the *Moraine profonde* of the last glacial epoch, but belongs to a much earlier stage in the series."² This view of the case seems to be supported by Mr. Clement Reid, F.G.S., in his *Origin of the British Flora*. He says: "We know that this Pleistocene Period was characterised by more than one wave of intense cold, which, for a time, must have profoundly modified the fauna and flora of Britain. It was also marked by milder intervals, sufficiently long for the temperate plants to reappear, and also by a period of drought, which brought the fauna of

¹ "Survivals from the Palæolithic Age among Irish Neolithic Implements," *Proc. Roy. Soc. Ant. Ireland*, vol. vii, Ser. 5, p. 1.

² p. 360.

Central Asia into continental Europe, and, in a minor degree, affected the climate of Britain. Man first appeared in Britain during the latter half of the Pleistocene Period; or rather, we should perhaps say, we have as yet no satisfactory evidence of his earlier incoming.”¹

Dr. Geikie describes how man may have hunted the reindeer in Southern England, Belgium, and Northern France for many generations before the increasing severity of the climate compelled both to retreat. “Step by step, however, man was driven south, England and Belgium were deserted; perhaps even Germany down to the foot of the Alps was left unoccupied, until at last the Palæolithic race or races reached the south of France.”² No doubt this region was not previously uninhabited, and there would be other peoples to go still further south to the shores of the Mediterranean and Northern Africa,³ and I believe it is in those regions we must look for the development of the neolithic stage of culture from the palæolithic. Possibly Sergi’s Mediterranean race would have its origin at this time. After the passing away of the glacial period, the fauna and flora would move northwards, and man would follow the game. The long lapse of time from the retreat southwards till the return to the north would represent the hiatus in Northern France and Southern England, but I believe we can find continuity in the implements, if we follow man southwards, and return with him northwards after the passing away of the glacial period. Seeing the advance made in the development of implements from the earliest part of the palæolithic age to the times known as Solutrien and Magdalénien, a further development is quite natural. From the polishing of bone there would follow the polishing of stone weapons. Other improvements would be introduced in the course of time, such as we find have taken place, but if we contrast and compare a whole set of the older implements with a whole set of the newer when the development is complete, we find that there is not a greater difference than we should expect. Much that is new has been introduced. Many old things have undergone improvement, but many old forms continue almost unchanged. We find that the neolithic axe is often no more than a palæolithic implement of longish shape, ground to an edge at the broad end, while objects like the rude *coup de poing* are sometimes found in factories of neolithic age. The Mousterien *pointes* and *racloirs*, as well as the laurel-leaf spear-head and other Solutrien forms, are quite common among neolithic implements, and many of the newer arrow- and spear-heads show only very slight variations from the older implements.

It will be seen from the foregoing argument that I derive the neolithic implements from those of the palæolithic age. It also follows that the neolithic period commenced with the return of man to the north after the glacial cold had passed away.

¹ pp. 36, 37.

² *Op. cit.*, p. 354.

³ Some may even have gone to South Africa, *e.g.*, the steatopygous race.

MANUFACTURE.

The method of manufacturing arrow- and spear-heads in prehistoric times is largely a matter of conjecture. The way in which modern savages have made nearly similar implements is interesting and suggestive, though the accounts of their methods of manufacturing flakes and arrow-heads show that scarcely two tribes followed the same plan. Many archæological writers have given more or less information on this subject, but Sir John Evans gives copious extracts from the writings of eye-witnesses regarding the way in which American tribes, the Eskimos, and the Australians manufacture their flakes and spear-points.¹ Mr. Gerard Fowke also gives short accounts of the modern method of manufacturing flakes and implements, quoting largely from Evans.²

