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fra forfat.

THE PALÆOLITHIC PERIOD

OF

THE SCANDINAVIAN PENINSULA

BY

F. ARENTZ

KRISTIANIA
PRINTED BY A/S S. & JUL SØRENSEN
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ANTHROPOLOGY

CONTENTS

In "Palæolithic Chronology 1911" the palæolithic period of Europe is treated. There I tried to prove that the 5 Danish kitchen middens or mounds of the older stone age, the Brabrand and Maglemose finds, and the coast-finds were preglacial and palæolithic, while the 3 kitchen middens of the younger stone age were postglacial and neolithic. Consequently, the between-lying Ice Age lasted but about 1000 years or less, corresponding chiefly to the Magdalenian epoch. Here I intend to find out if any preglacial and palæolithic period occurred also in the Scandinavian peninsula. Here existed, however, two different older stone ages, the so-called arctic stone age, from Finland invading the northern part of the peninsula, and the south-Scandinavian stone age, from Denmark invading the southern part as a direct propagation of the Danish tranchet people. The inferior arctic culture may probably indicate an earlier emigration from Asia, but if the peninsula was also earlier invaded may be dubious; the arctic culture was at least scantier and less expansive than the tranchet culture, and the natural relations were less favourable.

I.

THE ARCTIC STONE AGE.

In 1866 and more distinctly in 1871 O. Rygh in Norway considered this slate culture as belonging to another culture and another people, the ancestors of the Lapps, than the so-called south-Scandinavian culture from Denmark. In 1866 H. Hildebrand in Sweden wrote: „it is possible that the stone age of Norrland may not be considered as a continuation of that of the southern Sweden, but rather of that of Finland and the oriental countries in common, since amongst other things two javelins of slate are found in Ångermanland, remembering of identical finds in Finland and in the Russian gouvernement of Olonetz."

At the Congress of Stockholm in 1874 O. Rygh and Montelius maintained these views of an arctic-lappish stone age. But, as in the intervening time many slate objects had been found also in southern Norway, O. Rygh altered his views, and in 1895 he considered the arctic-lappish culture to have its origin from the south-Scandinavian stone age, adopted by the Lapps who developed an only slate culture, while Montelius at the same time still adhered to his former views. In 1903 K. Rygh of Trondhjem insisted upon the difficulties of O. Rygh's last explanation, however, without taking a decided point of view. K. Rygh found it less probable that the Lapps were unacquainted with the use of their slate material when they came in contact with the south-Scandinavian culture, where the relatively few slate objects hardly were the starting-point of the arctic culture. Flint and slate must have been used at the same time, since remains of both are found „nordenfjelds" (north of the mountain range of Dovrefjeld) in several places and even flint implements of southern types very far north, which is explained by trade. To me it appears probable that these two different cultures came in contact in Trondhjem's Stift in preglacial times, and at last the beginning Ice Age drove the arctic people southward, intermingling them with the south-Scandinavian tranchet people, why we now find the arctic slate objects also in the southern parts of the Scandinavian peninsula, but they are not brought thither by trade as a merchandise.

In „Studier over Norges Stenalder 1906" A. W. Brogger, owing to the supposed evolution of the slate point from the bone point and to the zigzag ornament, inferred that there existed a connection between the arctic stone age and the reindeer of the Magdalenian epoch. The arctic stone age was connected with the reindeer, following its track round the east-baltic region through Finland to Norway. It was a Lappish people. But, according to my opinion, the arctic stone age is not postglacial from western Europe, on the contrary preglacial and early from Asia. The slate point is anterior to the bone point, and the reindeer seems unknown to the arctic people; at least in his great work of 1909 Brogger mentions in the really arctic dwelling-sites only p. 23: „at Virik in Ofoten, Norway, a fragment of a small bone or horn spoon, assignably found in the dwelling-site together with some slate objects," and p. 36: P. Olsson mentions in Ångermanland, Sweden, the find of slate points, flint refuse, and bone remains, adding that „even some of the bone remains seemed to be ground." According to Andr. M. Hansen, the Lapps invaded Norway at the earliest about A. D. 1,000. There is no reason whatever for calling this arctic people the ancestors of the Lapps.

Later on Brøgger has, however, considerably altered this hypothesis to a more certain supposition. In „Den arktiske Stenalder i Norge 1909“ he says p. 50: „In spite of errors in the determination of age it may be considered as probable that the arctic occupancy, upon the whole, in time falls under the periods of the dolmens and the giants' chambers, formerly alluded to by Montelius, Almgren, Frodin, etc. It is an, on the whole, contemporary culture, by Brøgger called the arctic-baltic“. Brøgger has now entirely abandoned the theory of the Lappish people as bearers of this culture. P. 39 he says that the material of the axes from Holeheia (Jæderen) and Vespestad (Bømmelø) near Stavanger may, at any rate, comparatively safely be fixed to the younger stone age and not to the older one. The butt-necked type, the round axe (Trindøx), from Vespestad, also found in Sweden at Bråviken in Östergötland and perhaps at Åloppe in Uppland, belongs to the Danish dwelling-sites of the older stone age, while it is also found in the layers of the younger stone age. That is the reason why Brøgger in 1907 considered Vespestad and Holeheia as belonging to Worsaae's middle stone age between the older and the younger stone age, but now to the younger stone age. The submarine Vaalse heap in Falster, Denmark, where a slate point (Brøgger's fig. 62)* was found together with flint tranchets etc., is by S. Müller determined as the older stone age, why Brøgger (p. 41) says that it is the only instance in the North of a slate point found in the layer of the older stone age, though Brøgger seems not to like it. In the Tornegaard find in Bornholm a slate point of the slender type was found in a giants' chamber.

Brøgger (p. 161) mentions as characteristic of the arctic-baltic culture:

1) a characteristic ceramic horizontal style.
2) a naturalistic art, as sculptured small objects, rock-sculptures, and rock-paintings.
3) slate implements as arrows, knives, and javelins.
4) a series of common forms of axes.
5) a common form of culture, hunting and fishing.

The connection with the reindeer culture of Europe he will not treat here. In the North this culture was connected with the reindeer. The arctic-baltic stone age belonged to the periods of the dolmens and the giants' chambers, but certainly it lasted in many places far down in the Bronze Age. Accordingly, Brøgger's arctic-baltic stone age is found in Norway from Jæderen, south of Stavanger, along the whole coast up to the Russian boundary, in Sweden from Scania and

* All figures, mentioned here, are to be found in the original works.

Blekinge along the Baltic coast until the north, and besides in Finland and Russia.

These views of Brøgger I absolutely reject. The salient point in these great mistakes is the axiom that the whole North was first inhabited in postglacial neolithic times. Even if the axiom that the first man of Europe came from Africa, was true, even then it appears curious that at least Denmark was not inhabited by a palæolithic people, while Europe had a rich palæolithic culture. In this case, however, there might be an apparent reason for the very late invasion of the arctic people from Finland to the northern Scandinavian peninsula. But, at any rate, it seems rather curious that the arctic culture was extended quite down into Scania, even represented in the very rich find of the Ringsjø where not one slate object occurred, while the extent of the older and younger stone age of Denmark to the Scandinavian peninsula appears to have been relatively small and slow in spite of the shorter and more natural route for extension. If my opinion, however, is right that the primeval man of Europe arrived from Asia through Russia, then the relations are quite different, and an early invasion in preglacial times both to Finland and to Denmark appears reasonable.

Brøgger's characteristics of this culture are a complete mistake, a confusion of arctic and south-Scandinavian cultures. Even the new name, the arctic-baltic culture, is misapplied; „baltic" has nothing to do with the arctic culture. [1]) The ceramic style and, on the whole, [4]) the series of axe forms are palæolithic south-Scandinavian characteristics; a ceramic art seems unknown in the arctic culture as no pottery is found in northern Norway or Sweden, but some few simple ornaments as the zigzag line are sometimes found on the slate implements. In the northern Norway Brøgger mentions, as found, 18 very small transverse axes*), „Tverøx", of greenstone besides some few grinding stones of sandstone and in Sweden 2 such axes in Ångermanland and Jämtland. In the northern part of Trondhjem's Stift at *Bjørnør* (Grønvollan) 1 axe was found together with slate implements, some flint refuse, and a little fragment of a flint arrowhead like the types of Jæderen near Stavanger; at *Bølesæter* 12 axes occurred together with 100 slate points, about 40 slate knives, and some flint refuse of which 2 had an edge like scrapers and 1 was like a flint arrowhead; at *Bølestrand* 40 slate points, 25 slate knives, and relatively much flint refuse of which 6 small flint

* All transverse rock axes both of arctic and south-Scandinavian types are produced by grinding from one face so the edge lies in the prolongation of the other face.

scrapers and some flint arrowheads, besides 2 rock axes; at the adjacent *Uran* a flint workshop occurred like the flint fields in Jæderen, why K. Rygh inclines to consider it as south-Scandinavian; according to a note in the newspapers, Adjunkt Nummedal has last summer (1912) found flint finds from the stone age in the island of *Vikten* near the boundary of Nordland's Amt. It appears, then, as if these two cultures came in contact as far north as in northern Trondhjem's Amt. In Nordland's Amt at *Sandnessjøen* and at *Røsasen* in Ofoten 1 axe is found in each place together with slate implements. In Tromsø Amt at *Åse* in Andøen 1 very little hollow axe is also found. In Finmarken's Amt at the Jacobselv in southern Varanger (the river at the Russian boundary) 1 axe is found. These relatively few small transverse axes of greenstone from the „nordenfjelds" dwelling-sites are found also in Finland and in the south-Scandinavian culture as, for instance, at Gullrum in Gotland, why they hardly are characteristic of the arctic stone age, but only indicate a similar evolution in different regions, perhaps, to be referred to originally cognate races. It might, then, hardly be doubted that these small transverse axes of greenstone, from 5—7 ctm. long and more like chisels, were used also in the arctic stone age. But of [2]) the sculptured small objects the two animal figures of burnt clay at Åloppe in Uppland belong to the palæolithic south-Scandinavian stone age, and the rock-sculptures and rock-paintings are neolithic, as explained later on. [5]) The hunting and fishing culture is but a common palæolithic feature without any neolithic agriculture or breeding of cattle.

The only characteristic feature of the arctic culture is, then, [3]) the slate implements, as flint was wanting while slate was abundant and much more so in preglacial times, before the Ice Age had highly destroyed the sedimentary strata, grinding them up for the coming agriculture. The arctic people must have been an early palæolithic race; the Lapps had nothing to do with them, but it may be that they were originally related to the tranchet people of Denmark and the southern peninsula. The arctic invasion may have occurred already in late Miocene when the climate was warmer, but at least in Pliocene with a present climate. However, when the Ice Age began, the arctic people was driven southward, and that is the reason why we now find slate implements in the southern peninsula. K. Rygh mentions even that a comparatively great part of the slate points is „søndenfjelds" (south of the mountain range of Dovre) found in the mountain regions and in the more apart lying wooded districts, which fact may indicate their being lost during the southward route.

The slate point at Vaalse in Falster, mentioned above, is highly ornamented and seems to be of a better and finer form as if from the close of the arctic stone age, if it is not native. The slate point in the giants' chamber at Tornegaard in Bornholm may have been an ancient useless object placed in the grave; at least, one swallow does not make a summer. Brogger is of the opinion that the arctic people from Finland invaded Uppland by sea across the islands of Åland and from Uppland extended westward and northward, but in early preglacial times they hardly were able to cross the Baltic Sea, I think. More reasonable appears the route by land round the Gulf of Bothnia to northern Sweden and Norway; however, it may be that more southerly Norway was directly invaded from Sweden, at least partly as in Ofoten, but hardly in Trondhjem's Stift where only south-Scandinavian objects are found in the interior regions.

According to Brogger's statistics p. 69 (about 1908), there were in **Norway** found 520 slate points and 296 slate knives, but every year more are found.

„Nordenfjelds" (north of Dovre) 397 points and 291 knives.

„Sondenfjelds" (south of Dovre and east of Langfjeldene, why it is also called „ostenfjelds") 36 points and but one knife in Nedenæs' Amt where no points are found. Brogger remarks that 9 other knives, mentioned by K. Rygh, are not arctic types, but mostly unworked slate pieces.

„Vestenfjelds" (west of Langfjeldene) 87 points of which 45 in Stavanger's Amt, 11 in the two Bergenhus' Amts, and 31 in the most northern Amt of Romsdalen, besides 4 knives of which 1 in Stavanger's Amt and 3 in Romsdal's Amt.

The most striking feature is that in southern Norway only 5 slate knives are found single, and of these no less than 3 in Romsdal's Amt, being the southern part of Trondhjem's Stift and bordering to the „nordenfjelds" with its 291 knives, and that of 520 slate points only 36 occur „sondenfjelds" and 87 „vestenfjelds."

In his map (p. 3) Brogger has, in all, 15 arctic dwelling-sites along the coasts from Jæderen to Russia, but of these at least 4, perhaps 5, are, in fact, south-Scandinavian dwelling-sites as Holeheia (1), Vespestad (2), the dwelling-sites of the peninsula of Bergen (3), the kitchen midden at Stenkjær (7) at the inner northern end of the Trondhjemsfjord; perhaps Baret (5), south of the mouth of the Trondhjemsfjord, is also south-Scandinavian. The other 10 arctic dwelling-sites are lying from Trondhjem's Stift up to the Russian boundary, consequently in the „nordenfjelds".

By a complete mistake Brogger considers the different forms of

larger transverse axes of greenstone as arctic, while they are, in fact, south-Scandinavian types. He mentions, therefore, 433 such axes „vestenfjelds“ in southern Norway from Lister to Romsdalen. In Lister and Mandal's Amt, the most southern part of Norway, 37 greenstone axes are found, but only 5 slate points and no slate knife, while in Stavanger's Amt 272 greenstone axes occur together with 45 slate points and but one slate knife.

In **Sweden** Brøgger's arctic-baltic finds from Scania and Blekinge northward along the Baltic coast until Uppland, all these belong, in fact, to the south-Scandinavian stone age as the finds in Blekinge, Ringsjö in Scania, Gullrum in Gotland, Bråviken in Östergötland, and Åloppe in Uppland. However, also here some slate implements are found, to be explained, as in Norway, by the emigration southward on account of the approaching Ice Age. In Blekinge Montelius has but one slate point; at Ringsjö no slate is found, and Montelius mentions only one slate point in Scania; at Gullrum some few slate points, mostly in fragments, and very small greenstone axes occurred, and in the parish of Gothem, also in Gotland, 8 slate implements; and at Bråviken no slate objects are found and Montelius mentions but one slate point in Östergötland. In 1874 Montelius south of Uppland mentions 16 slate points and 2 slate knives and in Uppland only one slate point; but in his „Upplands stenålder 1909“ G. Ekholm has no less than 21 slate points, 6 slate knives, and 10 other implements of slate in Uppland alone. But north of Uppland the greater northern part of Sweden may be considered arctic. I do not, however, know the actual number of found slate points and knives at present. In 1878 Winther of Tromsø mentions 72 slate objects in Sweden, 65 points and 7 knives. Accordingly, the number must of late have increased considerably, specially in the northern landscapes. In northern Sweden Brøgger mentions many slate implements and a few greenstone axes in some dwelling-sites, but slate implements are mostly found single as in Jämtland. In Ångermanland Olsson in 1888 mentions 18 points and 20 fragments of points, while about 1892 Westrand moreover mentions 10 points and8 knives. Specially remarkable as, perhaps, indicating a removal by the ice and accordingly a preglacial arctic stone age, are the following remarks: amongst others Montelius says that a great amount of the arctic slate implements are in Sweden found in lakes or on the shores of lakes, and Brøgger mentions (p. 37) that, according to Olsson, several slate points were found by seining in a lake (Holmsjö) of the river Indal, and that about 20 slate points were found in a gravel hill near Kälen in the parish of Strøm (Jämtland).

According to Brogger (p. 143), in **Finland** the broad-bladed and the slender slate points with barbs are scarce, while the slender type without barbs, the rhombic, and the triangular types are dominating here; also the one-edged knives are quite scarce, but the double-edged knives are dominating. The exceedingly small, more chisel-like tranverse axes of greenstone seem also to occur here; at least Ailio mentions more than 4,000 „Geradmeisel" of different types. Also in **Russian** Karelen, Olonetz, and Novgorod slate implements are found by hundreds. At Kunda and Burtneck numerous points of bone (cfr. Maglemose in late Pliocene), but only few remains of slate occurred. These slate finds here indicate the route from Asia.

Brogger has divided both points and knives in several types. Of these the most numerous types, as the always barbated broad-bladed type, the slender type with barbs, and the double-edged knives, are found everywhere, while the other little numerous types are only found in local regions.

To prove that the arctic stone age was, in fact, preglacial and palæolithic, is impossible except in combination with the south-Scandinavian stone age. These two cultures must have been contemporaneous, but it is not impossible to prove that the south-Scandinavian stone age, the propagation of the preglacial Danish tranchet people, was really preglacial. Some minute circumstances might, however, hint at a removal, probably by an intervening glaciation. In Sweden the occurrence of slate implements in lakes and along the shore of lakes and the find of 20 slate implements in a gravel hill are already mentioned. In Norway the actually arctic dwelling-sites are more pronounced, but unfortunately never investigated by professional men. Of the four dwelling-sites at Stoksund in the parish of Bjørnor: at Gronvollan the find occurred in a low mountain slope „(Li)"; at Lovstrand also in a slope; at Åkernes uppermost in a slope; and at Salbuvik the relations were as in the other three sites, and the find here was rather gathered together in a field. At Bolesæter and at Bolestrand the uncultivated ground was covered by heathy turf, and up in the slope a stony field of large extent was found by spading off the turf. As far north also some flint was found. At Sandnessjö in Norland no competent investigation occurred, the dwelling-site was lying in a now cultivated piece of ground without flint. At Virik and at the adjacent Rösåsen in Ofoten the objects were found in several places; no south-Scandinavian finds have been found here. At Åse, Andöen, also in Norland a dwelling-site probably occurred; here 1 point and 5 knives of slate besides 1 very small hollow axe of greenstone were found. At Skånland in Tromsø's

Amt the objects were found scattered up in a field of a slope „that is steep and stony but otherwise even." At the Jacobselv (the river forming the Russian boundary) a dwelling-site probably existed, where some slate objects are found. It might be supposed, perhaps, that the people lived on the flat above and that the slate objects were later carried down in the slopes by the ice, but it is no actual proof; the primitive slate implements and the very small axes or chisels of greenstone might be more convincing, when the primeval man of Europe came from Asia and not from Africa. The actual argument, however, lies in the finds of slate implements in the preglacial and palæolithic south-Scandinavian dwelling-sites, as shown later on.

My conclusion is that the so-called arctic people came from Asia through Russia and Finland to the northern Scandinavian peninsula in preglacial, palæolithic times, and that they were, later on, driven southward by the glaciation. Brogger's hypothesis that the arctic people lived in the periods of the dolmens and the giants' chambers, is a complete impossibility, and his supposition that south-Scandinavian dwelling-sites were arctic, his arctic-baltic stone age, is but to be lamented.

Before leaving the arctic stone age, I must prove that the rock-sculptures and rock-paintings cannot have been arctic, but neolithic and postglacial. G. Hallström has treated „Nordskandinaviska hällristningar" in Fornvännen 1907, 1908, and 1909 besides in Ymer 1907. He says that the south-Scandinavian rock-sculptures from the Bronze Age occur specially in Bohuslän and Smålenene (besides sporadic on loose-lying stones in Denmark), over almost all Sweden up to and including the district of Upsala, and along the coasts of Norway to and including the Trondhjemsfjord, while the north-Scandinavian group (from the neolithic stone age) is represented by 10 rock-sculptures, 3 in Sweden in Jämtland and 7 in Norway from Romsdalen (1), round the Trondhjemsfjord (3), and up in Nordland's Amt (3), besides by 3 red-coloured rock-paintings in Sweden in Jämtland and Härjedalen and by 1 in Norway, recently discovered in Romsdalen. The north-Scandinavian group is characterised by naturalistic animal figures and quite different from the south-Scandinavian group, characterised by figures of ships. Of the 10 northern rock-sculptures Hallstrom, however, considers the sculptures at *Nämnforsen* in Jämtland as intermediate between these two groups. He remarks that in spite of the intimate connection with southern phenomenons of the same kind, the rich sculptures at Nämnforsen show several

features incompatible with the southern group, as the contour-cut and the wholly excavated animals with the new character, the figures of fish, and particularly the situation, rocks always washed over by the roaring watermasses of a mighty river. The sculptures here are to be entirely dated as from the Bronze Age particularly by the not few smaller and larger figures of ships, one ship is even 2.25 m. long with a mass of manning streaks of which some show the peculiar ripplings and bends often seen in the sculptures of Bohuslän, but not so stately cut as often there. The two figures of birds here, not common in the northern group, are sometimes also found in the southern group; also the here typical elk is found in the southern group where it is wholly excavated, but not so beautiful and plain. In the southern group the animals are, rather often, wholly excavated and but now and then contour-cut, a most common feature in the northern group. In the southern group no figure of fish is found, while here 2 and at Fykanvatn in Nordland 1 occurred. The not few figures of man here are all naïve and never so well cut as southward. At Nämnforsen the sculptures are cut in gneiss, but the lines are not deep, and the wholly excavated figures are wrought without chisel and hammer, only cut by a stone.

