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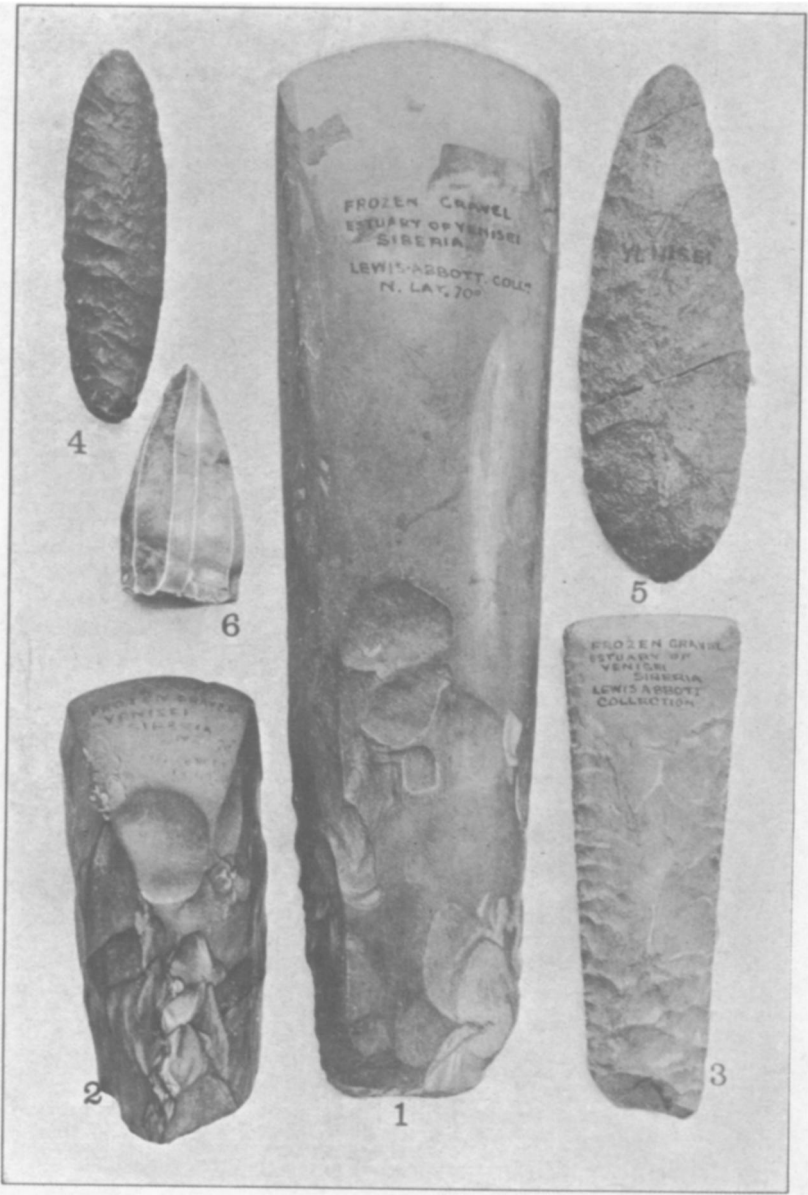
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STONE IMPLEMENTS FROM THE YENISEI.

ORIGINAL ARTICLES.

With Plate K.

Siberia : Stone Implements.

Abbott.

Stone Implements from the Frozen Gravel of the Yenisei. By **95***W. J. Lewis Abbott, F.G.S.*

Some ten or twelve years ago rumours were constantly floating southward of the remarkable burdens borne by the glaciers and ice-floes of high northern altitudes; islands of rock and mould capable of bearing vegetation were replaced by lenticular patches of gravel, in which the precious yellow metal formed an incredibly large part. All this has now become ancient history, and the wonders of Klondyke have added yet another charm and fascination to the possibilities of ice work. Nor has the western hemisphere the monopoly of the treasures of high polar latitudes, for the frozen soil of northern Siberia attracted the notice of gold prospectors in this country. In one instance one of our friends turned his attention to the mouth of the Yenisei, that great drainer of Northern Asia, and, in return for mineralogical information supplied, promised to keep a diligent watch for anything in the nature of man's handiwork, as well as for the far more attractive gold; and, faithful to his promise, he collected everything he saw, which was a terrible undertaking, as the collection had to be carried over ice and snow in sleighs, and on the back for many months. As I am not aware that implements of this character have been reported before from so high a latitude as 70 degrees, and as they present so many features of interest, a description of them may not be out of place in MAN.