A short summary of various methods employed, selected from the writings of these authors will be sufficient for my purpose. Flakes were produced by pressing a T-shaped piece of wood against a core of obsidian, the lower end being pressed firmly against the core, and the cross-piece against the breast; by hard pressure a flake would fly off. If the crutch-like piece is tipped with walrus tooth, or bone, and pressure used in the same way, a similar result would follow. Some of the methods of flaking, observed among American tribes, are by laying a bone wedge on the surface of a piece of obsidian and tapping till the stone cracks; by using a punch of deer's horn, which would be struck by a stone or wooden mallet; by placing a stone for an anvil on the knee, holding the core on it, and striking off flakes with a stone hammer; and by heating, when the stones break easily. The Eskimos produce flakes of chert by slight taps with a hammer formed of a very stubborn kind of jade or nephrite. Evans describes one such hammer which he has seen. It was "oval in section, about 3 inches long, and 2 inches broad, and secured by a cord of sinew to a bone handle, against which it abuts. The ends are nearly flat." He adds that "it seems doubtful whether the proper use of these hammers was not for crushing bones."³ The native Australians produce flakes by striking the core, from which they are to be detached, on a larger block.

In making arrow-heads, the flake is held in the left hand, and a punch, made of the tooth of a sperm whale, is held in the right hand, and struck with a wooden mallet by an assistant; the flake is turned, and the process repeated, till the arrow is complete. A second method of manufacture is to take a piece of obsidian in the left hand, and press it firmly against the point of a small goat horn, held in the right hand; by moving it gently in different directions, small flakes are chipped off till the arrow is complete. Sometimes a notch is made in the end of a bone, into which the edge of the flake is inserted, and a chip is broken off by a sideways blow. Another method is to set the flat side of a flake on a blanket, or other yielding substance, and nick off the edges rapidly with a knife. The Eskimos sometimes set

¹ *Ancient Stone Implements*, 2nd Edition, p. 23.

² *13th Report of the Bureau of Ethnology*, Washington, p. 139.

³ *Op. cit.*, p. 25.

the flake in a piece of split wood; the arrow is roughly chipped by blows with a hammer, either direct, or with a punch interposed, and is then finished by pressing off fine chips with a point of antler set in an ivory handle. The Eskimos also make a spoon-shaped cavity in a log, lay the flake over it, and press along the margin, first on one side, and then on the other, as in setting a saw, until they form two sharp serrated edges. In addition to the various methods of manufacture mentioned above, which are only a selection from a larger number given by the authors I have mentioned, we have accounts by competent witnesses of the production of flakes for gun flints, and the manufacture of the gun-flints themselves.¹

The above accounts will help us in forming an opinion in regard to the way in which ancient flakes and arrow-heads were formed. Assistance in coming to a right conclusion may be obtained from a careful study of the ancient implements themselves. The case may appear still clearer if the chipping of flint is practised, as has been done with advantage by many antiquarians. I have tried this plan myself, and have also witnessed the modern forger at work, and heard from him accounts of how some articles, which he regarded as evidence of his highest skill, were made. On one occasion, he made an arrow-head in my presence by means of a fabricator of basalt, selected from recently spread road metal. He placed the flake in a fold of his coat near the breast, and pressed round the edges of the flake with his rude fabricator, shifting the position of the flake from time to time, and, in less than half an hour, produced a very well formed arrow-head of the stemmed and barbed class. One would expect that the barbs would be the most troublesome to produce, but, if the fabricator has a thinnish edge, I know from experiments made by myself that the hollows separating the barbs from the stem are not hard to make, if pressure is strongly applied to each side alternately. The English forger can show even better work than his Irish brother in trade. I have some arrow-heads of glass and flint from England, given me by a friend, which show chipping all over the surface like ancient work. I was informed that the fabricator used in pressing off the flakes by this workman was the ivory handle of a lady's button-hook. My son has brought me spear-heads, made out of bottle glass and telegraph insulators by modern native Australians, which show chipping quite equal to that on ancient flint arrow-heads. He has also brought me some glass spear-heads, made by himself in imitation of the Australian ones, which are cleverly made, but he has done everything by striking with a hammerstone, and nothing by pressure, and, therefore, his work is not so fine as that of the native Australians.