At *Bardal* in the parish of Beistaden, about 8 km. from the town of Stenkjær at the northern end of the Trondhjemsfjord, the main interest is connected with the large naturalistic sculptures of about 50 animals, which have, later on, been cut over by about 100 figures of ships, cut across and partly disturbing the more ancient north-Scandinavian sculptures. Some of the largest and best manned ships of the North and some exquisitely beautiful ornaments of the Bronze Age are found here. Accordingly, the ships are younger than the animal figures.

Hallström means that these sculptures at Bardal form the best starting point for the chronology. We are quite justified to regard the Bronze Age culture of Trondhjem's Stift as completely contemporaneous with the other Scandinavian Bronze Age, belonging to the first half of the Bronze Age, and the underlying north-Scandinavian sculptures must be older. He says that the angle and zigzag ornament is, no doubt, a very characteristic ornament of the stone age (specially the older), but to a high degree even of the Bronze and the Iron Ages, why it is no safe argument. In the archæology of the North, he says, we only meet with 3 instances of a naturalistic art comparable to our rock-sculptures: the horn axe from Ystad in Scania („older? stone age") with two rough animal sculptures probably stag, and the head and figure of elk in burnt clay at Åloppe

in Uppland, which dwelling-site I regard as preglacial. Hallström mentions several French sculptures on smaller objects and on the walls of caves, indicating a palpable artistic tradition between palæolithic art and the north-Scandinavian art, why he is inclined to suppose that the north-Scandinavian rock-sculptures belong rather to the older than the younger stone age. However, I regard the older stone age of the North as preglacial and our rock-sculptures are postglacial.

Many simpler sculptures on smaller objects certainly occurred in the preglacial palæolithic period of Europe and sometimes also in the North; but the rock-sculptures and rock-paintings originated from the Magdalenian epoch, during the glaciation, in the caves of France and northern Spain and in the open air in southern Spain where no glaciation took place. The Swiss Adolf Stiegelman in his „Altamira 1910" has a little reproduction of the beautiful reindeer sculpture at Bola (Tafel X fig. 31) in northern Trondhjem's Amt, belonging however to postglacial times. In „Les peintures et la stratigraphie paléolithiques en Espagne" in Cosmos No. 1435 of 25 Juillet 1912 pp. 95—97, the same author mentions that in the last years in southern Spain there are everywhere discovered „peintures pariétales à ciel ouvert", as yet not found in any other country, what is true as these are Magdalenian and Azilian (the close of the Ice Age), while the north-Scandinavian ones are all lying in the open air but postglacial. In southern Spain there was no glaciation destroying them, why their red or black coleurs are still visible.

According to my views, before the Ice Age no rock-sculptures or paintings existed, and during the Magdalenian epoch the North was covered by ice in about 1000 years, why no people, then, lived here. If the north-Scandinavian art, always lying in the open air, had been preglacial, the Ice Age must have destroyed it, at least to a high degree. Originating from the Magdalenian epoch, this art can only have been introduced to the North in postglacial times by a palæolithic people; the new neolithic race hardly were masters of the north-Scandinavian naturalistic art. As mentioned already in my „Palæolithic Chronology", the first postglacial people in Denmark were the returning old tranchet people as the 3 neolithic kitchen middens indicate, and when the neolithic race invaded Denmark, the old population were subjugated or vere likely emigrated to the Scandinavian peninsula, always retreating northward in front of the new race. The ancient tranchet people, by the Ice Age driven southward, had there learnt the Magdalenian art and, at least partly, the neolithic culture. These relations might account for the north-

Scandinavian art in postglacial, probably neolithic times. This art is at least anterior to the art of the first half of the Bronze Age, and has nothing to do with the arctic stone age.

Of course, a description of this art lies, then, outside my present treatise on the palæolithic period of the Scandinavian peninsula.

In the new periodical „Oldtiden 1 Bind 1910" O. Nicolaissen has 2 figures of one arrow of slate with preserved wooden handle from the arctic stone age*). As far as known, it is the only find from the stone age of the Scandinavian peninsula where the wooden handle is preserved. It was found in Vesteraalen, the most northern part of Nordland's Amt.

This summer, 1912, Nummedal found flintplaces from the older stone age farther north than at Uran at the Bolefjord in Namdalen, viz., in the island of Vikten in the most northern part of northern Trondhjem's Amt and even in the island of Rodo in Helgeland in Nordland's Amt somewhat south of the 67th degree of north latitude. So far north the contact between these two cultures occurred before the Ice Age. In all the south-Scandinavian dwelling-sites, containing slate objects, these implements of slate will be specially mentioned.

II.

THE PALÆOLITHIC SOUTH-SCANDINAVIAN STONE AGE OF SWEDEN.

That the palæolithic period really existed in Denmark, is a fact proved in „Palæolithic Chronology." I began the study of this period in the Scandinavian peninsula with little hope of finding actual arguments, but to my surprise it was easier than expected, particularly in Sweden where it is convinient to start in Scania rich in flint and nearest to Denmark.

Knut Kjellmark: En stenålders boplats i Järavallen vid Limhamn.

Antikvarisk Tidskrift för Sverige XVII 1905.

„Along the southern and western coasts of Scania one or several, more or less distinct, often interrupted, postglacial littoral mounds are running. The largest one, Järavallen, is 5 m. above the sea in

*) A. W. Brøgger in Prähistorische Zeitschrift, I Berlin 1910.

the south, about 7 m. at Malmö, and about 12 m. in the north at Kullen, representing the highest mound of the Littorina Sea. South-west of Malmö at Limhamn the mound lies about 200 m. from the coast, being 2—2,5 m. high or less and about 3 km. long. It is partly disturbed by the situation of the town upon it and by digging for the cement factory. In the harbour, at a depth of until 2 m., there had been found 2—300 flakes, 7 flint axes all chipped and of the oldest primitive type, 1 greenstone axe, and a multitude of flint refuse. Also in the mound similar objects, „Slagstoks“[1] of stag's horn, and fragments of pottery had been found, partly *in situ* about 1 m. below the surface. In 1900 there were, in a gravel pit near Soldattorp, found many chipped flint axes and chisels, some ground greenstone axes, etc. In 1901 a dwelling-site from the stone age was found embedded in Järavallen. In the gravel pit vertical sections occurred, where a 0.20—0.30 m. thick, almost coal-black seam was seen 0.30—0.50 m. below the surface, being thickest in the middle and at each side gradually thinning out.

In the original paper there are instructive diagrams (1—6) of the situation. About 100—200 m. broad, Järavallen extended n. e.—s. w., following the coast-line at a distance of about 300 m. from the highest part of the mound, the so-called crown. Seaward the mound ended rather steep, but landward sloping slowly and here resting on underlying turf and stratified sand, however not directly on the morainic ground as seaward. Towards the coast the low-lying ground consisted of morainic layers, covered by a thin layer of littoral sand. The road from Malmö cuts deep through the mound, and on the southern side of the road the gravel pit and Soldattorp are lying. The materials of Järavallen generally were hardly pressed, stratified gravel, alternating with sand in thin layers; the rock fragments, of about 5—20 square cm., consisted mostly of flint and limestone with few other kinds as diabase, gneiss, and slate; *these fragments were not particularly well rolled.*[2] Sometimes larger *granitic fragments up to 1 square m.* occurred embedded in the stratified gravel in the lowest part of the mound, explained *as, perhaps, transported by ice.*

Palæontology outside the dwelling-site: remains of Cervus elaphus and capreolus, Bos taurus (urus?) probably aurochs but 2 longer bones certainly of cattle, Sus scrofa (ferus) probably wild boar, many fish species, many snails and muscles as Littorina littorea, Cardium edule, Tellina baltica, and Paludinella baltica mostly nearer the sea.

[1] The end of stag's horn, perhaps a punch for retouch, for taking off the lesser flakes of flint.

[2] The italics are mine, as also sometimes later on.

In the investigated portions of the gravel pit near Soldattorp 2 sections behind the crown of the mound showed from above downwards:

a. 2.40 and 2.30 m. stratified gravel (in which the cultural stratum was lying).
b. 0.08 m. turf (wanting seaward and only occurring behind the crown).
c. in one section: 0.10 m. dark gray sand. In the other: 0.15 m. yellow sand. 0·05 m. gray, in the air blackened sand.
d. moraine.

On account of the contents the turf must have been formed in brackish waters, and the yellow sand was marine, while nothing could be said about the other sands.

In the steep section near Soldattorp the upper proper gravel layer (a) showed an interesting structure: uppermost gravel, then the black coal-impregnated cultural stratum, below this a thicker sand layer, and undermost a thicker gravel layer (fig. 3) [1] Here was seen a discordant stratification between 2 unequal parts of the material along a line, running from the lowest parts near the road and obliquely upwards underneath the building of Soldattorp until, about 18 m. from the road, the line converged to the base of the black coal-impregnated sand stratum (fig. 6). Below this line the layers were lying horizontal, but above it sloping downwards to the road, on the whole, parallel with the line. Moreover, the lower gravel was considerably more pressed and contained less sand, but above the line the gravel was looser and alternating with thick sandy layers. Nearest above the line an actual sand bank occurred, at Soldattorp 1 m. thick and thinning out on each side, and upon this soft sand bank the stone age people settled down; hereon the cultural stratum was lying with sand below and gravel above. The author's explanation is: after the deposition of the lowest gravel, somewhat before the maximum of the Littorina sinking, the land rose a little; then a transgression of the sea anew deposited littoral gravel in discordant statification above the existing horizontal gravel strata; but he adds that in other places this oscillation seems uncertain, *why another explanation may be possible.*

The author's investigation included but the last remains of probably larger dwelling-sites. The cultural stratum (fig. 6) had a different situation underneath the surface: about 3 m. from the road its base lay 1.5 m. deep, by and by becoming higher-lying as it followed the inclination of the layers, so that about 15 m. from the road the depth was 0.75 m. and at last only 0.30—0.45 m.,

[1] All figures and diagrams, mentioned here, refer to the original papers.

where (farthest off from the road) only few objects and separated remains of a black coal-impregnated layer occurred. In the first 12 m. from the road the cultural stratum consisted only of small, narrow, quite separated stripes (in all 14), being the prolongation of the thickest middle layer of the cultural stratum, and moreover farther inward a higher-up-lying, thin, coherent cultural stripe occurred as a prolongation of the upper layer. From here, for a length of about 8 m., the thick cultural stratum was divided in 2 and at last in 3 cultural layers, separated by between-lying lighter-coloured gravel layers. But from there it was one undivided thick stratum for 10—12 m., and at last only remains occurred, as mentioned above. The „crown" of the mound lay 5.37 m. above the sea. The author's explanation is that the stone age people were by storm-floods compelled to withdraw for some time and anew settled down. Each time the wawes have, out of the gravel, washed away the finer materials as sand, coal, and mould, while the flints were rolled. At last the people left the place and later on the „crown" of the mound was deposited.

Speaking of the antiquities, the author has named the upper parts down to the base of the cultural stratum as follows:

1. The upper *surface layer*, 0.20 m. thick, was unstratified and stirred up by plough and spade, mostly containing refuse and but some few antiquities besides many later objects from the present times.

2. *The nearest underlying gravel layer*, stratified and 0.05—0.15 m. thick, was gray with mould, containing no present objects but specially refuse, a few stone implements, and fragments of pottery.

3. The (cultural) *black sand layer,* 0.15—0.30 m. thick, contained finely distributed charcoal, a great abundance of chipped flints (many implements), many fragments of pottery, and a number of scorched stones (distinct remains of fireplaces). In this cultural stratum the acute edges were generally worn away by the waves. This stratum was in one place divided in the upper, middle, and lower black layer with between-lying gravel layers.

The **antiquities** were mostly of flint, the author found only 4 axes of rock, 3 ground and 1 unground; formerly there had been found 1 ground axe of diabase, 5 fragments of grinding stones, and *1 hand-mill or grinding stone*. Besides, fragments of pottery of unequal material and quality, but no implement of bone were found. Remains of bones were few and very fragmentary.

Flint objects are made of 2 different kinds of flint, both with a very glossy fracture. Moreover, a third kind of flint with a dull and

rough fracture occurred in the mound, but it has never been used for implements in this place, the edge being less acute and difficult of working. This kind of flint must, therefore, be ground as at Sibbarp in the neighbourhood, where such ground axes and chisels besides numerous preparatory works were found. Probably the people used the flints on the shore, but hardly dug flints out of the moraine.

Flint refuse was abundant (9.623), while actual implements were little numerous. *In this place, not one single refuse or implement was found ground and polished*, but many were scorched. In the parts, acted upon by waves, all refuse was rolled, but *it often was difficult to settle, if it was rolling or the use that had made the acute edges dull and removed small particles.* In the two upper layers (1. and 2.) many occurred, but only a few had acute edges, while in the cultural layer (3) only a minority was rolled.

Of about 125 *flakes* (only 4 in 1. and 17 in 2.) only 54 appeared rolled.

Of 52 transversely edged *arrowheads* (5 in 1. and 6 in 2.) only 20 were rolled.

Of 6 certain *knives* only 1 occurred in 2., but none in 1.

Of 68 smaller *scrapers* ($2^1/_2$ in 1. and $10^1/_2$ in 2.) only 3 were rolled, but the rolling was nearly impossible to settle.

Only 2 certain *borers* occurred, while 8 were uncertain.

No blocks, but 99 *nuclei* (3 in 1. and 7 in 2.) occurred, some rolled, some scorched.

30 certain and 5 uncertain *tranchets* (1 in 1. and 2 rolled in 2., but of these one was lying near 3.), 3 rolled and 2 scorched, were here somewhat larger and generally more carefully chipped than in Ertebölle. Besides, 6 tranchets were found in other places.

12 *around-chipped axes,*[1] 4 rolled, were only found in the cultural stratum.

Objects of rock: 1 unground axe of sandstone (planyxa, tranchet). 3 ground (badly) greenstone axes (only 1 found in 2.). 3 grinding stones in 4 fragments, and 1 hand-mill or grinding stone.

Brøgger junior (pp. 52—6 in „Oxer af Nöstvettypen" 1905) says: At Lihult only rock axes are found, while at Limhamn flint axes and only 4 of rock. The Limhamn rock axes are another type than the Nöstvet type, „a near-standing but, however, distinctly deviating type from the Hästefjord type, and their form might be

[1] This axe of flint is in Sweden called rundtom slagen yxa, in Norway Kjerneoks (K. Rygh), in Denmark Flintox, and in France le pic. It is probably older than Skivespalteren (le tranchet).

derived from the chipped flint axe" (Kjellmark). 1872 Kurck found the Limhamn type at Lindormabacken. 1875 Cederström had 3 main types: the round axe (the butt-necked), the Limhamn type, and the Lihult type. There is some similarity between the Limhamn type (the rugged four-sided) and the Lihult type (the rugged two-sided). The Limhamn type is characterised by rude poorly work, generally ground only at the edge, perhaps sometimes over the whole surface, but traces of chipping visible; the section is various, most often from pointed-oval to quadratic. The breadth of the edge is generally greater than the Nöstvet type and flatter. The Limhamn type is concentrated to Scania and Blekinge, not longer north. But one axe of this type is found at Lihult and, perhaps, also some in Värmland, Nerike, and Östergötland.

Fragments of pottery: No dissimilarity between lower and higher layers occurred in the implements, but much more considerably in the fragments of pottery. At least some and twenty vessels were found, thick-walled in the lower parts and thin-walled in the higher ones, but in the middle as many thick as thin. Only modern shards occurred in 1., and 20 thin and only 2 thick in 2. In 3., the cultural stratum, only thick shards, 257 in all, were found in the lower part, but in the upper part thin shards, 268 in all, and some thick ones, 34 in all. In this calculation are not included the 48 thin and 29 thick shards from uncertain places of the black stratum.

The *thick vessels* were of coarse material, richly intermingled with sand and granitic particles, badly burnt and less solid, made by hand and with finger impressions, and partly unornamented, partly with very simple ornaments. Several fragments were distinctly rolled. Two kinds were found: *nearest the bottom* of a most coarse material, slightly burnt and little solid so only small fragments occurred, unornamented, and without a round mouth but forming an elliptic dish or boat-shaped cup; they were made of thick clay stripes pressed together by the fingers. *Higher up* of a coarse material and badly burnt, but more solid why the fragments were larger, unornamented or with a simple ornament of commonly lengthened shallow impressions; they were made of more or less thick stripes and by the flat hand formed unto sometimes large vessels with tap-shaped bottom.

The *thin vessels* were of finer material, certainly of washed clay, with swelling belly and mouth, and sometimes with ornaments near the mouth; the bottom is unknown. These vessels were certainly very small and not made by the fingers, but by the use of an implement for smoothing the surface, as indicated by fine crossed lines

both inwardly and outwardly. The ornaments, as small round hollows or shorter and longer lines, are made by the fingers and sometimes by a pin.

Fireplaces were indicated by charcoal, generally fine but seldom as larger pieces, by some scorched objects, and by the many scorched stones found everywhere in the black stratum without arrangement, specially lowest and mostly as fragments or small pieces, indicating countless fireplaces.

Vegetable remains: In about 10 different places larger pieces of charcoal, 8 oak and 1 ash, and some pieces of half-decayed wood, uncertain foliferous trees, occurred besides fragments of hazel-nuts in one place.

In the cultural stratum, but not *in situ, an impression of a wheat grain* was found in a shard, according to Sarauw one of the stone age's cultivated species of wheat, probably Triticum dicoccum. In some other shards there were also found impressions: 4 of straws, 1 of chaffs, 1 of coniferous needles, 2 of leaves, and 2 or 3 of pins besides some impressions of unknown plants or animal relics The chaffs are perhaps also of the same wheat.

Remains of bone are unexpectedly few and, as a rule, very fragmentary. They have probably been more numerous, but by and by demolished. Dissimilar layers had a fauna of dissimilar character. Cervus elaphus and capreolus, Halichoerus grypus, and Canis familiaris were found. Particularly from the lower part of the black stratum some uncertain mammals and many small fish-bones, even one bone of a bird, but no shells of molluscs occurred.

To be noted is that where the black stratum was divided in separat layers, one fragment of a bone of Ovis aries and one of Sus scrofa (domesticus?) were found in the upper black layer. From 2., the gravel layer below the surface layer, one bone of Ovis aries, one of Bos taurus (domesticus?) and one of Sus scrofa (domesticus?) were found. The author remarks: The bones of Sus scrofa are not to be taken into account, because the bone in 2. was found nearest the surface layer, so it is uncertain if it was lying in unremoved stratified gravel, and the bone in the upper black layer had a consistence, indicating that it is from present times, since even fine vegetable rootlets were seen on its surface, why it is propably fallen down by down-sliding from above. It is impossible to avoid such small down-slidings. On account of the condition of the bones it has been impossible to settle, if Sus scrofa and Bos taurus were tame or wild animals. At least, sheep seems to belong to the upper part of the dwelling-site.

The Archæological Age of the Dwelling-Site.

The following objects are formerly found in the surroundings of Soldattorp, but from uncertain places: 56 tranchets (of 20 were 8 rolled), 41 around-chipped axes (of 19 were 8 strongly and 6 less rolled), 24 greenstone axes (15 badly and 7 better chipped, 4 rolled), 10 „Slagstoks" of horn, and 2 greenstone axes with shafthole in the Museum of Lund. One ground thin-necked flint axe belongs to a private person.

Of all formerly investigated dwelling-sites from the stone age, Järavallen is most like the Danish kitchen middens from the older stone age just in regard of the condition of stone implements, particularly those of flint. The author compares the contents of Ertebölle and Klintesö to those of Limhamn. It seems, then, with precision to be evident that the dwelling-site at Limhamn belongs to the older stone age.