When these implements were submitted to Sir John Evans the same fact was the first to strike him that had struck ourselves, viz., the variety of types represented. Here we have in one river estuary types which might have been Polynesian, Scandinavian, Eskimo, early French or Indian or English. Of course, one cannot say that all these are of exactly the same age. Ice laughs at the flat consecutively-numbered leaves of a book, or the chronological succession of orderly aqueous formations, and rolls round and ploughs up and folds over its burdens and the underlying rocks into all sorts of fantastic shapes, so that distance from surface is no indication of age. Of the six implements here described three are uniformly very much altered; two, which are of a different material, do not show such extensive signs of alteration, but this may be due to their being composed of varieties of material less subject to alteration than the others.

Description of the Implements.—No. 1 is a beautifully worked adze measuring 214 mm. in length, 58 mm. at the widest end, subtending the slightly curved cutting edge, and 35 mm. at the base. The dorsal line is practically straight to within about 30 mm. of the butt, and only curves very slightly at the point, not gaining 3 mm. in the whole length. In section this face is convex throughout, flattening from base to cutting edge. The other face is flat for about a fourth of its length from the butt, when it becomes slightly concave, the latter feature increasing rapidly as it nears the point, where the curve of its concavity is about equal to that of its cutting edge. The latter is still perfectly sharp. The greater part of the chipping on the dorsal face has been polished out; the degree of polish attained is rather high considering the nature of the material. Although it was rubbed down with a grit capable of leaving small close-set scratches behind, the finishing must have been effected with something as fine as rotten-stone, which did not leave the slightest trace of a scratch behind. The rubbing was effected by strokes directed from the base to the point, and usually inclined from the right to the left at about 30 degrees, the angle increasing slightly with the convexity of the outline; the left edge being also worked with the implement in the same position and not turned round in the process. If the implement were worked from base to point it is practically right-handed, if from point to base (which is improbable) it was left-handed. There are, however, a few indications of ambidexterity. The colour of this implement

varies from light to darkish drab. Although a good homogeneous working material, breaking with a fairly good conchoidal fracture, it does not show the conchoidal ripples so familiar in good flint and obsidian ; but this latter is, of course, more dependent upon the method of working. From its fine granular or cryptogranular structure it appears to be an altered silicified fine mud-stone, which at the time of working was almost black.

No. 2 is a short adze 96 mm. long, triangular in section, with a sharp high dorsal ridge. The lateral edges are nearly parallel, the base being 35 mm. and the point 39 mm. wide. The underface is practically flat, and wholly polished, the striæ running in the same two directions as in No. 1. The two dorsal sides are unpolished, and show a great deal of labour, the fracture being apparently more hackley than in No. 1 ; this, however, may be partly due to the high angle at which adjacent sides were worked. The curved cutting edge is symmetrically formed parallel to the base in a rounded sweep, and, except at the ridge, it is entirely well-polished with few working striæ, and these at a very slight angle. There are other thickly set striæ at the flat underside, which post-date the polishing undoubtedly due to ice action. This specimen shows distinct signs of water wear, and the powerful force which broke this implement off at its base must have post-dated its making, although not by long. The colour of this specimen is a little more brown than No. 1, and a recent fracture shows that it possesses quite a hackley fracture, and a colour as black as basalt. It is in all probability the same material as No. 1.

No. 3. This is a chisel with a delicate ripple flaking, which calls to mind that of the very best Danish or Egyptian work. It is 105 mm. long, narrowing towards the base, which is 24 mm. wide ; the cutting edge is almost straight. Its faces are equally curved, the greatest symmetry attaining all through, the thickness relative to width never exceeding 1:3. The cutting edge is produced by grinding and polishing in a most even, symmetrical, bi-facial manner. Vestiges of the striæ show the same angular directions in working as in the preceding, but are almost wholly left to right. The material in this implement is much more altered than in the other two, and is now of a yellowish drab in colour. Although it has a rather better fracture than the other two, I have no doubt it is made of the same kind of material, and though it shows a more decided ripple-fracture, the latter may be due largely to mode of working, and the angular licence the operator had when working on two sides at so small an angle. Also in the former two, the work was probably the result of free-struck blows, as is the larger work of this specimen, but in the latter the finer secondary work may be the result of a pressure from a bone or other hard substance.