When we examine our Irish flint implements,—not the good and picked articles, but the good, the poor, and the broken, just as they occur on some site of a manufactory,—we gain a considerable amount of information. We find that the rough material consisted almost entirely of pebbles, or small boulders of flint which had been rounded by long-continued rolling on the sea beach. As a rule, the first thing done by the ancient workman was to break one of these pebbles in two. The break was a clean fracture nearly in the centre, and from this fractured face, flakes were

Skertchly, quoted by Evans, *op. cit.*, p. 18.

struck off in the direction of the end of the pebble. In sites where flint implements were manufactured, are found rounded boulders of quartzite, or other tough rock, with pitted hollows on one or both faces; these are supposed to have been anvil stones, on which the cores rested when flakes were struck off by other rounded stones, bruised on the ends, called hammerstones. At Whitepark Bay, where flint implements have been largely manufactured, chalk cliffs are seen all around with flints sticking out of their faces, and there are numerous flint boulders which have been weathered out, and are lying at the base of the cliffs; yet these do not appear to have been employed to obtain flakes, and quarrying does not seem to have been resorted to. Splitting the water-worn pebbles, and then making flakes out of each half, was the rule, though a small pebble might be unequally divided, and, in that case, the large portion only would be turned into flakes. I have seen small pebbles that have had one flake or portion struck off from one end in a slanting direction, then another from the other side, also slanting, and so on from each side alternately.

Arrow-heads were made chiefly from flakes. As evidence of this, in many specimens, even when highly finished, some traces of the bulb of percussion, or of the ridge, or ridges, along the back are found. I have examples which show the ridge in an undressed state, even after a stem or barbs have been formed. Plate VII, Figs. 7, 8 and 9, shows specimens of flakes made into three different forms of arrow-heads. Fig. 7 is leaf-shaped, Fig. 8 stemmed, and Fig. 9 barbed without central stem, all showing the central ridge of the flake, the chipping being confined to the edges in Figs. 7 and 8, and to the point and barbs in Fig. 9. These seem to have been good and effective weapons as they are; but we find other examples only partially made, which may have barbs well made, but the points unfinished, and in other cases show the completed points with unfinished bases. There are also arrow-heads which have been fairly finished at both point and butt, but which are so crooked that we cannot see to what use they could be put; yet if they are to be regarded as failures, one would have expected the workman to reject them before bringing them to the condition of finished implements. Possibly they may have been useful as knives. We can see, by examination of specimens, that the bulb and the curve in the flake always gave trouble to the workman, and also the great efforts that were made to neutralize these by extra chipping in one part, and little or none in another. In a few arrow-heads and other implements, an unchipped projection or burr is left in the centre of one of the faces. It evidently could not be removed by the flaking tool, yet, notwithstanding this defect, such implements would appear to have been brought into use.

I have a series of rude flint objects which I believe are not spear- or arrow-heads, but rather implements of that kind in process of manufacture. They are rudely dressed or blocked out objects of oval or ovate form, the flaking on which must have been produced by blows from a hammerstone. Some have been made from pebbles or boulders of flint, and others from large flakes or spalls. They are too rude for implements in the present state, and, therefore, I believe they must be blocked out spear- and arrow-heads which were intended to be brought to a finished state by

the flaking tool. No hoard of these blocked-out implements, so far as I know, has been found in Ireland, and I am not aware of their having been observed or noted by collectors.¹ I have the habit of putting articles having similar peculiarities together, and now after many years collecting, I find that I have over 200 of these objects. They come from various well known sites, Whitepark Bay, Portstewart, Glenhead, Glenleslie, and other sites along the valley of the Bann and Braid. In America, Mr. W. H. Holmes has found around Washington places where the gravels had been excavated in times past by American tribes in order to find boulders of a good and suitable quality to chip down into rude leaf-shaped blades, not for use as implements, but for carrying away to other sites, where they would be manufactured into spear and arrow points.² Sir John Evans mentions in his *Ancient Stone Implements and Ornaments* a find of thirty-four such rude objects as the Irish specimens I have mentioned, at Old Deer, Aberdeenshire.³ Dr. Munro, in his *Prehistoric Scotland*, also mentions a find of thirty-four such objects at Skelmuir, Scotland,⁴ and Dr. Joseph Anderson writes on "A deposit of flint, worked to a leaf shape, found at Bulwark, Old Deer, Aberdeenshire." The finds mentioned by these three authors appear to be one and the same, and, judging from the figures shown in Dr. Anderson's paper, and those of the American blades accompanying Mr. Holmes's report, I should think the rude Irish objects, which I have brought under notice, are similar in kind to the Scotch and American examples, and show a stage in the manufacture of a finer type of implement. Dr. Anderson sums up in his paper:—"We have here the material, partially manufactured, roughly blocked out for arrow- and spear-heads, and apparently so treated that they could easily be transported to a distance." In Plate VII, Figs. 10, 11, 12 and 13, are shown four of the Irish specimens. Portions of the crust of the original pebble from which they were made, appear at the base of Figs. 11 and 12. I have some specimens which show a slight advance on the first blocking out, by the point on one side having received more work than other parts, and, in some completed implements, rough bold chipping, as if made by blows of a hammerstone, appear in the centre of the broad faces, though the edges have been dressed by secondary chipping. Plate VIII, Fig. 15, shows a large leaf-shaped spear-head of this kind, which has been made out of a boulder of flint. It is $7\frac{3}{4}$ inches long, 3 inches broad near the base, and about an inch thick. It is one of three which were found near Ballycastle, over eighty years ago. The other two were slightly smaller than the one figured, but were lost by lending them to cure cattle.