Similar *chipped flint axes* are in Sweden found in the following dwelling-sites:

In Scania: Ringsjön, Lindormabacken, and Kullen's lighthouse; Sofiero.

In Blekinge: Fornanäs, Torsö, and Pysslingebacken.

In Bohuslän: Koön near Marstrand, Ramberget in Hisingen.

In Dalsland: Rådane's farm in the parish of Hesselskog.

Single found, for instance, in „Statens Historiska Museum of Stockholm": Bohuslän 5; Dalsland 4; Västergötland 1; Halland 3; Scania in all 75 as along the western coast 15, southern coast 12, eastern coast 5, central Scania 11, and 19 from uncertain places; Blekinge 1.

Greenstone axes of the same or similar types:

In Scania: Ringsjön, Lindormabaeken, and Kullen's lighthouse. In „Statens Historiska Museum": in Scania 9 and in Blekinge 6.

From Bohuslän, Dalsland (the lake Hästefjord), and Västergötland are found a multitude of rugged greenstone axes of a somewhat deviating type with a triangular diameter, while at Limhamn with a pointed-oval diameter. Some similar axes occurred also in Värmland, Nerike (at the lake Vättern), and Östergötland. All that shows that flint and greenstone axes are mainly found along the coast or near the coast and on the shore of lakes.

Pottery: In Järavallen occurred (1) large vessels with tap-shaped bottom and thick walls of coarse material, made by free-hand, besides shallow thick-walled cups of similar or worse material. In the Danish dwelling-sites from the older stone age just these two kinds

of vessels are formerly found, particularly at Ertebölle. But at Limhamn the large vessels have not a pointed, but a tap-shaped bottom and the peculiar ornamentation over the whole surface, which two peculiarities are never found in the stone age of the North. In both cases the vessels were intended to stand between stones or pressed down in the ground. Also the cups certainly belong to the older stone age. (2) Also the thin-walled vessels are represented in the 5 older Danish kitchen middens. Characteristic of Järavallen is that thin vessels are found together with thick vessels and older implements, but never with those of the younger stone age, while in Denmark they are found together with supposed younger implements, forming the transition to the younger stone age. At Ertebölle, Aamölle, and Havnö the thin shards were found in the parts farthest from the coast where also a younger character appeared, at Klintesö they occurred together with scrapers of a form characteristic of the younger stone age, and at Faareveile such vessels had a form and outfit more like the vessels known from the dolmens." But all these mounds belong to the older stone age, preglacial, as I have shown in Palæolithic Chronology.

„The *thin-walled* shards have 3 different ornaments: (a) 2 rows of shallow impressions below the mouth, a similar ornament is found at Hammeren in Bornholm but not yet properly investigated. (b) Deep, straight grooves or lines, also found in Bornholm and in the Havnö and Faareveile mounds. These two ornaments are considered as belonging to the beginning of the younger stone age. (c) The ornament in fig. 28 p. 95 of a clayey mass, placed on the wall below the mouth, is only found at Limhamn.

The *thick-walled* shards have 2 ornaments: (d) 3 rows of small rectangular impressions and underneath impressed quadrates, not found anywhere else. (e) Comma-like impressions below the mouth, very similar ones are found in the Faareveile mound and by S. Müller referred to the beginning of the younger stone age.

There are no analogies found on Ringsjö or in Blekinge. Sarauw refers the ornaments of Limhamn to the beginning of the Danish younger stone age; but Kjellmark says: the thin shards are younger than the thick ones, but there is no reason for not referring Järavallen to the older stone age. „As long as the chipped flint axes take the lead of chipped implements, the older stone age is ruling". Stone implements of all layers are belonging to the older stone age, but here we find some types, not common in formerly investigated older finds as the best formed knife, some scrapers, greenstone axes, and grinding stones. This and the evolution of

pottery in the upper part indicate that „the archæological age of this dwelling-site may, with a rather great certainty, be referred to the latest times of the older stone age."

Below the cultural stratum, underneath the above mentioned line of discordance, in the strongly pressed gravel layer even down to the bottom of the mound, the author found chipped flints etc., specially refuse and flakes and even some implements. Therefore, on account of the dispersion and the depth underneath the bottom of the cultural stratum and because the between-lying layers wanted or, at least, were poor in refuse or other signs of human agency, then it is quite clear that here only accidental visits occurred upon the shore and that it was no continuation of the overlying dwelling-site. Down here, for instance, 1.30—2.50 m. below the surface many objects occurred, partly little deviating from those of the dwelling-site, as large flint pieces, scrapers, axes, and pointed implements, and in several places scorched flint pieces, but no scorched rock fragments, no pottery shards, and no larger charcoals or coal-impregnated layers. All objects were to a high degree rolled. Accordingly, it must belong to a much earlier part of the older stone age. The axes are here larger and appear more roughly chipped than in the dwelling-site. The author has great expectations of a further knowledge of the oldest stone age from these finds.

In the region of **Sibbarp,** immediately south of the town of Limhamn, workmen in the gravel pits had formerly found ground axes and chisels of flint and greenstone, fishing-hooks of bone besides large chipped flints of different forms etc. Here no special insvestigation was made, since the antiquities were found much dispersed and only accidentally and some good sections already occurred. During my visits new finds were continually found, but only few ground implements occurred. The highest point of the here up to 2 m. thick Järavallen was 4.41 m. above the sea, ending steep landward and sloping seaward and resting directly upon the moraine. Shelly gravel was found throughout the entire mound, particularly in its outer parts. The stratification seemed homogeneous all over. This difference from Soldattorp was augmented by the antiquities, representing a great multitude of rudely chipped flints all of the opaque kind with dull, not glossy fracture and of different types. Most of them were 14—18 cm. long and 4—7 cm. broad, thickest (2—5 cm.) in the middle and of a mostly quadratic or rectangular diameter; some ones had a lengthened oval or elliptic form. At first sight these simply chipped flints appeared to be preparatory works or „Planker" for ground axes, so common in the last part of the

younger stone age. According to the statements of the workmen, they were most often found nearest below the grassturf until 0.50 m. deep, but now and then deeper and even down to the bottom; some were found down to about 3 m. below the surface. Scorched refuse occurred here and there down to 0.50 m. below the surface. In one region about 300 large chipped flints were found. Similar finds occurred also farther north in the town of Limhamn. More than three-fourth were strongly rolled. Such preparatory works are found in many places in Sweden and specially in Denmark, where at Omö an actual workshop was found on the shore, why the author considers Sibbarp a workshop-site. Here no remains of fireplaces or coal-impregnated layers and no pottery occurred, why it hardly has been any dwelling-site.

Moreover, here are also found of flint: 1 ground thin-necked axe, 5 ground chisels, 1 arrowhead with shoulder, 8 javelin heads, and 4 daggers, besides 1 boat-shaped greenstone axe, 2 pieces of grinding stones, and 6 fishing-hooks of bone. These objects were highly rolled. The author, therefore, considers the Järavallen at Sibbarp as, on the whole, deposited during a late part of the younger stone age."

Kjellmark's own statements, mentioned above, evidently prove that the so-called dwelling-site at Soldattorp belongs to the Danish older stone age, no ground polished implement of flint being found there; the so-called hand-mill is dubious, as Kjellmark himself characterises it „or grinding stone." The ground thin-necked flint axe, in possession of a private person and formerly found in the surroundings from uncertain place, cannot belong to this dwelling-site. According to my views in „Palæolithic Chronology 1911," Soldattorp is, then, preglacial and palæolithic. Moreover, the grinding of rock implements was a palæolithic process where flint was scarce or wanting, since the edge of the chipped rock was not so acute as in flint; the pottery art was in use by the people of the older stone age and passed, of course, through an evolution. But, when Kjellmark is of opinion that Soldattorp is from the latest time of the older stone age, he cannot be right, since Soldattorp must cover a great part of this age; and the few finds below the line of discordance do not correspond to his expectation of a much more ancient time, as they are only removed somewhat earlier from a common original dwelling-site in another near-lying place. However, there are two dubious facts at Soldattorp, the occurrence of bones

of supposed domestic cattle and the impressions of a wheat grain and some chaffs. But, as mentioned above by Kjellmark, most of these bones may probably be partly present ones, explained by down-sliding and marks of rootlets, partly so decayed that it was impossible to settle if tame or wild. But one rib of Ovis aries was found in (2) the nearest underlying gravel layer below (1) the surface layer, and the upper part of „Kanonbenet" (probably tibia) of Ovis aries in the upper layer of the black cultural stratum (3); these two bones of sheep might, however, have been ploughed down or slid down from above, if they were not a later accidental admixture from neolithic times. This I cannot prove, but on account of these two bones to conclude that this people had domestic animals, seems hardly possible. The impressions of one single wheat grain, Sarauw's Triticum dicoccum, and of some chaffs, each in one shard only, can hardly settle the neolithic stone age. In „Zeitschrift für Ethnologie Heft 5 1911 p. 822," Eduard Hahn in his treatise „Wirtschaftliches zur Prähistorie" remarks „that we lay too much stress upon the animal food in the stone age and that the people must also have lived on wildgrowing fruits, seeds, and grains specially of wild grasses. The later corn-culture certainly supposed the use of grains of wild grasses as its necessary prototype." Perhaps these impressions, probably occurring during the construction of the vessels, originated from wildgrowing grasses and not from cultivated wheat species. We must not forget that during Miocene and perhaps beginning Pliocene the climate was warmer than now. These impressions do not absolutely prove that the people used corn as food. I cannot accept these impressios as a sure argument of the neolithic age. To speak of a transition to the younger stone age, will not do, since the Ice Age lies between the older and younger stone age.

It is not possible to deny that the so-called dwelling-site at Soldattorp belongs to the older stone age of the North, according to my views being then palæolithic and preglacial, but the salient point is to prove that this dwelling-site was *not lying in situ*, but was removed from another place during the Ice Age and consequently was preglacial. The supposed postglacial warmer period of the Littorina Sea I have formerly absolutely denied in „Deviating Views on the Glacial Period 1910"; these effects were a result of the removal by the glaciation with contents of a preglacial warm fauna and flora. The present different height of Järavallen from 5—12 m. above the sea was not produced by a different sinking and upheaval in postglacial times, but Järavallen is a moraine, deposited upon the already at that time existing Scania of a present formation in the

main, though the glacial removals have somewhat altered the surface. Kjellmark even acknowledges that his explanation of the sea's reiterated transgressions is not confirmed in other neighbouring places, and that another explanation may be possible. The author's own statements may enable the reader to judge for himself; however, some hints may explain my views.

In the harbour, at a depth of until 2 m., the coast-find of much flint refuse and many primitive chipped flint implements besides a greenstone axe, must indicate a removal of preglacial objects by the ice

The proper coarser „moraine," lying underneath the whole Järavallen and underneath the thin gravel layer of the lower ground seaward, is removed by the glaciers, but also the overlying gravelly and sandy deposits, except the postglacial superficial and partly ploughed-up grassturf, belong to the moraine, mostly afterwards deposited by the fluvio-glacial floods. However, landward the deposits rested not on a proper moraine, but directly on turf and stratified sand; at least the stratified sand was removed during the glaciation and probably also the turf; but the turf might, perhaps, have been the original preglacial turf layer in this place. The sometimes larger granitic fragments up to 1 square meter in the lower parts of the horizontal gravel layers, must have been transported by the advancing ice-sheet or fallen down from the melting ice here, afterwards covered by stratified gravel during the fluvio-glacial floods; of these larger fragments Kjellmark remarks that they are „perhaps transported by ice." The so-called littoral sand, in a thin layer covering the moraine of the lower ground seaward, is probably also deposited by the same glacial agency, but not marine (littoral); the fluvio-glacial agency had, of course, a rolling influence. The line of discordance with the sloping condition of the overlying stratified layers must have been produced during the latest part of the fluvio-glacial action With regard to the two sections Kjellmark remarks that, on account of their contents, the turf (lying behind the „crown") is probably deposited in brackish waters and the yellow sand underneath the turf is marine. Both turf and sand must have been removed, but I cannot tell from where. If there were any remains of a marine fauna or flora from the upheaval (about 10—20000 years ago) in middle Tertiary, or if there was a bay behind before the Ice Age filled up these regions, I do not know.

The situation of the supposed dwelling-site *in situ*, the cultural stratum, is already described according to Kjellmark The people lived upon „this soft sandbank," what hardly can have been the case.

There was no shelter, and no kind of abode could be fixed in the loose sand. The axiom of the living upon the actual shore, exposed to reiterated transgressions of the sea, seems rather unreasonable even for people feeding on molluses; the people of the stone age hardly were so foolish. We must rather suppose that they preferred to live on the soft grassturf in a sheltered wood, where it at least was easy by fire to produce an open place, if such a one was not already at hand. The supposed many dwelling-sites *in situ* along this long and often interrupted extent, are hardly or rather not maintainable. Why are there, then, found no hearth, but only countless so-called fireplaces, however, without any arrangement of stones, when lying *in situ*? The many scorched objects and stones everywhere without arrangement, supposed to indicate these countless fireplaces, do not tell in favour of a situation *in situ*, but of a removal. The different layers of the cultural stratum, separated by sandy layers where all other signs than the rolled flints were wanting, can hardly be explained by the washing-out of reiterated transgressions of the sea; it is hardly to be supposed that the people always stuck to such unreasonable dwelling-sites. Kjellmark also remarks that such transgressions are not found in adjacent regions, why another explanation may be possible. My explanation is that a removal during the Ice Age has produced these facts. This removal may partly have taken place in a more or less frozen state, so lighter objects were kept together in the charcoal-impregnated layers, while heavier objects as the flints are partly fallen out and embedded in the sand removed at the same time. The cultural stratum was also partly dispersed in many separated smaller portions, hardly explainable without a removal. Implements, potsherds, and fragments of rock were sometimes rolled („the fragments were not particularly well rolled"); but Kjellmark remarks that it often was difficult to settle, if it was rolling or the use that had made the acute edges dull and removed small particles This rolling is explained as produced by the waves; but the rolling might have been produced during the removal and by the fluvio-glacial floods. Remains of bone were unexpectedly few and as a rule very fragmentary, what appears curious if lying *in situ*. The inferior opaque flint was never used for implements here as at Sibbarp, what will there be referred to. The large amount of refuse and the many primitive chipped implements in the different cultural layers and partly in the between-lying sand, besides in the overlying parts and even in the underlying parts down to the bottom of the strongly pressed horizontal gravel layers underneath the line of discordance, this also indicate a real

removal; it is, at least, very difficult to understand how the objects of the lowest gravel can be supposed to lie *in situ*. All objects here below were rolled to a high degree and here also some scorched flint pieces were found, but no potsherds or charcoals. The author's explanation of accidental visits here on the shore long before the existence of the higher-lying dwelling-sites, appears at least curious.

As to the pottery, Kjellmark maintains that the thin shards are younger than the thick ones, but there is no reason for not referring Järavallen to the older stone age. Here thin vessels are found together with thick vessels and older implements, but never with implements of the younger stone age. In the lower portion of the cultural stratum only thick shards were found, in the middle portion as many thick as thin, and in the uppermost portion 268 thin, but only 34 thick shards, while higher up in (2) the nearest underlying gravel layer 20 thin and only 2 thick shards occurred. These two different kinds of shards are, then, chiefly found in their proper place, the thick ones being the oldest. The consequence of these relations seems to be that the thick shards were lying lowest also in the original dwelling-site that probably, as in Denmark, was not lying far off, and that the contents were removed together, as a whole, in a frozen state and later partly divided and dispersed. If not so, the thin shards as the uppermost would have been removed first and now found undermost. The implements are not dissimilar in the different portions.

Järavallen at **Sibbarp** is unfortunately not investigated, since the antiquities here were found exceedingly scattered and only accidentally and already some good sections existed, why he only consulted the informations of the workmen and some existing sections. Formerly ground axes and chisels of flint or greenstone, fishing-hooks of bone besides large chipped flints of unequal forms etc. were found. During his investigations at Soldattorp still continually new finds occurred, but only few ground implements were found. Later on, however, he mentions only 1 ground axe and 5 ground chisels of flint, belonging, of course, to the younger stone age, besides some other objects probably from the older stone age; nearly all are highly rolled, but their findplaces are not related. Some few neolithic objects appear, then, later intermingled; but to refer Järavallen here to neolithic times, while the adjacent Järavallen at Soldattorp is palæolithic, seems unreasonable; the depositions must have occurred at the same time. The mound, also here resting directly upon moraine, consisted of homogeneously stratified shelly gravel everywhere, but was steep landward and sloping seaward. However, most

characteristic here are the many rudely chipped larger implements, all made of the peculiar opaque flint that at Soldattorp was never used for implements; along a region 300 were found. Kjellmark considers these as preparatory works for further grinding into axes and chisels, a real workshop, why he places Sibbarp in the periods of the giants' chambers or the cists. But, if they are really lying *in situ* and only preparatory works from a workshop, why are they found so exceedingly scattered and only accidentally, and why is apparently none of them mentioned as being ground? Kjellmark speaks, however, of ground axes and chisels of flint and greenstone, found formerly, but he mentions not that these flint axes were made of this same bad sort of flint as the preparatory works. They are most often found nearest below the grass-turf, but now and then also deeper, even down to the bottom; more than three-fourth were strongly rolled, propably during the removal. Kjellmark mentions also as chipped flints: 3 blocks, 2 nuclei, a great amount of flakes, etc. Scorched refuse was here and there found down to 0.50 m. below the surface, but no remains of fireplaces or coal-impregnated layers and no pottery, why „it hardly has been any dwelling-site." Certainly not, but all these chipped implements of an inferior flint must be removed from an original dwelling-site during the Ice Age and accordingly dating from preglacial times as at Soldattorp. My opinion is that all these so-called preparatory works were actual implements used in their present form, but hardly by the same people of Soldattorp, as no opaque flint seems used by these. It appears to me not quite unreasonable to conclude that these inferior implements were used by another lower race, perhaps the thralls of the superior people of Soldattorp, living in an original adjacent place, why we find their poorer remains removed to this neighbouring place. These peculiar implements are found from Sibbarp northward to the south-eastern part of the town of Limhamn. Kjellmark remarks that at Sibbarp the gravel of Järavallen was shelly, but not at Soldattorp; why? That the supposed lower race lived on molluscs, while the superior race of Soldattorp did not, might be only a passing fancy. Or did a bay exist behind in preglacial times, or is it but the remains from the upheaval in Middle Tertiary? No actual investigation has been made here. At last, I should propose that also the proper moraine and the ground underneath this moraine, both at Sibbarp and at Soldattorp, were investigated to find out if any objects occurred in or below the moraine.

According to Kjellmark, preglacial and palæolithic chipped flint

or greenstone axes are found in different places of at least the southern one-third of Sweden, so this preglacial culture appears to have had a large extent in Sweden.

C. D. Reventlow and H. Hildebrand. Fynden vid Ringsjön.
Månadsblad 1883, 1886, and 1889. Ymer 1905.

„Around the lake Ringsjö, in the interior of Scania, 20 finds besides 2 or 3 small ones were discovered about 25 years ago. The Ringsjö forms two confluent lakes; round the western lake the finds are abundant, less round the eastern one. A special map is found in Ymer p 157. Already before the lowering of the lake in 1882—83 a workshop from the stone age had been found. Near the outlet, Rönnea, 2 so-called „covered finds" occurred, while all the others were „open coast-finds," lying in the lake and after the lowering partly on the present shore; at Finhult and some other places they were found above the former shore line. The Ringsjö had formerly been much larger, the surroundings consisted mostly of boggy ground, at Ormanäs it is about 900 m. before the solid ground is reached.

The geologist **Lundgren** investigated the stratification near the outlet: undermost a layer of sand and gravel, sometimes mixed with a little clay; then a layer of more or less mouldy vegetable remains, sometimes an actual turf (the cultural stratum) of various, however, not considerable thickness up to half a meter; uppermost, at least nearer the present shore, a small sand layer. In these layers a great abundance of stones, often of very considerable dimensions, were lying, those in the lower sand layer pushed up into, even through the turf layer. None of these layers appeared formed on land, the lowest one being an old lake bottom, while the turf layer is formed in more stagnant waters. In the turf layer there were found remains of 4 certainly freshwater fish and 23 species of flora. Of these latter ones 6 tell distinctly and 5 probably in favour of a formation in water. Salix cinerea, nuts and ears of hazel, Equisetum, and seeds of coniferæ belong to a terrestrial vegetation, as also branches of trees. Against a formation in water only Ranunculus repens and Rubus idæus speak. Antiquities were found partly in the turf stratum itself and partly in the boundary line of the underlying sand or somewhat down into it; in the upper sand layer they were perhaps washed out from the lower layers during a lower level. Some pottery fragments showed signs of the action of waves. It was related that large stumps of oak had been found standing out in the lake rather

far from the present shore, probably from a time of a lower level. Other things plead in favour of a formerly larger lake with another outlet.