No. 4 is a little implement of perfect symmetry, 75 mm. long and 20 mm. in width, and 8 mm. thick in its widest part near the centre, from which it sweeps gracefully but finally, somewhat obtusely, towards either end. Owing to the unavoidable conditions of working, one face is a trifle more convex than the other, producing a low dorsal ridge, although in section at any part it is a perfect curve. This is a most perfect piece of ripple flaking, where the delicate hollows of the flakings, from both edges, not only meet in the centre, but, in their journey over the implement, describe curves which result in perfect bi-lateral symmetry all through the implement. The more convex face is worked entirely with the same hand, and the flakings are uniformly at an angle of about 45 degrees with the edge at each pit of percussion, so that in going up the first side from point to point the direction of the flakes alter through 180 degrees, and continuing round make a herring-bone ridging at a point which changes with the shape of the edge until the flake-ridges from both edges coincide, making it appear as if separate flakes extended from edge to edge in a curve, in a manner often exhibited by the fine Danish knives and some Yorkshire arrowheads. If this implement were worked with the right hand the working was pointed inward ; if left hand they were pointed outward. On the other face

this angular working is just as uniformly preserved, but by the non-alternation of the ridges at the points the herring-boning does not obtain, the flakings appear to run from edge to edge. The material of which this little implement is made is very interesting; in colour it is nearly black, except when seen in thin sections at the cutting edge all round, when it presents a corneous translucency, with grains and clouds of probably Mn O_2 , from which one might be disposed to regard it as an impure chalcedony.

No. 5. This implement differs as much from the others as does the last. It is a pure laurel-leaf spear head, 160 mm. in length, 35 mm. at its widest part, and 8 mm. in thickness at its thickest. The butt is nicely rounded, the point finely though not acutely sharp, and, considering the nature of the material, is very finely worked, being perfectly symmetrical in every plane, without flake-ridge prominences. In colour and general appearance it closely resembles the reddish and reddish-grey Cherbourg quartzites. The surface is sufficiently altered to obliterate the details of the physical structure of the material, but an accidental chip-fracture reveals that it is not, however, a chemical quartzite with rounded grains in a copious silica matrix. The quartz particles although showing no signs of crystalline outline are quite crystalline and colourless, and the interstitial silica forms a delicate mossy subordinate network lighter in colour, and probably more colloid in state though by no means entirely so.

No. 6 adds yet to the diversity! For some time I suspected that this was a specimen of an English flint core, from which parallel flakes had been struck, and which had subsequently been bleached and stained; closer examination reveals the fact that it is really worked from an agate and might have been either a chalcedonyx or sardonyx before alteration, the bands of crystalline silica producing but little effect upon the working. One side is quite flat, and all the flakes converging to a point make it a half-round in section. Although we usually speak of these as "cores," the fact that I have found these pointed wedges still *in situ* in partially split bones shows they really were employed for the purpose of splitting bones, either for their contained luscious grease, or for the manufacture of bone tools. I have therefore no hesitation in regarding this tool as a bone-splitter.

The interest in these beautiful examples of stone working lies, firstly, in the high latitudes in which they were found, being above 70° W. lat.; secondly, in the diversity of their types; and to these might be added the fact, that in the interstices of the incipient flakings, which always occur in silicious implements, deposits of gold have been found, which the geologist would probably consider to point to a long embedment in some river deposit, while to the theoretical mineralogist it would be an invaluable argument for the aqueous origin for at least some of the precious metal. Bones of the large animals, probably the extinct forms, also occur in these deposits, but how many times they may have been moved it is impossible to say. The altered condition of the various materials, and in all probability the depositing of the gold in the cracks, certainly point to a good age, but its extent we cannot tell. Whence came these tools of types and materials so different and in those high northern latitudes? With one exception they show no sign of river action, and not very much of ice action. When we have more minute details of the materials of which implements are made that are found in various parts of the globe, together with their types and forms and methods of working, and when the mineralogists and petrologists of the whole world will be so good as to describe all the varieties of silica and its allied rocks, we shall be in a better position to decide a question like this. For the last twenty-five years I have been trying to collect these latter, and although I have got many thousands of specimens I am continually finding new varieties. If we can localise a large portion of these it may be as useful as fixing the original home of jade, and we may then know more about the peregrinations of the nomads of prehistoric times.

W. J. LEWIS ABBOTT.