I have mentioned rounded pebbles or boulders with bruised ends being found abundantly in manufacturing sites. These are known as hammerstones, and are believed to have been used in striking the core of flint in order to detach flakes. They were also, no doubt, used in blocking-out implements. There are also,

¹ A small hoard of six was found in Knockandu, near the village of Clough, since this paper was written. They were found together between the peat and the clay when clearing out an old fence.

² 15th Report Bureau of Ethnology, Washington, p. 13 et seq.

³ 2nd Edition, p. 35.

⁴ p. 357.

finger-like implements of flint, blunt, and sometimes smoothed at the ends, which have received the name of fabricators. These are supposed to have been the tools employed by the prehistoric people in pressing off flakes when finishing an implement; fabricators of bone or horn may also have been in use. Many used tines of deer, and pointed bones that would have been suitable as fabricators, have been found in such manufacturing sites as Whitepark Bay and Portstewart.

CLASSIFICATION.

Arrow-heads have been variously classed by authors; and botanical, mathematical, and other terms have been used to describe them. Sir William Wilde¹ divides Irish arrow-heads into five classes, viz.:—triangular, indented, stemmed, barbed, and leaf shaped,² and Sir John Lubbock (Lord Avebury) adopts this classification in *Prehistoric Times*. Sir John Evans says “the better known forms of arrow-heads which occur in Britain, may be classed as the leaf-shaped, the lozenge-shaped, the tanged or stemmed, and the triangular.”³ In a paper by myself on the classification of Irish arrow-heads,⁴ I considered that a better classification could be made, but that we had to take into consideration that old terms had obtained a certain hold on the public mind; and I tried to amend the classification by retaining the old class names then in use. The classes which I then recommended, and which I shall now take in the following order, as I am now dealing with their origin, are:—leaf-shaped, lozenge-shaped, kite-shaped, triangular, stemmed, and indented. In the catalogue of the National Museum of Antiquities, Scotland, published in 1892, flint arrow-heads are stated to be of “three varieties of form, leaf-shaped, lozenge-shaped, or triangular with barbs or basal stem for attachment to the shaft”;⁵ and in 1895, the Rev. Dr. Buick contributed a paper to the Royal Society of Antiquaries, Ireland, on Irish Flint Arrow-heads, in which he divided them into three classes:—the leaf-shaped, the triangular, and the stemmed. He says he adopts this arrangement “not only an account of its simplicity,” but “because it seems more in line with the process of development out of which the typical forms have grown.”⁶

If a fairly mixed series of arrow-heads were placed before any one who had no previous knowledge of the subject, and he were told to classify them, the simplest way he could do so would be to divide them into two classes, those having a continuous outline like the leaf-shaped, lozenge-shaped, kite-shaped and triangular, and those having indentures in the outline, like the barbed and indented; but I find that when we simplify in the classes, we have to introduce complications of the nature of divisions and subdivisions. The classification, which I recommended in 1877, taken in the order in which I now intend to deal with the various classes, will give us, in my opinion, some further insight into the origin of arrow-heads, as

¹ *Catalogue of the Royal Irish Academy*, 1863, p. 13.

² 4th Edition, p. 105.

⁴ *Journ. Anthropol. Inst.*, vol. vi, p. 482.