At „Na", the outlet, in one place the antiquities were lying in the surface or immediately below it, probably a thin turf layer being removed by the waves; but in another place a sometimes one foot thick, however, mostly thinner surface layer of turf without antiquities covered the cultural stratum of one and a half feet's thickness, containing antiquities of stone and bone besides remains of meals, particularly animal bones of which the bones containing marrow were cleft. This place contained 10—12,000 potsherds, of which about 3,700 were ornamented. Here are mentioned 52 flint axes of the older type and 180 of the younger type, but in the lowest layer no older, only 6 younger axes, why Reventlow considers this lower layer as belonging to the younger stone age. For the rest, older and younger axes were intermingled. However, no objects, so common in the period of the cists as finely chipped spear- and arrow heads, daggers, crescent-shaped objects, and hanging ornaments of slate, were found here. On the whole, **no slate** was found on Ringsjö.

Of *animal* remains are mentioned: 166 Cervus elaphus, 58 wild boar, 25 elk (in the Ertebölle mound only a couple of bones), 17 beaver, 8 roe, 10 smaller bos, 3 badger, 2 otter, 2 ferret, 2 wild cat, 1 bear, and one bone of a human skull; but no bone of dog was found and no bones were gnawed by dog. Of fish some bones and scales of 4 freshwater species occurred, but of bird only a fragmentary bone of swan.

Of *plants:* particularly such growing in or near freshwaters, but also charcoals and other remains of oak, hazel, Salix caprea and cinerea, Rhamnus frangula, but no beech; exceptions were hazel-nuts, oak-nuts, and seeds of raspberry.

The *stones* in the cultural stratum were often so eroded that they collapsed by the slightest touch, probably formerly scorched, while Lundgren considers them eroded *in situ.*

Of *implements* were found:

Many *scrapers* of flint, but only 2 of greenstone. They often were round, but most of them were either of an oval form or of a more lengthwise out-drawn form of uniform breadth. The edge was mostly rounded. Two had a tang for a wooden handle (also common in Danish coast-finds).

Flint *nuclei* were as usual or with tang, in abundance.

Rudely chipped *flint axes* were of the same types as in the

Danish kitchen middens and coast-finds and even in Scanian coast-finds. Nearly all were either (a) skivespalters, tranchets[1], or (b) of the type with pointed-oval diameter. The younger types of flint axes and chisels, either ground or unground but more carefully made, all with rectangular diameter, commonly occurred as fragments; only some few entire specimens were found, why their supposed number might be too high.

Greenstone axes and chisels were quite numerous, but only 4 axes with shafthole occurred. Usually 2 types: (a) round or oval diameter with somewhat rugged faces, and (b) round or oval diameter at the base, but soon getting plane on one face down to the edge while the other face was rugged. A third more seldom type (c) had a pointed-oval diameter, usually only ground at the edge and on the most rugged part of the faces, while the lateral sides were unground; of this type 4 were quite unground.

Flint borers of the older type with pointed-oval diameter.

Arrowpoints: not many types; in some places quite wanting; partly with tang and partly unfinished; seldom with transverse edge.

Hammerstones most of flint, some of rock.

Flint nodules numerous, some carefully made.

Flint flakes and refuse in great abundance in several places.

Refuse of greenstone in great abundance at the railway bridge across the outlet.

Implements of bone and stag's horn: besides punches one hammer and some picks of horn like those at Spiennes and Brandon. No object of stag's horn with shafthole was found. Later on in Ymer are mentioned one fractured eel-spear of horn and some harpoon-points besides a supposed preparatory work for a fish-hook. Also one perforated tooth of bear and one of boar occurred.

Fragments of *pottery* were, specially at the outlet (Na), numerous, generally an intermingling of older and younger forms, but also at Fulltofta (F) and at the railway bridge (N) some few occurred. The vessels were of quite large dimensions, generally of a diameter of 20—40 cm. at the mouth, while smaller ones were only an exception. No traces of handles, ears, or, apparently, holes for hanging were found. Of 90 fragments of the bottom 85 indicated a pointed bottom as in the older Danish mounds and only 5 a flat bottom. Several vessels were of a very thick and coarse material, consisting mostly of very coarse grains not to mention small pebbles, with clay for cementing and polishing; only some few were almost free from gravel and pebbles. Some shards were rolled by the waves, but others

[1] The tranchets are in Sweden called „ismeislar" or „skifyxor".

were unrolled, probably lying in covered places. Ornaments sometimes occurred at the margin, but generally on the sides and the lid. The motives were like those from other vessels of the Swedish-Danish stone age, larger and smaller punctate markings, impressed by a stick of the size of a lead-pencil or by an awl-like object and generally arranged in horizontal rows, often several above each other as the common form. Also several motives of trailed lines were found as, for instance, the zigzag line; in 2 shards impressions of the nail; some impressions more like ears or leaves of ferns; others had 3 short lines from one point like the impression of a bird's foot. Sometimes the impressions were made by Paludina vivipara or a species of Helix and in one shard, perhaps, by the marine Aporrhais pes calcanei. Even holes for joining of broken portions seem to have occurred (1886 pp. 192—3). Only some few ornaments were like those in the younger mounds and in the barrows, however, different and not so finely made, as particularly the square motive; they appear more ancient and more analogous to the east-Scanian and Blekingian dwelling-sites and also to those from Gullrum or from the cave of stora Karlsö near Gotland, even in some respect to those from Åloppe in Uppland. To be remarked is that some fragments had ornaments not found in Scandinavian dwelling-sites from the stone age. At the outlet occurred an impression of a comb in which one tooth was broken off (fig. 7 p. 161 in Ymer), but no comb was found. Curious was here the impression of a weaving found in two shards (fig. 5 and 6 p. 160 in Ymer), perhaps, indicating a knowledge of weaving. In one shard a skin or pellicle of a fruit was found, perhaps, belonging to the pip of an apple. Some carbonised relics of food occurred on the inner side of shards, indicating cooking. But no traces of cereals were found, only many nutshells of hazel and seeds of Rubus idæus.

Like Sarauw at Maglemose but earlier, Reventlow supposed a living upon a *raft* in summer, but not in winter when it was too cold, though he supposes a certainly warmer climate than now. There were no actual traces of a lake-dwelling, though piles were found driven down through the cultural stratum, but it was quite certain that most of them were worked by metallic axes and that some were certainly used for fishing. Hildebrand mentions 2 oak stumps of piles probably worked by stone axes at the pointed end.

Reventlow *concludes:* Then, at the period of the dolmens and, perhaps, down to that of the giants' chambers, the people lived at the outlet of the Ringsjö upon the lake in summer, but also a less numerous people lived all the year on the shore at Klinta (L) and, perhaps, in some other places."

C. D. Reventlow: Yxformer från stenåldern i Ringsjöfynden.

Månadsblad 1889.

„Montelius has mentioned 2 different types of the Swedish unground flint axes[1]: *A.* without narrow lateral sides has a pointed-oval diameter, rapidly tapering upwards to the butt-end, often almost to a point; and *B.* with distinct narrow lateral sides has accordingly a quadratic diameter with the butt-end a little narrower than the edge. The edge of *A* is generally more rounded off than in the type *B.* The difference appears great, but numerous intermediate forms imperceptibly form the transition between them, the type *A* being older than *B.* Reventlow is doubtful about this last, because *B* is found alone in a lower layer than *A* at the outlet of the Ringsjö, though they are commonly intermingled.“ But, if my hypothesis of a removal by the ice is correct, then the originally overlying *B* (the younger) must have been removed first and consequently now be found lying lowest in some places. „According to Montelius, the type *A* must be the oldest, because *A* was common in Europe outside the North but *B* next to never, and in Scania much more common than in the rest of Sweden; *A* is an evolution of the type *β* in the Danish older kitchen middens with a pointed-oval diameter and in all like the type *A*, except that *β* is unfitly and rudely chipped and always unground. Transition forms from *β* to *A* occur in abundance. The type *A* with pointed-oval diameter seems in the North to have been a local form, peculiar to Scania.

Summary of Axes and Chisels.

The author enumerates the finds with the contents of each and from these specifications I have collected the following summary:

Greenstone axes without shafthole, unground or more and less ground, in all 183, of which only 6 had a quadratic diameter, 53 a cut-off[2] oval, and 3 a cut-off pointed-oval diameter. Only 4 axes with shafthole were found.

[1] These unground flint axes, as they are called in the older stone age of Denmark, are now generally called in Sweden the around-chipped axes and in Norway Kjerneökser; they are quite different from the tranchets and probably older. They correspond to les pics.

[2] The pointed or somewhat rounded lateral sides are cut-off, a kind of transition to the quadratic type.

Rudely chipped, *older flint axes*, in all 474:

1. Skivespalters, tranchets („ismeislar“)	155
2. The type β („Retyxa“, straight axe, with pointed-oval diameter)	298
3. The by-form of β („Tväryxa“, tranverse axe, with pointed-oval diameter	17
4. Chisels of the type β	4
	474

Younger flint axes (occurring also in the barrows):

1. The type A (with pointed-oval diameter)	3	5
2. The by-form of A (with cut-off pointed-oval diameter)	2	
3. The type with oval diameter		1
4. The type B with quadratic diameter:		
a. „Rätyxor“ rectangular	265	272
b. „Tväryxor“ (hollow chisels) rectangular	4	
c. The trapezoid form	1	
d. Chisels	2	
5. Undetermined fragments *(all ground)*		27
		305

Of these 27 undetermined ground fragments occurred: at the outlet of the Ringsjö 18, of which 9 arrowheads and 1 scraper; at Fairyhill 1 undetermined fragment of a ground axe; at Bo 1; at Finnhult 5; and at Fulltofta 2. Moreover, there is expressly mentioned that some few entire flint axes were ground: at the outlet of the Ringsjö 1 flint axe with trapezoid diameter ground on the broad-sides or faces, but it was so broken that it is unsettled if Rätaxe or Tväraxe, and one of the *older* axes of the type β was ground at the edge; at Northern Ormanäs only one axe of the so-called younger type occurred, viz., a ground Rätaxe with quadratic diameter, but as found in an open coast-find it may be a later admixture; and at Bo is mentioned that in all 14 finely chipped, often ground, so-called younger flint forms of axes were found.

Accordingly, Greenstone axes without shafthole 183 + with shafthole 4 187
Older flint axes 474
Younger flint axes 305
in all 966

At the railway bridge (N) across the river Rönneå a well-chipped spearhead of flint, 39 older and 15 younger axes were found, besides 25 greenstone axes without and 2 with shafthole.

At the outlet of Rönneå (Na) almost 12,000 fragments of pottery occurred, about one-third ornamented. Of 950 flint scrapers of various forms the greatest part belonged to the younger stone age according to S. Müller, but many to the older stone age. 52 older flint axes and chisels occurred and 198 younger. Lowest in the cultural stratum no older axe occurred, but many younger ones of the quadratic type *B*. Only 2 small fragments of a dagger or well-chipped spearhead of flint were found here. 14 greenstone axes and 1 with shafthole.

In the coast-find at Northern Ormanäs (R) 46 older flint axes and only 1 younger ground axe occurred, besides 13 round or oval flint scrapers of the younger stone age and only 6 scrapers of a longer flake from the older stone age (S. Müller). Accordingly, it is a transition from the older to the younger stone age. 8 greenstone axes.

At Southern Ormanäs (S): 94 older flint axes and 8 quadratic younger, besides 66 greenstone axes, 7 older and 11 younger scrapers.

At Prâmlandet (I): 40 older flint axes and 1 chisel, 17 younger axes, and 11 greenstone axes.

At southern Råröd (C): only 58 older flint axes, 18 greenstone axes, 26 round or oval younger scrapers, but only 11 older scrapers.

At Bo (B): 95 older flint axes and 15 younger, 30 greenstone axes, besides 2 exceedingly well-made flint daggers and 3 well-chipped spearheads of flint (younger).

Some other smaller finds are also mentioned on the western lake.

Round the eastern Ringsjö only comparatively few coast-finds occurred, prominently older types.

At Klinta (L): only 6 older axes and 1 quadratic younger axe, all of flint.

At Finnhult (A): 16 older flint axes and 13 younger, besides 4 greenstone axes without shafthole and 1 with shafthole.

At Fulltofta (F): 10 older flint axes and 4 younger, besides 2 greenstone axes.

Two other insignificant places near Häggenäs had only 1 old axe each.

At Sätofta (G): 3 older flint axes and 2 greenstone axes.

Specially all *flint axes* of the so-called younger type are mostly more or less fragmentary, even the greenstone axes are often fractured. Of the older flint axes only some few are not fractured, though they often at the edge showed signs of the use; probably many fragments of these are counted as refuse. The great amount of flint refuse and in some places even of greenstone refuse indicate that the implements were wrought on the spot.

The various forms of *greenstone axes* are highly indifferently distributed in the different places. The rudely chipped, quite unground greenstone axe with pointed-oval diameter is only found on the Ringsjö except some few from Bohuslän, but not in other places of Scandinavia. The only at the edge ground, but rudely chipped greenstone axe with pointed-oval diameter is not seldom here and in Scanian coast-finds. The entirely ground axe is very seldom, what also is the case with the cut-off oval axe of greenstone. The axe with oval diameter is common here as in the whole Scandinavia. The quadratic greenstone axe is very seldom here, only 2, and it seems also seldom in other parts of Scania and in Denmark. Only 4 greenstone axes with shafthole are found here."

What is, then, the Real Age of the Find on Ringsjö?

Before trying to settle this question, it is necessary to see if Reventlow's many implements from the younger stone age are actually neolithic postglacial and not palæolithic preglacial, belonging to the Danish older stone age.

The 183 greenstone axes without shafthole partly unground, partly ground certainly belong to the older stone age. Rock was used where flint was wanting or scarce, and the inferior chipped edge wanted grinding, probably an invention of the North. Here on Ringsjö 11 axes are quite unground and 28 ground only at the edge and a little upwards. Kjellmark mentions in the palæolithic Järavallen only 1 unground axe of sandstone and 3 badly ground greenstone axes, besides 3 grinding stones.

However, the 4 greenstone axes with shafthole? It may be that these also date from the last times before the Ice Age; we have, for instance, perforated teeth and perforated horn axes in the palæolithic period, and a perforation of greenstone cannot have been difficult. Reventlow does not mention the size of the holes, but such holes were sometimes too small to permit of a sufficiently thick handle of an axe. In Swedish Fornminnesforeningens Tidskrift 12, 1905, pp. 35—44, Flentzberg writes: „The hole is sometimes too small relative to the use as axe. He proposes, as an hypothesis, that these greenstone axes were often used as wedge, having a short thin shaft for guiding it, while a wooden hammer struck the butt-end that was often left uneven and unground. The shaft or handle was too thin for hewing as axe, and many are found with unhurt edge but fractured butt-end; in one even a new hole was wrought. Such implements were used longer than the axes, even down in the metallic age." Used as chisels such axes with shafthole existed per-

haps in palæolithic times. My opinion is that greenstone axes without shafthole are palæolithic and preglacial, while the 4 axes with shafthole may be dubious, perhaps lost in the beginning neolithic period. It is not unreasonable that the neolithic people also settled down here near the Ringsjö.

Of flint axes 474 are rudely chipped and even by Reventlow referred to the older stone age. Of the so-called younger 305 axes and fragments 278 axes are mentioned and of these only 3 were ground: 1 ground at the edge and even by Reventlow referred to the older stone age, 1 trapezoid ground only on the broad-sides or faces, and 1 lying in an open coast-find and then, perhaps, lost later on; but moreover, at Bo Reventlow says: „finely chipped, often ground," so-called younger forms, of which 14 axes are mentioned, however, without telling how many were ground. Of the 27 ground fragments 9 are arrowheads and 1 a scraper. Reventlow, however, says: „Of the older flint axes only some few are not fractured, though they often at the edge showed signs of the use," why we may, perhaps, ask if all supposed ground objects are really ground. The about 270 quite unground flint axes of the so-called younger types cannot tell against, but rather in favour of palæolithic preglacial times, though they are partly used also in the neolithic period. However, the amount of unground flint axes is so exceedingly prevalent compared with the few ground axes and fragments. I have formerly accentuated that the grinding of flint was characteristic of the neolithic age, but it might be a question, if that absolutely holds good in the North where grinding of rock implements was commonly in use in the older stone age. It might be possible that even flint has been somewhat ground in the Scandinavian older stone age before the Ice Age, but I do not know, as yet at least, how it can be proved. It appears, however, not quite unreasonable that some neolithic objects are lost here later on; the ground objects are mostly fragmentary and might have been as useless thrown out in the lake, on or near the shore.

In Ymer 1905 p. 168 there is a drawing, fig. 13, described underneath as follows: „Rather rudely chipped flint axe, intended for grinding, rectangular section, thick neck. $^1/_2$." This axe, also by Reventlow called axe and not preparatory work as he supposes, is a really finished axe intended for use as it is, and not at all intended for further grinding. This opinion of mine is also accepted by a competent archæologist. This axe has a certain similarity to Kjellmark's preparatory works at Sibbarp, but Kjellmark has no drawings of them, only the dimensions.

My opinion is that these unground, more or less quadratic, rectangular types of flint axes are, in fact, palæolithic and preglacial. The cut-off oval or pointed-oval types are also a kind of quadratic types. As to the few ground flint axes and fragments, I cannot give any definite answer, they might be lost later in neolithic times; but on account of these to place the find in the neolithic period, appears to me unreasonable.

Also the round and oval, chipped, unground scrapers I cannot accept as neolithic; there must be a mistake here. And the same is the case with the few daggers and spearheads. It is also reasonable that the chipping reached its acme in the latest part of the palæolithic period, but not in the neolithic period.

But I must, however, call attention to the fact, mentioned later in the Norwegian finds of Mr. Nummedal, that the first postglacial inhabitants seem to have chiefly used older palæolithic implements.

The few implements of bone and stag's horn, the rudely made pottery with simple primitive ornaments, and the animal or vegetable remains do not tell against a palæolithic time. The motives of the pottery are compared with east-Scanian and Blekingian dwelling-sites, Gullrum and the cave on Stora Karlsö, and even Åloppe; all these dwelling-sites are palæolithic. That some potsherds are rolled by the waves, is produced during the removal. However, the impressions of weavings in 2 shards are remarkable; perhaps, a primitive weaving was palæolithic, a not quite unreasonable hypothesis. At Järavallen is already mentioned Eduard Hahn's treatise on „Wirtschaftliches zur Prähistorie."

If the find on Ringsjö is, in fact, palæolithic and preglacial, this find is not lying *in situ*, but is removed out into the lake from other original dwelling-sites on the solid dry land. The raft-theory appears rather too absurd, here as at Maglemose. Reventlow's supposed warmer climate than at present would refer to the close of Miocene or the beginning of Pliocene. The only reasonable explanation, however, is a removal out into the lake by the ice and the fluvioglacial floods. The antiquities are found in the lake or the present lowered shore, but sometimes even higher up than the former shore line. In the two dwelling-sites near the outlet antiquities and other remains occurred mainly in the cultural stratum, but also higher up and even down in the underlying old bottom of the lake. In the layers near the outlet a great abundance of stones, often of very considerable dimensions, were lying, those in the lower sand layer pushed up into, even through the turf layer (Lundgren); this can hardly be explained except by a removal. The entirely eroded stones

throughout these 2 dwelling-sites may not unreasonably represent scorched stones removed from original fireplaces on land. The cultural stratum contained even a terrestrial vegetation, removed. Some turfy mass is probably also removed, but in postglacial times a freshwater vegetation occurred. In the numerous coast-finds the contents are highly and variously scattered. In all the many other open coast-finds no cultural strata are found. The large oak stumps, found farther out in the bottom of the lake, must also indicate a removal. The boggy environs of the lake, in one place even up to 900 m. before solid ground is reached, may also tell against a living in these places. To be remarked is also that not one single arctic slate implement was found here on Ringsjö, why it is quite absurd that Brogger jr. considers this find as arctic-baltic. At last, I must recommend to the reader a reiterated careful study of the author's description of this find.