⁵ Enlarged Edition, p. 13.

³ *Op. cit.*, p. 369.

⁶ Vol. v, Ser. 5, p. 43.

the various kinds are not all of the same age. The leaf-shaped and the lozenge-shaped are undoubtedly the oldest, and reach back into Palæolithic times, the continuance of old forms into Neolithic times suggesting a survival which I have already explained. The tanged form also reaches back to the Palæolithic age, and so, I believe, does the triangular, but barbs may have been developed at a later period. I believe the kite-shaped and the indented are our latest forms. The classes which I recommend are not equal in point of numbers. The leaf-shaped is more numerous than any of the others, the stemmed is also a large class, and the indented, though not equal to either of the other two already mentioned, is third. The lozenge-shaped, the kite-shaped, and the triangular are small classes, but it is not in accordance with a scientific method to ignore a species because it is small, or to incorporate it with an allied kind for the sake of convenience.

Leaf Shaped Class.—A variety of the forms belonging to this class is figured in Pl. IX. Fig. 25 is the typical laurel leaf, Fig. 16 shows a somewhat similar example. Ovate forms are shown in Figs. 24 and 28; lanceolate in Figs. 22 and 27. Fig. 29 approaches the orbicular, and Fig. 30 is entirely of that form. The little point in the latter specimen is neatly broken off, but the flat surface of the break is still visible. Figs. 23 and 28 have rounded, and Figs. 19, 24 and 26 pointed bases. Fig. 18 has the point at the broad end, and represents a fairly numerous section of this class. A variety in sizes may be seen in Pl. VIII, Fig. 14, and Pl. IX, Fig. 20, though these are not the extremes on either side. Fig. 22 is a beautiful specimen; it is very thin, and greatly discoloured from repeated boiling in cow's drinks, in order to cure cattle which were elfshot.

Lozenge-shaped Class.—Flakes struck off in the manufacture of the larger implements, whether of Palæolithic or Neolithic age, were often of a lozenge-shape, and when dressed round the edges, as I have mentioned was generally the custom in the Stone age, a lozenge-shaped implement or spear-head was formed. I have specimens of this kind of implement of Palæolithic age from the rock shelters of the Dordogne. Some of the Somaliland implements, collected by Mr. H. W. Seton-Karr, are also of this shape, and the same form is still found among Neolithic flakes in Ireland; two views of a specimen of this kind are shown in Pl. VIII, Figs. 14, 14*a*. One of the four sides of the lozenge is formed by the plain piece of the core remaining on the flake where it was struck; this is best seen on the lower right-hand side of Fig. 14*a*. The outer face of the flake (Fig. 14) is merely trimmed round the edges; the inner face (Fig. 14*a*) is scarcely touched except at the point. Like the leaf-shaped, this class originated in Palæolithic times, and has survived among Neolithic implements. I can show many Irish lozenge-shaped points dressed round the edges only, and though I have not enumerated them among my lozenge-shaped spear- and arrow-heads, I have no doubt they were used as points for spears in their present state, and are not, at least in all cases, spear-heads partially made. Lozenge-shaped arrow- or spear-heads, neatly worked, of Solutrien age,¹ have also been found in France, and, therefore, I hold that this class has an independent origin, and was not

¹ *Musée Préhistorique*, Plate XVII, Fig. 95.

derived from any other class. I should say it even competes for first place with the leaf-shaped, but this place we concede to the latter on account of its numerical superiority. Varieties of the lozenge form are shown in Pl. X, Figs. 31-37. Figs. 31 and 35 show two sides bounding the base shorter than those surrounding the point; Figs. 34, 36 and 37 show examples with four equal sides.