My conclusion must, then, be that all these finds of the Ringsjö represent the preglacial palæolithic existence of a people, living in other probably not a great way off lying dwelling-sites of the terra firma, the remains of which are now found removed during the Ice Age out into the lake. The comparatively few objects of a probably neolithic origin may have been lost later after the Ice Age; it is at least quite dubious, if grinding of rock sometimes led to grinding partly also of flint, or if the effect of the use is, perhaps, sometimes mistaken for grinding.

Stenåldersfynden i Råå vid Helsingborg.

Carl Wibling, Oscar Almgren, and *Knut Kjellmark.*
Fornvännen 1908 pp. 105—127.

The principal find, the gravel pit (I), was investigated by all three in somewhat various places, why their description varies. The implements belong undoubtedly to the older stone age, and the only explanation must, then, be an actual removal. On account of the importance of proving such a removal from a preglacial place, I have chosen to relate rather too much at length and let the reader judge for himself.

„*Kjellmark* chiefly investigated the geological relations. It is a distinct mound, nearly 9 m. above the sea and indicating the Littorina boundary. The ground slopes gently, forming lower terraces that are deltoid formations of a river from the highest level of the Littorina Sea. This plateau, a stratified formation of littoral sand, rises up to 6.75 m. above the sea. The statification is:

a. present arable layer, 20—30 cm.
b. black or rusty loose gravel with spots of light sand, 0.35 – 1 m.
c. stratified light gravel, 30 – 40 cm.
d. stratified white sand with 2 dark charcoal-impregnated bands, 50 cm.
e. stratified yellowish white sand, 50 cm.

a. was rather rich in flints, most of the flint implements scattered specially at the surface down to 5.5 m. above the sea.

b. sparingly contained flint refuse, one piece of a scorched stone, one small around-chipped flint axe, and one scraper from about 60 cm. below the surface. This layer b, loose and unstratified, containing some larger stones, and with a specially uneven and pitted bottom, indicated a modification in late times by human agencies. The black colour distinctly originated, at least partly, from charcoal.

c. contained no chipped flints.

d. contained, mainly in the lowest slightly charcoal-impregnated band, sharp-edged flint refuse, but no characteristic implements, no scorched stones, or other traces of an unremoved dwelling-site. Kjellmark supposes that flint and coal in d have been washed down from a higher-up-lying dwelling-site.

In respect of a and b the formation seems somewhat dubious.

The owner of the farm related that some time ago the plateau was very uneven and had several larger and smaller hillocks, levelled by his father. The layer b appears not like an unremoved cultural stratum from the stone age, as formerly known in our regions; the layer is too little pressed and the cultural remains too sparingly occurring. Kjellmark finds it highly probable that a former gravel-screening has occurred here.

However the case might be, the fact is clear that the layers contain remains of a dwelling-site from the older stone age of the North. The height of the place appears incredible, since all finds formerly known have shown that they are older or contemporaneous with the maximum of the Littorina Sea, but never essentially younger. Here the find occurs at between 80—60 per cent of the Littorina boundary, a most interesting fact." My opinion, however, is that no Littorina Sea ever existed.

Almgren describes the profile of a trench (I):

„a. dark somewhat gravel-mixed mould (Kjellmark's a + b).
b. stony somewhat mould-mixed littoral gravel.
c. fine somewhat mould-mixed littoral sand with darker charcoal-impregnated bands.
d. fine white littoral sand,

As by Wibling recorded, the greatest mass of chipped flints and nearly all typical implements were found in a, being 40—60 cm. thick. There were found 23 tranchets and around-chipped axes, 18 scrapers, borers, etc., and a great amount of flint refuse, generally sharp-edged and only a few rolled. Formerly was found 1 ground greenstone axe with pointed-oval diameter of the same type as at Limhamn and Kullen. The only object from the younger stone age was a small fragment of a spearhead or dagger, found in the field. Only some pieces had been exposed to the fire, but not a single ground object was found. In other places of the fields of the farm objects from the younger stone age, however, occurred. A small piece of one flat grinding stone of sandstone might belong to the older stone age for grinding of greenstone axes.

b contained some irregular, strongly rolled flint pieces without certain traces of working.

In c one typical transversely edged arrowhead and some flint pieces, sharp-edged or rolled, were found. In the dark bands several smaller pieces of charcoal occurred.

Farther in the north near the Decauville railway (III), where Wibling's fire-hole was destroyed, he only found a fragment of a quadratic flint axe imperfectly ground, and a little farther north-east a thick-necked axe only groud on the broad-sides, besides farther north a thin-necked axe and in the churchyard half a flint saw.

Wibling mentions that in a small hillock (II) near the churchyard Arne found a grave from the Bronze Age."

„*Wibling* at the gravel pit (I), a former littoral terrace about 6 m. above the sea, found much chipped flint refuse in the two dark charcoal-impregnated bands, each about 15 cm. thick, specially in the upper one; but in the between-lying sand, only as an exception, coal of birch occurred. These cultural strata were very like those on the coast of Blekinge, and it may be possible that they are washed down from a higher strand, though such a one does not occur now. All the found objects of flint were unground and of a primitive kind.

Higher up in the uppermost terrace, some above each other lying stones and fireplaces were found, but they were situated too far from the cultural strata so any connection is uncertain; in this case the strength of the waves must have been unusual. Particularly observable were the hollows of the upper cultural band in several places, more like excavations and not produced by tillage. These hollows cannot have been former huts, since they are too small and lying too near each other, but they have a certain resemblence to

fireplaces. Perhaps, there is a connection with some tumuli in the neighbourhood farther away.

Wibling mentions 5 flint daggers found near Ill at the Decauville railway. In the neighbourhood he found a band of coal-impregnated sand with chipped flint pieces and refuse, 0.40 m. below the surface; at the one end here a cup-shaped hollow occurred, containing charcoal and above each other lying scorched stones, the remains of a fireplace."

My opinion can only be that the find at Råå is palæolithic and preglacial, removed during the Ice Age. But also in postglacial times people have lived in these regions.

Bror Schnittger: Förhistoriska Flintgrufvor och Kulturlager vid Kvarnby och S. Sallerup i Skåne.
Antikvarisk Tidskrift XIX.

„In the Tullstorp-region, immediately east of Malmö, N. O. Holst describes the chalk as occurring in probably 4 mighty loose blocks intercalated between 2 moraines, why the chalk is pressed asunder, nearly plastic; consequently the pits here have another form than in the solid chalk of western Europe. Holst found picks of horn in the upper chalky layer or in the overlying moraine and, later, flint pits and cultural strata of black mould with antiquities.

The people of the stone age dug through the upper moraine that was about 1—3 m. thick. The shaft was sometimes irregular but mostly square, at best some meters broad, and reaching $^1/_2$—2 m. down in the chalk until some flint layer was found, whereupon the shaft was filled up. These pits were, then, only some meters broad and 3—4 m. deep, different from the vertical and mostly also horizontal shafts of western Europe, since the loose condition of the chalk did not here admit of horizontal galleries. The excavations in the chalk often were hollow by hollow, only being a pressing together and a rupture in the chalk, a pointed vault filled up by crumbled chalk and flint.

In the chalky contents of these pits there were found forgotten horn picks, numerous flint refuse, and perhaps some implements of flint. The complete absence of objects from younger times than the stone age, indicates an immediate refilling, perhaps, to prevent a sloping down from the near-lying pits. Some pits may, however, have been open, since Holst found a lamp of burnt clay from the stone age, and in another pit a piece of iron is found.

In two pits many flints, mostly refuse and often with exquisite marks of percussion, were found. Size, form, and remaining crust indicate a chipping near the pits. In one pit a beautiful tranchet lay 30 cm. deep. In two other pits no antiquities or worked flints occurred. In another pit numerous flints and one tranchet were found. There were not, as in western Europe, marks of the picks on the walls that were destroyed during the excavation.

The found tranchets belong to the older stone age, but do not prove the age of the pits, since they are probably as refuse (one had a patina indicating a long influence of the air) left behind in after-times when other better axes were of value, i. e., in the younger stone age. And since no larger younger implements are found in the pits, it proves that the pits belong to a time when such objects were of an actual value and, therefore, specially taken care of. Moreover, it is also less acceptable that the man of the older stone age, living for the day, would have taken so much trouble to obtain materials for their commonly small implements, when flint certainly was abundant upon or near below the surface at this time, the region then being much richer in flint than now after the tillage during several thousand years.

The author found no picks himself, but got some few from the workmen besides one Slagstok."

The cultural layers in this treatise do not concern us here, since they belonged to the younger stone age or the bronze and iron ages.

The great ado about these so-called pits appears to me rather curious. There have never been dug any pits here; but it is smaller injuries of the chalky blocks, removed during the Ice Age, and the few antiquities between 2 moraines and even in the upper moraine are actually palæolithic and preglacial implements from the older stone age, also removed at the same time from a palæolithic dwelling-site. Seen from this point of view, the whole explanation appears more natural; there can hardly be any doubt about it.

Knut Kjellmark: Öfversikt af Sveriges stenåldersboplatser.
Ymer XXIV 1904.

A map of the different findplaces in southern Sweden is to be found in Kjellmark's treatise. Here are only mentioned the dwelling-sites in Scania of which already some are treated. Those in other Swedish provinces will be related later.

Western Coast of Scania.

„At *Vikhög*, north of Järavallen, 3 finds occur. I and II, 5—6 m. above the sea, are considered to belong to the older stone age and III, 4 m. above the sea, probably to the younger stone age, since it is like Sibbarp and lying at a lower level. All objects are of flint and many forms occur, mostly very primitive and many rolled. This littoral mound is in some places 20 m. broad, but in other places only 3—4 m. broad. The objects do not quite distinctly indicate the dissimilarity between older and younger dwelling-sites.

I and II are lying at the Littorina boundary, but the mound is not particularly well marked. There are no fireplaces, pottery fragments, bones, or charcoals, but I and II are rich in flint refuse, flakes, implements of various kinds, and scorched flints, indicating a dwelling-site. Some tranchets are exceedingly well-formed. Probably both finds are contemporaneous with each other and with Soldattorp; in one the objects were lying rather superficially without stratification.

The lower-lying dwelling-site III is, according to Kjellmark, to be compared with Sibbarp. Besides other objects indicating the younger stone age, several rudely chipped preparatory works for ground flint axes are found here, entirely conformable to the great number of Sibbarp in respect to form, size, and nature of flint; also here the preparatory works are found in stratified gravel. At a depth of half a meter Kjellmark found such a rectangular preparatory work for an axe with quadratic diameter in a gravel pit here. At least down to this depth flint refuse was here and there found in the same gravel pit.

Moreover, G. Andersson and N. O. Holst have found chipped flints intermingled in the highest Littorina mounds farther north until Helsingborg to such a great amount that future investigations may probably discover dwelling-sites here.

C. Wibling (Ymer 1903 pp. 314—7) *round Helsingborg* found flint objects and refuse from the stone age. In a 10—20 m. deep sand pit at Ringstorp there were, in the lowest part, found narrow coal-impregnated bands of sand and 5 beautifully chipped flint saws, why he regards the find as belonging to the younger stone age. By Wibling these saws are considered a votive find.“ But, according to my opinion, it may be a question, if not these 5 chipped saws are actually palæolithic, lying at the bottom of this 10—20 m. high mound. How could they lie so exceedingly low if not removed by the ice?

„On the island of *Hven* in the highest Littorina mound with false stratification, since the moraine had slid down over it, Andersson found several pottery fragments and numerous chipped flint pieces, some rolled. Remains of a vessel with flat bottom and marginal ornaments distinctly indicate the beginning of the younger stone age. The find is not properly investigated.

In Ymer 1902 „En stenålders boplats på Hven," G. Andersson has a section: (1) uppermost 3.2 m. moraine; (2) then 0.30 m. mould; (3) 0.50 m. moraine; (4) 0.60 m. littoral sand; (5) 4.8 m. moraine; (6) undermost littoral gravel. (1—3) The moraine had slid down over the mound (4) of the highest level of the Littorina Sea; this moraine was somewhat sandy with up to 0.50 m. large blocks and numerous shells of species of Helix and Pupa, and lowest an old wood-ground was lying. The littoral mound (4) with the cultural stratum had a bed for a fireplace and was rich in charcoal, containing a 6—8 cm. thick ashen layer with scorched stones; this real littoral mound consisted mostly of 2 –5 cm. large, well rolled stones of specially flint, limestone, and red granite, intermingled with few blocks of the largeness of a clenched fist consisting of gneiss, flint, and limestone. In the middle of this mound several pottery fragments and numerous chipped flint pieces, some rolled, occurred; at the depth of 30 cm. in a more clayey layer many shells of Littorina littorea were found. The underlying moraine (5) consisted of a very fine and even material, nearly a clayey soil with quite few blocks. The pottery was intermingled with numerous grains of quartz and feldspar and was well burnt, particularly in the bottom. Shards and flints date probably from the first part of the younger stone age and accordingly the find is younger than the kitchen middens. The section just mentioned was the steep slope down to the beach."

To me, everything seems to tell in favour of a removal of a preglacial palæolithic find; the rolled stones might have been rolled during the removal. The intercalation of the cultural stratum between 2 moraines can hardly be explained without a removal during the Ice Age. However, the many shells of Littorina littorea deep in the cultural stratum appear difficult to explain, if these shells have not been lying in the original dwelling-site.

„At *Sofiero*, north of Helsingborg, Kurck in 1870 found 300 objects, of which characteristic tranchets and around-chipped axes of the older stone age and ground flint axes of the younger stone age occurred. No systematic investigation has been undertaken, but one or more dwelling-sites probably appear here.

At *Kullen's Lighthouse,* on a plateau 11.5—12.5 m. above the sea,

Kjellmark found a large dwelling-site of about 400 square meters. The waves had changed the position of some antiquities. An abundance of objects were found: 15 tranchets, 15 around-chipped flint axes, 25 transversely edged flint arrowheads; of greenstone 10 only partly ground, shapeless axes and 33 only chipped preparatory works probably intended for grinding (also of greenstone), 1 grinding stone of sandstone; 2 unornamented thin fragments of pottery; moreover, many other flint implements and an enormous amount of refuse, of flint 3,530 and of greenstone 350. A black charcoal-impregnated stratum, 2 dm. thick and with many scorched stones and refuse, was found 1.5—3.5 dm. below the surface. The find belonged to the older stone age, probably the same age as at Limhamn; the scrapers (20), however, were of another form. On account of bad weather the investigation could not be completed, but is to be renewed later.

Close by at *Ransvik I* 12.7 m. above the sea the so-called Gastalå, 25 m. long and 9 m. broad, precipitates very steep seaward with a steep wall landward. This place contained 5,700 flint refuse, 50 transversely edged flint arrowheads, 8 tranchets, 9 around-chipped flint axes; of greenstone 50 refuse, 1 preparatory work, 3 ground shapeless axes, and, besides, 12 fragments of pottery (1 ornamented). In the stratum large charcoal pieces occurred, and many scorched stones were lying without order; 10 per cent of the flint refuse were scorched. Outermost in the dwelling-site the layer of antiquities was mightiest, almost 1 m., rapidly getting thinner and in the middle hardly 3 dm. thick. The find was unusually rich in objects and the flint was most like Soldattorp. Two nuclei with tang are formerly found only on the Ringsjö. Of pottery both thick and thin fragments of the same material as at Limhamn occurred, one of the thin shards with an ornament of impressed punctate markings on the margin analogous to the upper layer of Soldattorp. Some of the flints showed traces of being rolled. There was no stratification.

Ransvik II, about 300 m. westward, had the same situation and extent as I with about the same richness of flint, but the real antiquities were scarcer. A great deal of flint was scorched and scorched stones and charcoal were found in rich abundance. 700 flint refuse, 5 transversely edged arrowheads, 3 around-chipped flint axes, etc. were found. There was no stratification. The antiquities occurred from the surface down to 4 dm. deep in a very mouldy, gravel-mixed layer. 3—4 dm. deep there were found charcoal and many chipped flints in a dark redbrown formation, also one scraper and one arrowhead.

In *„Karl XII's skansar"* a majority of chipped flint axes and flint refuse occurred, and also in another place many chipped flints, 1 scraper, 1 saw, etc. occurred, indicating the older stone age.

In *„Fredrik VII's Grotta"*, 8.79 m. above the sea (the Littorina boundary is 11.5 m.), Retzius and Wallengren found a thick cultural stratum. Besides charcoal, only 3 scrapers and 1 knife of flint (apparently not ground) and 1 bone needle with eye occurred, but both in the upper and lower layers remains of domestic animals were found, why this find must be neolithic. These last 5 finds occurred on the Kullaberg.

In the little islet close by, *Hallands Väderö*, in an about 9 m. high littoral mound Kjellmark found a charcoal-impregnated band, 3—4 dm. below the surface. Scorched stones were intermingled in this band, and from the surface down to the mentioned depth rather rich flint refuse, 5 per cent rolled and some scorched, and some antiquities occurred. Besides several, perhaps, older objects a fragmentary ground flint axe with thin neck was found, indicating the age of the dolmens, but it is not stated where it was found."

One thing is quite certain that most of these finds on Kullaberg are contemporaneus with Soldattorp and from the older stone age. According to my opinion, the older stone age of the North is palæolithic and preglacial. To prove the removal of the finds by the ice, is not so easy here, but at least in some cases it seems not improbable. It must, however, be left to the judgment of the reader.

Southern Coast of Scania.

„At the mouth of the river *Skifarpsä*, west of Ystad, Kurck in 1872 found some older objects and 2 ground axes and 1 well-chipped axe in fragments, these 3 latter fragments by him considered to belong to the younger stone age. No more is, however, known at present.

Moreover, R. Sernander (Antikvarisk Tidskrift XVI p. 6) mentions that Bruzelius in 1868—69 in the *harbour of Ystad* found a turflayer below the sea, lying above the stumps of an oak wood that had grown up in a morainic field. In the turf, rich in aquatic vegetations, there were found flint refuse, a flint dagger, and a flint axe. Sernander explains it by a sinking of the Littorina Sea in postglacial times." But a removal during the Ice Age out into the sea, appears to me much more probable.

Eastern coast of Scania.

„*Lindormabacken* is also described by H. Hildebrand in Antikvarisk Tidskrift III pp. 19—23. Near the coast an open field slopes down to the sea; behind this sandy field lies a ridge, now often called the flint-hill, from which many flints are fallen down upon the lower more level ground. In a prominent part of this ridge, somewhat below the summit, a thin layer of flint is seen. The wind has removed the other prominences and a part of this, and when the sand rolls down, the flints follow. It is mostly flint refuse, but also an incredible amount of transversely edged arrowheads, an abundance of scrapers, several knife- and spear-shaped implements, a great deal of tranchets, all of flint, and a majority of ground greenstone axes commonly like those at Limhamn and Kullen, however, some better and evenly ground all over the faces with ground narrow sides. Even some heart-shaped arrowheads occurred, perhaps indicating younger times. Also thick primitive pottery shards like Limhamn were found. On the whole, there is a striking resemblance to Limhamn and Kullen, but perhaps a more distinct transition from the older to the younger stone age."

Hildebrand about 1870 writes: „I do not know that ground flint is found here. It is probably two stone age periods, since bones of domestic animals are found intermingled with more rudely made flint objects and with better made ones. The heart-shaped arrowheads are not found in the Danish mounds, but the rudely chipped flint chisels are found there."

Kjellmark about 1904 says: „This find might stand at the transition between the older and the younger stone age, even more distinctly than the finds at Limhamn and Kullen."

The cultural band in the ridge is not yet investigated, only the downfallen objects are collected. It seems, however, to me that this band represents a removed preglacial and palæolithic find. Even the heart-shaped arrowheads may be palæolithic; we must not forget that the chipping of the implements reached its acme in palæolithic times and accordingly in preglacial times in the North, where no people lived in the Ice Age. The remains of domestic animals must be later admixtures; all objects are found on the surface of the lower more level ground, and the flint band in the ridge is not yet investigated. Remains of domestic animals without ground implements appear rather absurd.[1] When the authors speak of a transition

[1] But in a few places along the western coasts of Norway such relations actually occurred, and the probable cause is there explained.

from the older to the younger stone age, i. e., from the palæolithic to the neolithic stone age, it is an impossibility in the North where the Ice Age lies between them. Moreover, even in Europe there is no transition, because the neolithic culture was introduced from Asia by the new superior neolithic people.

„In some other „coast-finds" of Scania there are found flint refuse, nuclei, scrapers, transversely edged arrowheads, chipped axes, and grinding stones."

In the Interior of Scania.

„On the shore of, but above all out in the lake *Råbelöfsjö* in north-east, antiquities of various kinds were found in more than one place. In 1878, 3 dm. deep in the lake near the shore, there were found numerous flint flakes, 3 grinding stones of sandstone, 1 broad quadratic ground flint chisel, 4 ground quadratic greenstone chisels, 1 butt-necked greenstone axe, 1 quadratic greenstone axe, a great number of bone objects (of which 3 awls and 10 other pointed implements), 3 fish-hooks, and 14 harpoon-points. These harpoon-points are the most interesting, as 6 had barbs and 1 had flint pieces inserted in the margins; these forms of implements are by several investigators considered as belonging to a very early period of the older stone age anterior to Soldattorp. However, much tells in favour of the period of the giants' chambers. The people must have lived on a raft or in a lake-dwelling, standing at least at a depth of 2 m. out in the lake. Kjellmark says: somewhat mysterious overhangs this dwelling-site from the stone age, more than any other in our country."

This riddle is, however, easily solved by a removal during the Ice Age from an original preglacial dwelling-site on terra firma. The ground flint chisel must be lost after the Ice Age. The remarks on the much older age of some harpoon-points rest only on the mistake of Sarauw that the Maglemose find was older than the kitchen middens, while it represents the last epoch of the palæolithic period.

„The *Näsbyholmssjö* in the south was lowered about 1860 and partly investigated by Sven Nilsson and later by Kurck. In the middle of the lake or more than 100 m. from the shore there was, on the surface of the former lake-bottom, found a great number of antiquities of which, according to Kurck, more nearly 100 objects of stone, pottery fragments, bones of various animal species, besides — the most interesting — a mass of bone implements, of which last

the lion's part consisted of fish-hooks of several types, at that time unknown or very seldom. At one fish-hook a portion of the rope was still adherent, but was unfortunately strown away by the workman. No digging of any extent is here made. Probably this find belongs to the last periods of the younger stone age, in many respects like the Råbelöfssjö. Kjellmark mentions also 3 other lakes in Scania with some few objects."

Also this find must be palæolithic and removed, perhaps, from a late preglacial time as Sarauw's Maglemose.

I have tried to point out that the older stone age is represented in many places in Scania, but actually to prove the removal by the Ice Age is not easy where no systematic investigation has taken place; here only some hints may be found. However, if a real removal is proved in some places, the other finds with the same objects from the older stone age must also have been removed. Some implements, formerly considered to belong to the younger stone age, must, in fact, be palæolithic, even if they might be found also in the postglacial younger stone age.

Blekinge.

Carl Wibling: Om kustfynd från stenåldern i Blekinge.

Ymer XIX 1899.

I have here enumerated the finds along the southern coasts of Blekinge from west to east. In several places some objects from the stone age are mentioned, but here only the prominent finds from the older stone age are treated.

„*Torsö* (or Torse) was a quick-sand field, about 2 m. above the sea. Extensive charcoal layers were probably worked by the sea; in these and in the sand chipped flakes of granite and north-Scanian flint were lying, and westward fragments of coarse pottery, flakes of south-Scanian flint, and simple implements of **slate** (fig. 3 in this treatise seems to be an axe af slate) occurred. These occur nearly always in round „brandfläckar" or coal-beds, covered by scorched stones. In such a one the point of a little eel-spear and some smaller fragments of bone were found, and in some few others burnt bones, seemingly human. Close by a couple of larger accumulations of stones and sand were lying, perhaps, remains of former huts,

while the coal-beds might be graves with burial goods. Formerly A. Lundh found flint refuse, scrapers, axes, and other „badlier made" implements of flint and rock, besides bones and pottery fragments. Kjellmark considers this find as nearly contemporaneous with Lindormabacken. Brøgger jr. remarks that also here the Limhamn type of greenstone axes occurs.

At *Ryedal*, somewhat farther up in the country, Kjellmark mentions that Lundh found an abundance of flint refuse and several flint implements, between which 1 spearhead, greenstone axes, a fragment of a grinding stone, etc., lying on the surface of a sandy field that formerly was the shore of a mostly exsiccated lake. „The former lake reached even up to — if not above — the flint field."

Wibling mentions that formerly there were *near Karlskrona* found 1 chipped flint axe (fig. 1) like the type of the Danish kitchen middens[1] and 1 fractured spearhead of **slate** of the arctic type (fig. 2).

At *Fornanäs*, about 0.50 m. below the surface, dark cultural strata occurred in some places, in one place about 8 m. long and up to 0.70 m. thick, lying 10 m. above the sea, the Littorina boundary in these regions. Coarsely chipped flakes and implements of rock and north-Scanian flint occurred besides better made implements of south-Scanian flint in the upper layer. Only 1 rudely chipped chisel of greenstone and 1 transversely edged arrowhead could tell the age, but no remains of pottery or bone were found. Coal of birch, alder, hazel, and specially oak, but not of beech occurred. Holst considers some part of the cultural stratum changed by the sea, but Wibling considers these layers formed, perhaps, by the agency of the sea. Several stony objects were also found in the neighbourhood, indicating extensive dwelling-sites. Kjellmark means that without a careful investigation nothing can be said about the chronology.

At *Angelskog*, in 2 places 0.60 m. below the surface, Wibling found layers rich in charcoal with 20 flint flakes, 2—3 m. above the sea, in stratified „ishafslera" (clay from the ice sea).[2] Formerly several objects of greenstone and north-Scanian flint were found. This is very interesting: either people lived here when the clayey layer was deposited, indicating a yet unknown high age (what is not contradicted by coal and very primitive flints), or the objects are buried during times when the relations of the coast were as at present.

[1] Such rudely chipped flint axes are in the Danish kitchen middens called flint axes and in Sweden around-chipped axes, certainly the same as in France les pics.

[2] Ishafslera is removed glacial layers without fossils, while Littorina layers contain warmer fossils and Ancylus layers contain colder fossils. All 3 are layers removed during the Ice Age.

The Littorina maximum was here 10 m." To me, all this controversy is distinctly solved by a removal of preglacial objects during the Ice Age.

„At *Kuggeboda*, in a principally sandy littoral mound about 10 m. above the sea, a horizontal strongly coal-impregnated cultural stratum of great extent was found; in several places dark thinner or thicker parts were seen. About 0.60 m. lower the mound rested upon clay, in which some smaller coal pieces and a couple of seemingly chipped pieces of „hälleflinta" occurred. These last finds are, however, too indistinct for the conclusion that people lived here already before the formation of the littoral mound. Below the mound, towards the sea, objects from the stone age were also found. The finds in this place are like those at Fornanäs." A glacial removal explains also this find.

„At *Torp* in the islet of Senoren Fürst, between several flints, found preparatory works of 3 rock axes; this find lay about 10 m. above the sea.

At *Skällenäs* and at *Abrahamsäng* in the islet of Sturkö the relations were of the same character, both lying about 10 m. above the sea. At Skällenäs Fürst found flint refuse, flakes, implements of flint and greenstone, and fragments of pottery. Some objects were rolled and polished by the waves.

At *Gisslevik*, in a pit somewhat below the surface, a cultural stratum and lower-lying darker spots or coal-beds were found down to 1 m., separated by sandy layers. The cultural stratum contained objects like Pysslingebacken and other finds in this region, but the lower spots had only coarser pieces of„ hälleflinta," flint, and quartz, besides unornamented pottery fragments of a particularly solid material. Only very trifling bones, apparently burnt, occurred. Formerly Fürst had here found several implements of flint, 1 greenstone axe ground at the edge, potsherds, and pieces of bone.

At *Björkekärr*, in a pit of the littoral mound, a dark horizontal layer of 2—3 cm.'s thickness was found, 5.1 m. above the sea. In the cultural stratum numerous fragments of pottery occurred, but no cultural objects were found above or below. Also farther landward a similar cultural layer occurred, where of found flints one flint flake with worn-off margins is to be noted. Even farther away at the foot of a hill, similar ornamented shards were found in the surface.

Near Torshamn, in *Ytterö*, a javelin-point of red sandstone (fig. 4) was found, being of **arctic type.**

At *Pysslingebacken*, 0.30 m. below the surface of the sandy littoral

mound, a dark humus- and coal-containing layer of generally 15 cm.'s thickness occurred. In the cultural stratum there were found scorched stones, larger and smaller pieces of salix, birch, and oak, animal bones specially of seal, numerous fragments of pottery, single pieces of flint, and sparingly implements of bone and stone of various kinds as flint, granite, sandstone, and **slate.** The numerous potsherds of clay with mica and feldspar are only slightly burnt and nearly all ornamented, at Gisslevik 63, at Björkekärr 75, and here at Pysslingebacken 464. In the original treatise fig. 6 is a tranchet, fig. 7 an axe of granite, and fig. 8 an arrowhead of slate; all these 3 are from Pysslingebacken.

The ornamentation of nearly all the pottery shows a quite marked taste through its rich variations. Fig. 5 represents 3 shards from Björkekärr, ornamented by impressions of punctate markings, even perforated small holes, and of short lines forming an open angle or crossed, commonly all arranged in rows. Sarauw and S. Müller regard the ornaments as belonging to the period of the dolmens. Of implements are mentioned a smaller knife of bone, a tranchet, a chipped long arrowhead (both of south-Scanian flint), and an axe of granite ground at one end. The implements of **slate** belong almost all to the arctic type, but they are sometimes of an unknown form. The objects are not found in a single place, but are scattered about, perhaps produced by a rearrangement during a higher level of the sea. To be remarked is that the coal-impregnated cultural stratum by and by goes over in pure sand, perhaps produced by percolating water."

To me, it appears rather certain that a removal during the Ice Age has produced all these changes. The simply ornamented potsherds are palæolithic and preglacial as the implements. The few implements of slate or sandstone cannot make these finds arctic; I have explained them by the retreat of the arctic people in front of the advancing Ice Age. The author mentions even some unknown forms of slate, perhaps being native and not arctic.

Halland.

„In this province („landskap") on the western coast of Sweden, north of Scania, only some few smaller finds occur. De Geer found chipped flints in the highest parts of the Littorina boundary. At the same level flint refuse and flakes, some rolled, and numerous

small pieces of bones, probably assorted by the waves, are found. At Snapparp many fragments of pottery occurred. At Fyllinge, 0.50—0.75 m. deep, an abundance of ancient fireplaces with objects from the stone age are found."

Bohuslän.

From the island of Hisingen outside Göteborg until the Norwegian boundary Kjellmark quite cursorily mentions about 50 places, from which, besides flint refuse often in incredible abundance, a less number of implements occurred. But in most cases they belong to the younger stone age; the height above the sea is various. Potsherds and bones are exceedingly seldom found and charcoal appears to be seldom; a proper cultural stratum is not distinctly found. A closer investigation would be of great importance. Even some few spear-heads of **slate** are found in Bohuslän.

The Find of Lihult.

„In northern Bohuslän at Lihult on the lake Lången (19.4 m. above the sea), a dwelling-site was about 35 years ago found lying 45—50 m. above the sea in a field that sloped rather steep up from the lake. The maximum of the Littorina sinking was about 42 m. above the present sea level in northern Bohuslän, and the sea is at that time, when the people of the stone age lived here, supposed to have reached immediately up to the dwelling-site of Lihult. Here were, then, found 66 greenstone axes without shafthole, 1 axe with shafthole besides 3 fragments of such axes, 38 grinding stones, 1 unground leaf-shaped flint arrowhead of the heart form, and 2 chisels of **slate.** This form of greenstone axes is called the *Lihult type* and is a complete correlative of the Norwegian Nöstvet type near Kristiania. The difference between the Lihult type and the Limhamn type is mentioned in Kjellmark's Järavallen at Limhamn. According to Cederström, one axe of the Limhamn type is also found at Lihult. In „Öxer of Nostvettypen 1905" p. 36, Brogger says that also some butt-necked axes are found, what appears from the first account of this find.

In northern Bohuslän in the parish of *Vette* are mentioned 103 greenstone axes without shafthole, and in the parish of *Tanum* 27 axes.

The commercial traveller Blomquist says in 1905 that a great number of the Lihult type are found in the region around Vänersborg,

as well on the shores of the lake Vänern and of the river Göta as on the smaller lakes in northern *Västergötland* and southern *Dalsland*, so the Lihult type seems extended mainly over these regions and northern Bohuslän. The dwelling-sites found latest are lying above the Littorina boundary, but Lihult about at this boundary.

Sernander mentions that several graves and workshops in Bohuslän from the stone age are lying below the Littorina boundary, and that Ekhoff at Almö on Tjörn found a workshop so low down as at 18 m."

All these greenstone axes without shafthole of the Lihult type must belong to the preglacial, palæolithic period; if the axe with shafthole and the 3 fragments are also preglacial, is at least a question. That the butt-necked axes are preglacial is certain; in the preglacial find of Brabrand[1] 5 ground butt-necked axes of greenstone and in the Klintesö Mound 3 similar axes were found; but by a mistake these preglacial Danish axes are by me called „thick-necked" instead of butt-necked, the actual butt-necked round axe type.

Otto Frödin: En svensk kjökkenmödding.
Ymer XXVI 1906.

„At Ånneröd in the parish of Skee in northern Bohuslän, 3 km. north of Stromstad, in the highest part of the valley there was found an actual kitchen midden of at least about 15 square m.'s extent, but only 3 square m. were investigated. Below a slope in the upper portion of which the kitchen midden occurred, an extensive sandy plateau with several scattered stone objects and abundant flint refuse was lying. In the slope, resting on typic littoral sand, a cultural stratum of about 0.50 m.'s thickness contained masses of shells of mollusc and snail often burnt or scorched, more or less scorched stones and redburnt sand, charcoal, mammalian bones, and particularly abundant fish, besides fragments of pottery and implements of flint, rock, and bone. Above this kitchen midden a grassturf was now lying.

Among the found implements are to particularize: axes of flint and greenstone, numerous spear- and arrowheads of flint more or less well made, hammer stones and grinding stones, a pestle of a hand-quern, a sinkstone, and several bone implements of which a well-cut fish-hook, were found besides some small pieces of pumice with traces of grinding, formerly only found at Holeheia in Jæderen, Norway. The great number of pottery fragments were often ornamented

[1] Palæolithic Chronology 1911, p. 54

with impressed small round punctate markings and with that in Sweden very seldom „snoddornament,“[1] produced by the impression of a string in the earthen vessel previous to the burning.

The axes (confer Montelius' svenska fornsaker 1872, fig. 25 and 26), the spear- and arrowheads (confer fig. 51 and 65), and the „snoddornament“ indicate the period of the giants' chambers.

Of bones occurred Sus scrofa probably ferus, Cervus alces, seal, 2 smaller species of whale, eagle, and many various kinds of fish, for instance, the tunny (Orcynus thynnus). Of molluscs a great mass of Ostræa edulis, many Mytilus edulis, Cardium edule, Tapes decussatus and aureus, 9 other species, and, besides, 3 species of Helix.

Particularly remarkable is Tapes decussatus, now living in warmer seas at France and the British Isles and seldom at the south-eastern Norway. The tunny belongs to the Mediterranean, however, now sometimes observed at our coasts. Oysters are now very seldom in these regions.

The people lived by hunting and fishing and perhaps by a little agriculture, but not by breeding of cattle. The place is not suitable for fishing, why the sea was at that time standing higher. The lowest flints on the plateau were lying at 18.5 m. above the sea, and accordingly the sea was standing 18—19 m. higher than now. Some flint refuse was rolled by the waves, only possible when the sea reached up to the place.

The maximum of the Littorina sinking when the Danish kitchen middens and the contemporaneous culture in southern Sweden existed, was about 42 m. above the present sea level in northern Bohuslän with a 2° C. warmer climate, and accordingly the find at Ånneröd corresponds to only 44 per cent of this boundary. Upon the whole, at least on the continent, about half of the Littorina upheaval was reached at the transition from the period of the dolmens to the period of the giants' chambers, in which latter period the author places the find at Ånneröd.“

In the North, as elsewhere, the archæological chronology of the stone age is founded upon mistaken geological relations of the glacial period, being but one and very brief; by the interval between the preglacial older kitchen middens and the postglacial younger kitchen middens of Denmark the Ice Age can be estimated to about one thousand years.[2] The Ice Age,[3] as little as the running water, has not carved out one single valley, that is but a strange fairy tale;

[1] Called in Germany Schnürornament.

[2] Palæolithic Chronology 1911.

[3] Deviating Views on the Glacial Period 1910.

the Ice Age made very little damage, it produced the moraines and many so-called littoral mouds, but left behind such an abundance of preglacial objects that are at present partly found below or in the moraines and gravel mounds. The relatively small glaciers pushed forward the smaller and larger erratics to a certain degree, dependent upon the more or less hilly or mountainous character of the region; but, when the energy of the glacier was exhausted, the glacier went across the moraine and anew began the same work, so we often find series of moraines, the one in front of the other. Such series of moraines do not indicate the boundary of different glaciations. At last, when the glaciers melted away, these coarser moraines were covered by sometimes great masses of sand and gravel. In more level regions, as in Denmark, the original preglacial dwelling-sites are, perhaps, only removed some few meters from the plateau of smaller eminences down the slope and out in the underlying plain. The supposed enormous thickness of the ice up to many thousand feet, reaching, for instance, from the top of the Norwegian mountains down to the bottom of the North Sea, is of course but a strange fairy tale; the ice-sheets have not destroyed everything, but they were of a relatively minimal thickness and have left much behind from the preglacial times.

In my three treatises on mountain-making[1] I have proved that the plasticity of the up-lifted mountains is a formidable mistake of Albert Heim, but that the upheaval was produced by an enormous eruption of a molten magma as the older geologists quite rightly supposed, and that at the same time the valleys were formed. However, I have not there explained how this was possible, why I here take the opportunity. The mountain-making of the higher mountains cannot have been produced at once, since there were too little of sedimentary strata and gneiss, broken loose from the crust of the earth, to prevent an out-flowing of the magma, in which case a plain and not a valley would have been formed. The sedimentary strata were not very thick so the upheaval must have occurred in successive repetitions; when the first erupted magma had become, at least, viscid so it could not flow out, then the next eruption lifted this part higher up; the sedimentary strata were, for the most part, broken loose and accumulated at the base, preventing an out-flowing here.

But returning to the find at Ånneröd, it may, perhaps, be that this kitchen midden here, like the older ones in Denmark, is removed, preglacial and palæolithic; at least in Denmark the younger post-

[1] Archiv for mathematik og naturvidenskab, Bd. 29 nr. 8—10.

glacial mounds always contained actually neolithic objects. It appears not very reasonable that the stone age people lived on a real sand beach, even in its slope, and not in a sheltered wood; and it is hard to explain the stone objects and the abundant flint refuse scattered over the below-lying large sandy plateau, if they were not removed during the Ice Age. Frödin supposes that this plateau was covered by the sea. If these objects had slid down from the cultural stratum in postglacial times, they ought to have been found collected near the lowest part of the slope and not scattered across the plateau. Some flint refuse on the plateau are supposed to be rolled by the waves, but this might have been done during the Ice Age. If the cultural stratum is removed, perhaps in a frozen state, then the so-called littoral sand mound is also removed. That the sea in preglacial times had a wider range than now seems probable, since the glacial removal must have filled up much of the lower regions; moreover, the people lived also by hunting and certainly made many excursions, and it might be that it was the women's business to collect the molluses.

The warmer climate during the formation of the cultural stratum, specially proved by the tunny and Tapes decussatus, tells absolutely in favour of preglacial times, since no warmer postglacial Littorina times have ever existed.

No domestic animals except the dog were found, and the single pestle of a hand-quern can hardly prove a neolithic agriculture; as mentioned formerly, the use of wild-growing fruits and seeds might have been common partly also in the older stone age.

According to my views, the supposed 44 per cent of the Littorina sinking cannot at all be taken into account for the period of the giants' chambers, against which time the circumstances already related seem to speak.

However, a main point is, if the found implements are in keeping with the older stone age or not. The implements appeared to be not so few, but the description of them was very deficient in the treatise, why I have read a letter from the author. He writes: „.... the following inventory (of the axes), which is not long: 1) a thick-necked flint axe, ground, however specially on the narrow sides („Smalsidorna") incompletely (found before our arrival); 2) a thick-necked greenstone axe, the surface of the common aspect (not ground shining); 3) 5 flint flakes with traces of grinding, thus flakes from ground axes or chisels. Only two of the last mentioned were found in the shell layer, the others were lying on the large sandy plateau (the dwelling-site in a wide sense)." He does not mention the spear- and arrowheads in the letter.