Kite-shaped Class.—The kite-shaped is evidently a derived class, but I think it comes more naturally from the lozenge-shaped than from the leaf-shaped. The two classes are alike in each having four angles, and they might be classed together as the quadrangular with more show of reason than there is for including the indented with the triangular. This class is distinguished by having, in most specimens, the two sides which surround the base curving outwards, and the two sides which bound the point either straight, or inclining inwards, and the two principal faces often polished. The basal angle is sometimes absent, and, in such cases, the base is bounded by a semicircular arch. Examples of this class are shown in Pl. XI. Figs. 45 and 47 are two very fine specimens, each about 6 inches long; they have been polished on both faces before being finished by the flaking tool. Fig. 45 was found in peat between Bellaghy and Castledawson in co. Derry, and Fig. 47 at Tihorney, near the Bann, co. Antrim. Fig. 46 is very thin, and shows remains of the polishing on both faces; this specimen had also received a final chipping after being polished; there are, however, examples where the polishing has taken place, after the implement was apparently completed, by chipping. Fig. 44 shows a slight trace of grinding on one side; it was found at Clough, co. Antrim. Figs. 42 and 43 were also found at Clough, and show no trace of polish. I have never found any examples of this class in the sandhill sites which are found round the Irish coast. Spear-heads with polished sides have not, except in Portugal, as yet occurred out of Ireland,¹ but flint knives polished on one, or both, faces are found in Egypt.

Triangular Class.—Arrow-heads in the form of a triangle are a fairly numerous class, and are properly described by the term triangular; this class therefore has no necessity to take under its wing those which are described by the term indented, a much more numerous class.

The triangular was also, I believe, an early form of implement, while the indented must be a derived class, and later than the triangular. We often meet with points which are triangular, as well as those which are leaf-shaped and lozenge-shaped, and I have seen several triangular palæolithic implements.² I possess two specimens myself from Côtes-du-Nord, France, the smaller of which is 2 inches long, thin and finely worked. It could scarcely be useful for any other purpose than that of a spear-head; front and side views of it are shown in Plate VI, Figs. 1, 1a. The purely triangular forms are numerous in Ireland, and

¹ Evans, *op. cit.*, p. 372.

² See *Musée Préhistorique*, Plate X, Fig. 59. Also *Le Préhistorique*, 3rd Ed., Fig. 29. See also *Guide to Antiq. Stone Age, Brit. Mus.*, Figs. 6 and 27, for examples of triangular implements of Palæolithic age.

are generally well-made and highly finished. Examples are shown in Plate X, Figs. 38 and 40. Although Sir William Wilde employs the term triangular as a class name, he takes as his type two examples, both slightly indented at the base, rather like Plate XIII, Fig. 74. One of his figures shows notches near the base for holding the string. I believe this specimen cannot be Irish, as I have never met with an undoubted example notched in the same way. The purely triangular arrow-heads, like Figs. 38 and 40, do not seem to have been known to Sir William Wilde. There are specimens, some of which are slightly concave, and others, convex at the base like Plate X, Figs. 39 and 41, which might be included in this class.

Stemmed Class.—Stems were developed in Palæolithic times. The "*pointes à cran*," though they may have been knives rather than spear-points, had well developed stems, and a stemmed implement is figured in *Reliquæ Aquitanicæ*, A, Plate VI, Fig. 3. The following description is given of the figure:—"Spear-head shaped, but broken at the top, carefully chipped on both faces, and indented with a bold angular notch at each side of the broad end." I believe, however, that barbs were developed at a later date, when population had greatly multiplied, and war and the struggle for existence were causes of the invention of more deadly weapons. There are many varieties in this class; and in some of these varieties there is a great likeness among individual specimens. The larger implements, those from 3 to 4 inches long, were, no doubt, spear-heads. As a rule they differ from the smaller varieties by having the central tang large, well made, and projecting beyond the barbs. The stem was probably made both long and strong, with a view of enabling the spear-point to be securely attached to the shaft. There is a section of this class which has either no barbs, or very minute ones (Plate XII, Fig. 53). This kind is fairly numerous, and might have been classed by itself. It was, no doubt, the earliest of this class. Few of the specimens in this section are well made, or highly finished, and they gradually merge into the kind which have both a stem and well developed barbs. Some expand at the shoulders, and have strong barbs (Figs. 52 and 60); others are serrated on the edges (Figs. 51, 59 and 60); Fig. 61 shows a finely worked example of triangular shape which was found in Quolie Bog, near Ballymena; Fig. 49 shows an example of a numerous variety of the smaller barbed arrow-heads; Fig. 55 shows an example of the smaller kind with stem longer than the barbs, and expanding at the base, like some of the larger kinds; Fig. 48 shows barbs sloping outward; Figs. 50 and 57 show the barbs sloping inward, and longer than the central stem; Fig. 58 represents the barbed class of Sir William Wilde; Fig. 54, like Fig. 49, is representative of a considerable number of small arrow-heads, while Fig. 56 represents rather a rarer kind.