Accordingly, the found axes give no exact answer as to time, but out of at least 15 square m. only 3 are investigated. The thick-necked greenstone axe may be palæolithic The ground flint axe must be postglacial, but it was found before the arrival of Frödin; if in the cultural stratum or on the extensive plain below is not mentioned. And of the 5 flint flakes with traces of grinding only 2 were found in the cultural stratum. On the large sandy plateau the objects may originate from neolithic times. The numerous spear- and arrowheads of flint afford no distinct informations. Hammer stones, grinding stones, the sink-stone, bone implements, and pieces of pumice may be palæolithic. The result must, then, be that no determination of age can be founded upon the implements.

The other relations, however, seem to indicate preglacial times, except the pestle of a hand-quern, supposed to indicate a little agriculture; but no domestic animals were found and the living was hunting and fishing, and the climate was warmer than at present. This find is, at any rate, dubious as yet.

Actually neolithic collections of shells with bones of domestic animals but without ground flint implements are, in fact, found in Norway as at Buset, the caves of Hestnes and of Valse, and the rock-shelter in Skjorn, all in Trondhjem's Stift. In the 3 Danish postglacial kitchen middens the implements were neolithic and ground, but not so in the Scandinavian peninsula. The reason might be that some of the returning tranchet people, as those from western Europe, had but a little knowledge of the neolithic culture, while others were quite acquainted with this culture as those from Italy, where the invasion of the neolithic race from Asia occurred already at the close of the Ice Age when the glaciation of Central Europe drove them southward to Italy. The stock-keeping seems known by some, but not the grinding of flint implements.

Dalsland.

„By the lowering of the lake *Hästefjord* in 1868, 67 greenstone axes of the Lihult type were found, and Kjellmark says that one might be tempted to think that this lake covers a series of dwelling-sites. He compares this find with Järavallen at Limhamn. Kjellmark mentions also that near the lakelet *Radane* a collection of charcoal, flint refuse, one tranchet, etc. occurred. Above is mentioned that Blomquist found such axes in southern Dalsland."

Such a great number of palæolithic objects out in the lakes must indicate a removal during the glaciation.

Småland.

„Kjellmark mentions that along the shores of the lake Bolmen many chipped flints are found in several places, and that Palmgren in one place found arrow- and spearheads among the flints; that no cultural strata are found might depend on insufficient investigations."

C. Wibling: Ulföfynden.

Ymer XVII 1897.

„During the construction of a railway in southern Småland several objects, seemingly belonging to the older stone age, were found as, for instance, chipped flint axes, a chipped arrowhead of flint, and some bone needles with eye. In a ridge of the islet of Ulfö in the large lake Åsnen about 100 firespots, by the workmen called „Brandfläckar", were found. Also in adjacent regions and far away in north-north-west such firespots occurred, up to nearly 1,000. These firespots were the remaining bottoms of ditch-shaped hollows or graves, commonly lying abouth 0.60 m. deep in the distinctly disturbed ground, but Wibling found some at the depth of 1 m. They consisted of dark mould mixed with ashes and coal and contained some flint and rock objects, partly with traces of fire, and sometimes smaller particles of bone, most often as small grains, but sometimes as larger splints like those found in graves from the younger Iron Age. In the ridge of Ulfö they were arranged, from north to south, in almost regular lines at a distance of 1 m. between the lines and of about 60 cm. between the single firespots. But these firespots were also found far away in many places, as already mentioned, by Captain Quistgaard during the construction of the railway up to nearly 1,000. Commonly the firespot was 1,8 m. long and about 60 cm. broad, mostly lying in looser layers but even in moraines. In sand and gravel layers the disturbance of the overlying ground was easily seen, but in the plains only sometimes here even lying in layers of clay.

In the ridge of Ulfö, at a depth of 1 m., Wibling found 3 firespots, one of which was dug in underneath a large stone block. The gravel ridge, though prominently a rollstone formation, consisted, however, apparently of moraine. These darker burial relics had a thickness of nearly up to 20 cm., between ashes and coal containing chipped stone and flint pieces and in one firespot, besides, some insignificant bits of bone. At Hönshytte, lying near the lake Åsnen, he found 4 firespots with several flint chippings but no bone, the

cause of which was that the ground was flat and the bones accordingly destroyed. In Ulfö was found a so-called „firebottom", probably remains of a dwelling-site, between the mould and the underground; moreover, here were found 5 new firespots of which 3 were entirely undisturbed, all with coal and chipped flint flakes. In the best preserved of these, lying in „jätterjord" (moraine), more than 30 flint flakes were found, some scorched and several quite small. Among the better-chipped flakes were a knife, a transversely edged arrowhead, a scraper (?), and some fine long flakes of unknown destination. Though also here no bones were found, these firespots were, however, so typic that even Montelius was of opinion that certainly here is found a form of graves formerly unknown. Wibling mentions that in Ulfö at least a hundred firespots are found.

Though the disturbance of the overlying gravel layer was not always constant, these firespots can, however, hardly be explained except as the result of a burial. Otherwise they must, as far as Wibling could find, at least in some places have been overlain by moraine and consequently date even from the Ice Age. Wibling means that along the coasts of the Baltic Sea the lands were inhabited rather soon after the Ice Age. It appears also impossible that it is remains of dwelling-sites. These pits were little useful as fireplaces; they were lying too near each other and coal and ashes are not found in the overlying ground, but some pieces of wood are found close by. In favour of graves the circumstance tells that antiquities are never found in the adjacent layers, but only among the scorched products. Moreover, in these regions no graves of as yet known types from the stone age are formerly found."

However, everything appears so distinctly to indicate the only reasonable explanation that these numberless and so widely scattered firespots must absolutely be remains of former preglacial dwelling-sites, removed by the ice and covered mostly by fluvio-glacial deposits, even in some places by actual moraines. The implements belong all to the older stone age, and no human bones are verified in the numberless so-called graves, very often without traces of bone. If still in doubt, read anew the author's own description of these finds and his explanations! The rollstone formation is a real moraine.

Östergötland.

H. Munthe: Om fyndet af et benredskap i Ancyluslera nära Norsholm i Östergötland.

Öfversigt af Kungl. Vetenskap-Akademiens Förhandlingar, 1895 No. 3.

„In the northern part of this province the railway station Norsholm lies at the eastern end of the lake Rox, and the pit is situated somewhat north of the station. In the southern section of this clay pit, about 2,5 m. deep below the surface, there was by one of the workmen found a worked bone implement, which was with great probability lying *in situ* imbedded in Ancylus clay with asp, birch, and alder; but wood, characteristic of the Littorina clay, seemed completely wanting. In this section the Ancylus clay occurred from 1. m. below the surface down to 5 m., overlain by some dem. thick Littorina clay, while the supposed underlying Ice-sea clay was not reached during a boring from the bottom of the pit on this southern side. But in the northern section of the same pit, from almost 4 m. below the here somewhat higher-lying surface, a thinly stratified, about 1 m. thick Ice-sea clay („ishafslera“) without fossils was found, while the deeper layers below the bottom of the pit were not here investigated; the base of this Ice-sea clay corresponded to the bottom of the pit. Upon this Ice-sea clay there rested a somewhat thin layer of Ancylus clay that was overlain by thick layers without fossils (in the profile called „Ras“ i. e. down-slidden masses). The surface here, at **Tångstad,** was lying 32.7 m. above the present sea level. The geological relations with their contents are at length described in the paper. About 3 km. from this pit Emys lutaria was found about 15 feet below the surface in a gravel mound, but it is uncertain if it was in Ancylus clay. In the southern section of the pit where the bone implement was found, no boundary line between the Ancylus clay and the overlying Littorina clay could be found. The Littorina clay contained 9 freshwater, but only 3 brackish-water diatomaceæ.

The bone implement, the right radius of elk, was finely ground and polished with fine short incisions of the margins, arranged in groups and, therefore, ornaments and not produced during the use. It is probably a kind of a smoothing implement, by Stolpe referred to the close of the stone age. Similar implements are found at least in 6 various places in Sweden, for instance, one in Dalarne in a peatbog 6 feet below the surface and one in Södermanland in a turfmoss 3 feet below the surface. Even in the islet of Stora Förvar near Gotland Munthe has rather often found a kind

of uncertain bone implements of nearly similar form, but much smaller. Except this last find all others are found single. The implement in the pit at Tångstad was described as lying horizontal and most probably *in situ*.

Munthe's conclusion is that man lived here in Ancylus time, probably somewhat after the middle part. The vegetation does not deny it. This implement is probably lost in the Ancylus Lake, reaching up to about 85 m. above the present sea level so there were only small islets here at that time, why the people probably lived farther north. In Denmark man lived in the fir time, confer Maglemose. Sven Nilsson relates from southern Scania that finds of knives, spear- and arrowheads of flint occurred below turf layers of a thickness of 3—4 even until 10 feet, overlain by the Järavallen. He mentions that in his presence such objects were found in the lowest part of the peatbog resting on potter's clay („blalera"). If this is right, then the potter's clay originates from the later part of the Dryas time or the beginning of the Asp time, and consequently man lived here about the first Ancylus time. And in Östergötland man lived, then, in the middle part of the Ancylus epoch.

However, later it was discovered that the workman had not found the implement *in* actual *situ*, but first after having loosened a portion of the wall by his pick. Founded upon this circumstance, the opponents of Munthe maintained during the subsequent discussion that this implement was fallen down from the Littorina layer, while Munthe adhered to the fact that the implement was found in the Ancylus clay."

My opinion is that Munthe is quite right when he maintains that the bone implement was lying lower down in the so-called Ancylus clay — so far I agree, but not any farther. It may be quite indifferent, if the implement was lying in any of these three layers that are all removed during the glaciation; it only proves that the implement was preglacial as Emys lutaria. The removed clay is called by different names according to its contents of different fossils or its want of fossils. The at present uppermost lying Littorina clay is the originally undermost lying and, therefore, latest removed layers from Miocene, characterised by warmer and specially marine fossils; the marine fossils date from the upheaval in Middle Tertiary when a warmer sea was lifted up into land, and the warmer terrestrial fossils[1] date from the warmer Miocene. The between-lying Ancylus clay is the originally uppermost lying and,

[1] Specially of a warmer flora, but also of a warmer terrestrial fauna, according to my views.

therefore, first removed Pliocene layers, characterised by terrestrial and freshwater colder fossils. The Ice-sea clay, now found undermost in places and without fossils, is the first removed clay, probably removed by the actual glaciers, while the other 2 clays are removed by the fluvio-glacial floods of the melting glaciation, why the fossils are here still preserved. It was partly clay, partly gravel or sand that were removed; Emys eluteria was found in a gravel mound. Of course, these removed layers are more or less intermingled and partly wanting in some places. Even here Munthe says that in the southern section no boundary line between the Ancylus clay and the overlying Littorina clay could be found, and that the Littorina clay contained only 3 brackish-water, but 9 freshwater diatomaceæ, what appears to point rather to an intermingling, if the supposed deposition of the Littorina Sea with salt water was right. Another similar peculiarity will be treated later, when I speak of A. Hj. Olsson's investigations in Gotland.

Formerly in my „Deviating Views on the Glacial Period" I have said that the Littorina Sea never existed, but I tried to prove the actual existence of the Ancylus Lake. However, already there (p. 39) I wrote: „One might even be tempted to ask if the rising of the Ancylus Lake ever occurred"; this remark is founded upon the supposed want of any traces of an inundation of the Baltic provinces of Germany. But after the study of Munthe's profile at Tångstad I am absolutely arrived at the conclusion that the Ancylus Lake, as well as the Littorina Sea, has never existed, but represents the effects of the glacial removals. What I then wrote about the Ancylus Lake, is a complete mistake.

Accordingly, this ground polished bone implement dates from the later stage of the preglacial older stone age, and Nilsson's remarks tell the same story. The curiously different stratification in the two sections of the pit tells a remarkable tale. In which layer a single implement is found, may sometimes be a mere accident, but lying in Ancylus clay it is to be referred to Pliocene. A better proof of the implement's preglacial character can hardly be desired.

O. Almgren: Stenåldersboplatsen vid Bråviken.

Östergötlands Fornminnesförening 1906.

„Somewhat north-east of Norsholm and about 2 km. west of the river *Kvarsebo's* outlet in Bråviken, this dwelling-site lies near the farm of *Säter*. On a low sandy neck of land a bronze knife had formerly been found. Up on the adjoining hill a small plateau furnished abundant fragments of pottery, characteristic of the dwel-

ling-sites of the stone age in eastern Sweden. The ground here was fine littoral sand lying on round water-worn stones.[1] The sand was more or less dark from decayed refuse and remnants of charcoal, commonly 30—40 cm. thick, but on one spot with scorched stones up to 65 cm. thick, indicating a fireplace. Here and there fragments of the same vessel occurred; one had the usual rounded bottom for placing in sand or between stones. The vessels were large, but also a small one was found. The ornaments, arranged in rows, were punctate markings and incised short lines, mostly inclined; sometimes longer lines crossed each other and in one fragment perpendicular zigzag lines were found. A whole series of greenstone axes and chisels were found, one round axe (with pointed neck), some small finely ground quadratic axes, and some trapezoid chisels, all of greenstone. The probably oldest form, the round axe, lay 15—20 cm. deep, while some quadratic axes lay nearly 40 cm. deep at the bottom of the cultural stratum. One little arrowhead of a flint flake, one unworked flint flake, and some flint chippings occurred, 2 being of the southern flint from Kristianstad. Rock refuse was abundant. Several smaller grinding stones of sandstone were found besides a probably modern one of another kind of rock in the upper part and certainly belonging to the other modern objects that were found here. No slate implements were found, but one **slate** spearhead is formerly found in the neighbourhood.

The animal bones mostly scorched were comparatively few, mainly consisting of seals as Phoca foetida and Halichoerus gryphus, some fish bones, and 1 or 2 bones of certainly wild boar (1 at a depth of 30—40 cm.). In the upper part, however, some bones of swine, sheep, and horse, all unscorched and from much younger times, were found together with also modern objects as an actual clasp-knife, the half of a pair of scissors, nails, and other objects of iron, metallic buttons, glaced potsherds, and fragments of brick. All these modern relics and a heap of stones indicated cultivation in recent times.

Almost 100 m. westward another dwelling-site of a distinctly different character, specially in regard to the fragments of pottery, occurred. In the other eastern dwelling-site it was a commonly hard burnt, reddish yellow material with sharply incised and imprinted ornaments, between which punctate markings and trailed zigzag lines played a great part, while in this western dwelling-site a coarse,

[1] Just above this dwelling-site a field with stony debris sloped rather rapidly up towards the steep mount Kolmorden, and lowest in this field potsherds occurred, but no investigation was made here.

dark, and strongly stone-tempered material occurred with considerably different ornamentation of rude lines and punctate markings in arrangements. This western site was also much richer in flint refuse about 40, while the eastern one in a $4^1/_2$ times larger area had only about 10. Of these 40 chippings only 2 showed grinding, consequently relics of ground flint axes, and one chipping was large enough to show a quadratic axe with incomplete grinding on all four sides. Also here some bits of flint from Kristianstad occurred. Moreover, 1 small flat grinding stone and some rock refuse were found. Here the bones were almost exclusively of seal mostly scorched, and one scorched bone of bird occurred.

The distinct difference between two so adjacent dwelling-sites can only be founded upon a difference of time. The eastern site resembles much Gullrum and Hemmor in Gotland, while the western one shows certain patterns from Åloppe. The eastern site might be the oldest on account of relations of dwelling-sites in Finland (confer Ailio), particularly in regard to the punctated zigzag lines. In spite of poorer work the western site shows a more advanced stage through the sometimes prominent vertical arrangement of the ornaments, perhaps, produced by influences from the periods of the dolmens and the giant's chambers. The eastern site lies about 25 m. above the present sea level, and the younger western one at least 2 m. higher. The bronze knife was found 13 m. above the sea."

According to my views, also these finds must belong to the older stone age and be preglacial and removed, at least somewhat, probably from one and the same original dwelling-site. Fragments of pottery are also found higher up in the not investigated field towards Kolmorden; fragments of the same vessel are found here and there, accordingly scattered; Åloppe and the two mentioned finds in Gotland are also preglacial. The underlying fine littoral sand may be rolled during the removal by the fluvio-glacial floods, and the round water-worn stones upon which the sand rests, may be marine stones from the upheaval in Middle Tertiary. All the found implements correspond to the older stone age, but the 2 ground flint chippings are probably neolithic; their situation is not related and many modern objects are found, it must be an intermingling later on. Only one spearhead of slate was formerly found; one swallow does not make a summer or the arctic stone age.

T. I. Arne: Et fynd från den äldre stenålderen i Östergötland.

Ymer XXV 1905, pp. 119–20.

„A collection of chipped flint implements was sent in to the museum, related to have been found at *Åby*, not far from the lake Vättern, scattered in about 100 square fathoms of a field. It has plainly been a peatbog and at still older times a little lake.

Uppermost a layer of top-soil, about 25 cm. thick, resting on a yellow stratified layer of plastic mud (?). In the top-soil rich masses of freshwater snails occurred. The flints were by ploughing found at unequal depth down to 25 cm. Sent in were: 3 small axes of chipped flint being tranchets, one flint implement like a knife, 20 flint flakes, and a couple of coarser chippings. Also a portion of the edge of a ground flint axe and a chipped part of a ground object occurred; this last chipping was absolutely not found together with the other objects but nearer the farm, and the same might have been the case with the other ground object.

The types of the found flint implements belong to the last time of the older stone age of the North. In that age a smaller lake certainly existed, but there is no indication of any ait or islet; probably it was a raft like Sarauw's Maglemose. No potsherds or bone implements were found. When we except the bone implement at Tångstad in the region of Norsholm, being perhaps from the Ancylus epoch, then this find is the oldest trace of man in Östergötland. It is a question if it was a dwelling-site."

This not investigated find must certainly be preglacial and palæolithic, removed into the lake. The two ground chippings seem not to belong to this find.

Uppland.

Oscar Almgren: Uppländska Stenåldersboplatser.

Ymer XXV, 1905, p. 461.

In this preliminary note the author gives an extract of his following treatise. „The potsherds were coarsely ornamented with impressed grooves, points, and lines. Greenstone axes without shafthole with round or oval diameter occurred, serveral arctic. Of flint one chipping of a distinctly ground flint axe, probably a thin-necked axe; of bone fragments of awls and harpoons, one chisel,

and one dagger. Perforated teeth and burnt clay pearls. Bones of swine in several cases absolutely wild, but in no case surely tame. The people lived near a bay of the sea and surrounded by wood.

The Ringsjö—Åloppe ceramic art is found even at the southern and eastern coasts of the Baltic Sea, even up in northern Finland, and extends farther eastward right through middle Russia (the river territory of the upper Wolga), even towards the region of Jekaterinenburg eastward of Ural. There is no ethnographic connection, but only cultural influences."

Oscar Almgren: Uppländska Stenåldersboplatser.

Fornvännen 1906, Hefte 1 og 3.

„The so-called *Åloppe-finds*, westward of Upsala, are lying around the lakes Åloppe and Ry; as yet 7 dwelling-sites are investigated. This region consists of small lakes with between-lying, now mostly cultivated peatbogs. 3 sites occur around the lake Åloppe and 4 others north of the lake Ry.

I. This site is a little neck of land, covered with morainic blocks and projecting into the peatbog from the behind-lying woody morainic field. This plateau is a long, cultivated field, called the „church-yard" on account of its contents of bones. The greatest thickness of the cultural stratum is 70 cm. Close by in a not cultivated and accordingly untouched portion of the morainic field, Salin found many objects in the here thinner cultural stratum. Between some blocks and even underneath them, as far as the arm could reach, fragments of pottery are found in the soil. Many bits of pottery and bone occurred. At I, on the northern side of the valley, the stone age people mainly lived, since they here had sunshine and shelter from the north wind. II and III also furnished objects, but to a less degree.

Of the 4 sites near the lake Ry 3 are lying in not cultivated regions:

IV, the northernmost, is not yet further investigated.

V is a clayey field, slightly sloping from the surrounding mountainous and morainic hills towards the peatbog, whereby the boundary of the dwelling-site downwards or probably the ancient coast line is reasonably determined. All the other dwelling-sites have steeper slopes towards the peatbog or the present lake, why in these sites an easier washing down of the objects might have occurred.

VI, an important dwelling-site, is a rather steep morainic

field with here and there occurring plateaus, probably of considerable extent.