Indented Class.—The term indented having been one of the first names applied in the classification of arrow-heads, I think it is well to retain it. I have Sir John Evans with me here. In his Presidential Address, delivered to the Anthropological Institute in 1878,¹ in reviewing my paper on the classification of

¹ *Journ. Anthropol. Inst.*, vol. vii, p. 519.

arrow-heads, he says :—" Without myself accepting all Mr. Knowles's conclusions as universally applicable, I think the term 'indented' is one which will be found of service, especially in describing a prevailing type of Irish arrow-heads." The term triangular which some antiquarians would apply to the class now under consideration is, I consider, most inappropriate, as many are not triangular in outline. This will be seen in viewing the different varieties of this class (Plate XIII). For example, Fig. 67 represents a fairly abundant variety ; it is very unlike a triangle, and is more like a leaf-shaped arrow-head with a large indenture at the base. Fig. 71 is also a bad example of a triangle. Again, many examples of this class show five angles, Figs. 63, 64, 73, etc., two on each barb and one at the point, so the term triangular is in no way a good one when applied to this class.

We would expect that the indented class would naturally arise from the triangular. We see that the base of some of the triangular class is slightly concave, and we can go step by step, from the slightly indented, as in Figs. 66 and 74, to those deeply indented, as in Fig. 65. The indented class may have had its origin in that way, but in one of the varieties of the stemmed class, it can be seen how very small the stems become as compared with the barbs, as in Plate XII, Figs. 50 and 57. These, however, are not the most extreme examples ; compare rather Plate XIII, Fig. 62 with Fig. 63. In Fig. 62, the stem is very diminutive, and could be of no use in fixing the arrow-head to the shaft. It would, therefore, be an easy step from the small stem in Fig. 62 to no stem at all, as in Fig. 63. The stemless kind would be liable to split the shaft, but this could be remedied by applying a wrapping of gut, or sinew, round the shaft at its junction with the arrow-head. An example, mounted in the way described, was found in Kanestown bog, co. Antrim, in the summer of 1885, and I gave a note of the find with an illustration to the Royal Historical and Archæological Association, Ireland.¹ I reproduce the illustration in Plate XIII, Fig. 78.² There was a white substance at the base of the slit in the shaft into which the arrow-head fitted, which I believe was a cement, like putty. Putty, I have no doubt, would be known to the people of the Stone age. I have found, in the sandhill sites, many pieces of chalk, both scraped and rubbed ; this, I believe, had been done to obtain the chalk in a fine state for paint, and possibly also to mix with grease to make cement.

The stemmed and indented classes are very much alike when mounted ; unless the central stem is very large, it would be impossible, in a great many cases, to tell whether the mounted arrow-heads belonged to the stemmed, or indented class.

I have stated that the indented class was one of our latest kinds, but I believe it was invented prior to the northward migration of the people from Southern France and the borders of the Mediterranean, after the passing away of the glacial period, as

¹ Vol. vii, Ser. 4, pp. 126-7.

² An arrow-head, similar in shape to Fig. 75, Plate XIII, selected from my collection by the Ballymena Archæological Society in 1887, was mounted in Irish gold, after the style of the Kanestown specimen, so as to form a brooch or shawl fastener, and presented to the Queen on her Jubilee.

the form is as well developed on the southern shores of the Mediterranean and in Northern Africa as it is in Ireland.

As it may be interesting to have an idea of the numbers in each of the several classes, I have counted those in my own collection; I find the numbers in each class are :—

Leaf-shaped	...	...	...	...	2,127
Lozenge-shaped	...	...	...	...	319
Kite-shaped	...	...	...	...	236
Triangular	...	...	...	...	220
Stemmed and barbed		...	...	...	1,589
Indented	...	...	...	...	872
					<hr/>
Total	...	...	...	...	5,363
					<hr/>

IRISH FLINT ARROW- AND SPEAR-HEADS.

*M. Knowles
1902.*

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