VII is the upper rather horizontal part of a cultivated field, strongly sloping down towards the lake and up-hill bordered by a woody hill. Here were formerly found fragments of pottery and a round axe of greenstone. In 1904 were found an isolated fireplace pit containing earth mingled with charcoal, numerous pottery shards, and some bits of bone. In 1905 a closer investigation was abandoned, since the pottery shards occurred quite scarce; however, a smaller fireplace with scorched stones, shards, and bones besides a clay pearl were found. This site certainly seems only accidentally occupied. The lowest pottery shards were found where the slope began to be steeper, 5—6 m. above the lake Ry which is lying about 32 m. above the present sea level. Accordingly, the lower boundary of this dwelling-site lies about 36—37 m. above the sea, indicating the highest ancient sea level, what is still more marked in the sites V and I.

At V the richest finds occurred rather far up on the more even slope, about 6 m. above the peatbog; 10 m. nearer the peatbog, at 5.4 m., the cultural stratum was already poorer in objects, and 20 m. nearer the peatbog, at 4.5 m. above the peatbog, it was considerably decreased. 30 to 40 m. nearer the peatbog, at 3.7 m. and 3 m., the clay was still somewhat mixed with mould containing both pieces of charcoal and some small shards, but specially 2 shards at 40 m. were distinctly water-worn. At 50, 70, and 90 m. from the main part of the cultural stratum, at 2.3, 0.9, and 0.05 m. above the peatbog, no other traces of the cultural stratum were found than small bits of charcoal that in all places occurred single until 10 cm. deep in the clay. These relations can only indicate that the ancient sea reached up to and washed in the border of the cultural stratum at the level of 3—4 m., and that thereby bits of charcoal were washed farther down towards the bottom of the ancient sea. The height of the peatbog is now 33.6 m. above the present sea, and accordingly the coast line of the ancient sea was about 37 m. above the present sea level (33.6 m. + 3 to 4 m.).

At I the lowest lying numerous pottery shards were distinctly rolled by the waves. This dwelling-site was lying 3—3.5 m. above the peatbog, and the result is, then, the same as at V. Between this spot and the peatbog no shards were found, but several bits of stone axes, a „psychological“ argument that these parts were covered by the ancient sea. Even in the stone age it was a common feature of the human character that a man, throwing away a stone (a fragment

of a broken axe), would throw it out in an existing sea or lake to have the pleasure of looking at the disturbance of the calm surface of the waters.

In the stone age the sea went far into the land as narrow bays and sounds bordered by woody morainic fields. The animal remains were partly from the sea and partly from the wood. In 1902 Salin found 21.800 animal remains of which 6.250 belonged to fish. Most numerous was Phoca foetida, then wild boar and elk, but only few bones of bear, fox, dog, hare, beaver, and 3 other species were found. Some bones of sheep, goat, and cattle in the surface layer were later admixtures. Quite certain, the dog was the only domestic animal. Of birds only 1—3 bones of 4 species occurred. But fish bones were very numerous, principally occurring in large collections here and there, while mammalian bones were evenly distributed over the whole region. The fish bones were remarkably well preserved, sometimes whole lots of scale occurred. Only fish, able to live in brackish waters, were present. The largest specimens were greater than the now living ones.

North of Upsala at Torslunda in the parish of **Tierp** another dwelling-site of the same character is found. Already in 1887, at some distance south of Tierp at Yfre, some pottery shards and a spearhead of **slate** had been found. In 1906, somewhat north of Tierp, there was investigated a rather extensive cultural stratum but poor i objects, lying on the western side of the river Temnare high up at the end of a long gravelly ridge upon its last terrace. This dwelling-site is now divided by the highway, which to the north-west leaves a 10 by 20 m. large cultural layer upon the ridge, disappearing, however, as soon as the ridge becomes steeper and richer in stones. On the south-eastern side of the highway the cultural layer is extensive over a rather level plain, but disappears near the steep slope towards the river. Being here 100 m. long and broad and in many places rather thick, this cultural portion is, however, remarkably poor in objects; only in a small area potsherds and a couple of slightly scorched bony pieces occurred. And on the other side of the highway only some few shards were found. The ground consists of sand that is less able to preserve objects than the clayey mould at Åloppe. In about 15 trial pits no objects were found. The lower border of the cultural stratum lies 36 m. above the sea level as at Åloppe, the maximum of the Littorina Sea being 75 m.

The Culture of the People.

The enormous amount of *pottery* fragments in the dwelling-sites of Uppland is the most prominent feature, and a very great part of them are decorated with simple impressed or incised ornaments. Mostly large, however, also small vessels were found, but not one proximately entire vessel. All of them seem to have a rounded bottom that made them unfit for standing without support. Upward the vessels were somewhat flaring towards the aperture, and mainly the upper portion was ornamented. The ornaments were arranged in horizontal rows around the vessel: punctate markings conferred by impression of a blunt-pointed implement as small hollows or points; small incised lines horizontal, vertical, or slanting, and sometimes forming zigzag lines; even straight cross-hatched, circular, or semicircular lines; in rarer cases a vertical grouping in the arrangement of the ornaments; the thick rim was very often notched. One potsherd (fig. 18) shows an imitation of a fern leaf, consisting of a long vertically trailed line, the petiole, with short slanting streaks on each side. A similar ornament occurred in the find on Ringsjö. The material is richly tempered with small stony grains of quartz, feldspar, etc., perhaps an explanation of the numerous and sharply edged bits of quartz found here.

Always small pieces of *flint* occurred also, but only a couple showed a little working. One flint flake had rough streaks after the first grinding with sand (perhaps a fragment of a thin-necked axe), and a workman found one 10 cm. long narrow, grooved chisel of flint. However, the axe material was *greenstone* of which numerous refuse was found. It was greenstone axes without shafthole with round or oval diameter besides a couple of thin accidentally formed chisels with only the edge ground. No axe with shafthole is as yet found; only a few uncertain bits, perhaps indicating axes of this type, are found and must, then, originate from the upper layer as later admixtures. In the vicinity serveral such axes or fragments of them are found. In the find VI, a distinct workshop, numerous larger or smaller greenstone refuse and grinding stones of sandstone were found scattered in the cultural stratum.

Spear- and arrowpoints or knives were wrought not from flint, but from **slate.** 2 beautiful slate knives are found, even some small arrowheads or fragments of them. At VI one hind-part of a large spearhead of slate with the characteristic large barbs occurred. One spearhead is also found formerly at Yfre south of Tierp. Ekholm in his subsequent treatise mentions that more than 30 slate imple-

ments are found in Uppland and of these 10 in the dwelling-sites near Åloppe, where no bone points occurred.

Implements of *bone* are quite few, specially compared with the abundance in the contemporary finds in Gotland. Fish-hooks are not yet found, and only 2 or 3 small fragments of harpoons occurred at Åloppe. Broken points of awls were most common and sometimes entire awls occurred. One little bone chisel and a fragment of another, a couple of pointed tines of antlers of elk, an uncertain dagger of a bone of boar, and 2 perforated toe-bones were found. Some few perforated teeth of seal and elk occurred.

Some simple pearls of *fired clay* besides one miniature axe with a hole and 2 animal figures probably of elk, all of fired clay, were found.

In the find VI, undermost in the here 25 cm. thick cultural stratum and lying upon the clayey bottom itself, one lower jaw and 3 dorsal vertebræ of *man* were found. The author considers these human bones as refuse from the meals during the formation of the cultural stratum like other bones. It is almost unimaginable to explain the human bones here as originating from a disarranged grave, of which no trace was found. On the lake Åloppe in the thickest part of the cultural stratum one human humerus and one tooth were found between an enormously rich collection of large bones of seal, boar, and elk near some stones, indicating the same cannibalism, a not quite unreasonable supposition. Also in the cavern of Stora Förvar in the islet of Stora Karlsö near Gotland a quite great number of human bones were found scattered between animal bones in this colossal cultural stratum, and a part of these human bones were cleft in such a manner that it appeared done to obtain the marrow. However, further material in new finds is necessary to settle, quite definitively, this question.

Almgren regards these finds as connected with the periods of the dolmens and the giants' chambers in southern Scandinavia. It is a remarkable circumstance that the youngest of these dwelling-sites in Sweden at the ancient Littorina coast line belong to the period of the giants' chambers, while we hardly know any such dwelling-site in the period of the cists. Along the Scanian coasts agriculture and stock-keeping appear known long before the period of the giants' chambers, already at the close of the older stone age, as Kjellmark's find at Limhamn indicates."

Here at least is no occasion for any doubt about the age of these finds. Everything points directly to the older stone age and decidedly to a removal during the Ice Age, accordingly the preglacial

palæolithic period. At least the Åloppe-finds are lying more or less deep in extensive morainic fields with large erratics. How is it possible to find fragments of pottery in the soil underneath large blocks, even as far in as the arm could reach, if these fragments were not transported before they were covered by the erratics? The cultural objects are so widely scattered over extensive regions and are partly found far away from the proper cultural strata deep in the morainic deposits. The curious „psychological argument" is of no avail and proves only the glacial removal as, in fact, everything here does; there was no higher standing Littorina Sea to wash down some part of the cultural strata. Mammalian bones are evenly distributed over the whole region and the very few human bones, found in two places, are easily and evidently explained by the removal from original dwelling-sites lying more or less away from their present places; at least no cannibalism has here existed, that is absolutely certain. Even the flint flake with rough streaks „after the first grinding with sand" (the supposed fragment of a neolithic thin-necked axe) must be a common chipped flake that during the removal has been somewhat affected by the also removed sand or gravel. Also the „water-worn and rolled" fragments of pottery must during the removal have been affected, perhaps specially by the fluvio-glacial floods. The site VII was not „certainly only an accidental occupancy," but represents a removal. Also the relations of the finds at Tierp must tell the same story of a removal; why have we here an extensive cultural stratum almost without antiquities, and why are 2 objects found far away to the south of Tierp at Yfre?

Also the implements belong to the preglacial older stone age. Of flint only some small bits and a chisel occurred; of these bits only a couple showed „a little working," perhaps produced during the removal. The supposed fragment of a thin-necked axe is mentioned above. The greenstone axes without shafthole are palæolithic even when ground, and axes with shafthole are not found in these finds, but only in the vicinity; it may, however, be a question if not even such axes occurred in the older stone age. The few implements of bone are also palæolithic and, perhaps, as lighter objects removed farther away or destroyed during the removal. Even the rude figures of fired clay are probably palæolithic. That no proximately entire earthenware vessel is found, is natural when removed; the material is coarse and the ornaments palæolithic. The fern-like ornament is also found in the preglacial find on Ringsjö.

How is it possible to refer these finds to a late neolithic time, having not one actual sign of the neolithic period? The people lived by hunting and fishing, and no domestic animals were found.

It struck me at first as very peculiar that so numerous remains of seal and fish from brackish waters were found at Åloppe quite in the interior of Uppland at such an exceedingly long distance from the Baltic Sea. How was that possible, when I rejected the supposed Littorina Sea and supposed that the Baltic Sea had a somewhat similar extent in preglacial times as at present? Of course, the removals during the Ice Age had altered much in the extent of the sea in low-lying parts of Uppland, but this was, however, too formidable. I studied, therefore, the present map of Sweden and found that the very long gulf of Mälaren sends a long narrow arm far to the north up towards Upsala, where in its northern part a small bay runs westward, at present ending about 15 km. from the lake Åloppe. Before the Ice Age filled up much of the low-lying Uppland, this bay might have extended still somewhat farther to the west, and moreover these finds at Åloppe are now removed so that the distance of the original preglacial dwelling-sites from this brackish bay of the sea was at that ancient time, perhaps, still shorter than at present. All species of fish, found at Åloppe, lived in brackish waters. The people of the older stone age did never live on the actual coast as always supposed, but made certainly excursions to catch the seal and the fish, while they were also a hunting people. The result is, then, that my supposition appears not so quite unreasonable.

The 10 slate implements at Åloppe must probably be the remains of the arctic people of the northern Sweden, when they were driven southward by the beginning Ice Age. There is no reason whatever to consider the finds at Åloppe as arctic-baltic, as Brogger junior does.

Gunnar Ekholm: Upplands stenålder.

Upplands Fornminnesföreningens Tidskrift, H. XXVI.

Here must it always be kept in mind that the 2 dwelling-sites in Uppland are regarded as belonging to the periods of the dolmens and the giants' chambers, while they are really preglacial and palæolithic, and accordingly many found implements must be judged from this point of view. Moreover, before the Ice Age a great part of the low-lying Uppland was not or, at least, was less habitable, and many of the single found implements might have been transported to their present place from quite other sites during the glaciation.

„According to v. Waldheim, the peninsula of Uppland was through its low-lying situation exposed to the effects of variations in level.

Hollender remarks that in Uppland until Dalarne the levels of 66 to 90 m. above the sea are relatively richest in rock axes without shafthole, while the lower levels are marked out by a proportionally greater amount of axes with shafthole. Moreover, in regions with rich finds axes without shafthole are relatively more numerous than in regions with few finds. Accordingly, the higher levels were first inhabited and from here man extended over the lower levels, the people following the coast. At the beginning of the Scandinavian stone age about 200 feet (about 64 m.) corresponded to de Geer's coast line in the western part of the central Uppland. Even the main part of the levels of 100—200 feet was localised to western Uppland, and in the southern parts numerous islands occurred.

A lowering of the level of only some few meters could here and there produce an alteration of several Swedish miles[1]) in the coast line. The difference between the extent of older and younger types was, therefore, very great. According to Montelius, the axe with a pointed-oval diameter belongs to the first period of the younger stone age and in this case it ought to be the oldest type in Uppland; but in Uppland only 4 certain such axes are found near the boundary of Västmanland, 3 ground flint axes and 1 unground.

The real occupancy seems to have first occurred during the period of the dolmens. In Uppland as, on the whole, north of Mälaren there are not found any giants' chamber or cist, the so-called megalithic grave type. Antiquities from these periods, however, occur single, but quite richly. 68 thin-necked axes, of which 20 of flint, are found; axes of rock are of a variating type, but technically they show an influence of the round axe, chipped and ground only at the edge. The Lihult type (Bohuslän) of greenstone axes is not found in Uppland, but in Södermanland (south of Mälaren) this type is not uncommen.

About 260 round axes („Trindyxar") occurred in Uppland, mostly belonging to the period of the dolmens as the thin-necked axe. Ekholm's typological division of these rock axes is the following:

1. Oldest the axe with almost circular diameter and butt-necked, occurring in the Danish kitchen middens, but in Uppland the neck is not so carefully wrought. This type is not, however, found in the dwelling-sites, but probably somewhat older than the others.

2. Younger the axe with round or broad-oval diameter and pointed neck. One axe of this type is found at Kvarsebo, Braviken, in Östergötland in the upper (younger) cultural stratum, indicating a younger time of the period of the giants' chambers.

[1]) One Swedish mile is almost 10.7 km.

3. Youngest the axe with compressed elliptic diameter, the sides often ground flat, and broad-necked. These 2 last types occur in Uppland side by side in the beginning period of the giants' chambers.

Besides, a type very long until more than 30 cm. occurred

Contrary to the flint axe with its distinct lines, the rock axe is difficult to classify on account of its often badly workable material. All these rock axes in the western part of Uppland are not evenly distributed, but the finds are almost without exception localised to the valleys, the bottoms of which were at that time bays of the sea. In the valleys of Åloppe and Vittinge (somewhat north-west of Åloppe) very important centres occurred, but also out in the peripheric parts of Uppland some more isolated finds occur, indicating an occupancy also of islands there. For instance, at Alunda a large thin-necked axe and at Flottskär in the parish of Väddö 2 axes are found; Väddö lies on the present eastern coast and Alunda somewhat to the west of Väddö. De Geer estimates the Littorina maximum at Väddö to 60 m., but at Åloppe to 75 m. In the south-eastern part of Uppland 2 round axes occurred in the parishes of Riala and Vester-Åker.

The primitive style of the ceramic ornamentation at Åloppe is akin to the dwelling-sites on the mouth of the river Laga (southern Halland) and Ringsjö (Scania), in Gotland, and at Braviken in Östergötland, even in Finland and Russia towards Ural. The round axe is numerously represented at Åloppe, but the butt-necked axe is not found here.

Besides the round axe of greenstone, it is the **slate** implements with delicate forms that give their character to the dwelling-sites of Uppland. In Uppland more than 30 samples of slate objects are found. The experience from Åloppe, Tierp, and other places shows that in such sites the spear- and arrowpoints of slate and bone are the normal type of such implements. In the dwelling-sites of Uppland the bone points are wanting, but instead of bone the slate is the more prominent. At Åloppe not less than 10 slate objects are found. The places where slate occurred, are regularly situated at the level of 100 feet. A southern group, from Kumla in west until Åloppe in east, has 8 findplaces. The other group, from Upsala in south until the lakes Vendel and Dannemora in north, has 13 findplaces. An isolated situation have the 2 slate points at Lännersta in the island of Vermdö on the southern side of the inlet of Mälaren (exactly spoken in Södermanland) at a somewhat lower level. The settlement, characterised by slate, is then eminently a coast occupancy. In Dalarne and Norrland, the northern half of

Sweden, the slate objects follow the rivers even up until the mountain lakes, why it is curious that in Uppland they are limited to the coast and do not go higher up. In the valleys of Vittinge and Löfsta, otherwise so rich in finds, they are wanting. The only explanation is that these regions were already prevailed over by the megalithic agriculture, coming from west. The flint culture seems to have arrived early to Uppland, at least in the period of the dolmens, and then earlier than the slate culture. It is impossible to refer the slate culture to the older stone age, in which case the slate objects must have been found at higher levels, while they are regularly found near the level of 100 feet. When we know that Åloppe belongs to the period of the gigants' chambers, then the slate objects in Uppland cannot be placed farther backward than to the beginning of this period. In the period of the cists they do not belong.

This dualism between a coast region with a fishing and hunting people and an inland with a megalithic agriculture, is also found in eastern Sweden as in Kalmarlän, Östergötland, Nerike, and Västmanland. Kossina's opinion that the bearers of the slate civilisation were a Finnish-Ugrian people is hardly possible, since no deeper dissimilarity seems to result from the anthropologic material [1]. Consequently, it is not various races, but perhaps only different tribes.

In the basin of Vittinge the numerous round axes must belong to the agriculture, but such axes are also numerous in the dwelling-sites of Åloppe, belonging to the coast region, and accordingly this axe type is common to both civilisations. The round axes are, however, not particularly characteristic of such dwelling-sites in general; at Kvarsebo (Braviken) only one axe is found and at Gullrum (Gotland) it is quite unknown. The butt-necked form occurs not at Åloppe, but in the basin of Vittinge.

Ekholm's conclusion is that the slate objects belong to the civilisation of the dwelling-sites, and that the round axes are common to this and the agriculture. The thin-necked axe is a real megalithic type, however, not exclusively limited to the inner part of Uppland."

The following portion of this treatise is of less interest in my behalf, as the various other axes and chisels are found scattered across Uppland and mostly belong to postglacial times. „The probably most numerous group is the thick-necked axe with rectangular diameter and without shafthole; of 260 found specimens 50 were of flint. Besides, some dissimilar axes and chisels of rock, only in the

[1] Almgren: Fornvännen 1907 p. 117.

formation of the neck somewhat reminding of the thick-necked type, may not all belong to the same time as the common thick-necked axe: a. 4 chisels of amphibole (fig. 51 and 52), also found in Norway (Brögger's fig. 42 in „Norges Vestlands Stenalder") and in Finland of somewhat similar types. b. The Vittinge type[1] of axes (fig. 53 and 54), also found in western Norway and called by Brögger the „Vestlandstype". c. The Gullrum chisel (fig. 55 and 56), numerously found at Gullrum in Gotland. d. Figure 57 found in 3 large specimens in Uppland. e. Figure 58, not belonging to the megalithic group, also found in western Norway (Brögger fig. 41) and in Finland. The Vittinge type is particularly localised to the basin of Vittinge where no slate objects are found; however, at Sjöhagen in the parish of Vittinge 2 slate chisels occur, the one a distinct Vittinge type and the other nearly an arctic type. The Vittinge type belongs to a later time of the period of the giants' chambers, why it is not found in the dwelling-sites that belong to the beginning of this period.

The axes with shafthole, about 1,200 specimens, are specially localised to the peripheric parts, particularly the coast region in east, with few finds in the interior. In the basin of Vittinge, the principal centre of the period of the dolmens, not one axe with shafthole is found."

The author says that at least north of Mälaren no megalithic graves are found, but only megalithic implements. However, these so-called megalithic implements are for the most part palæolithic and preglacial; the supposed contemporaneous dualism does not exist, it is but 2 quite different cultures from different periods, the one preglacial and the other postglacial. Why are the megalithic graves quite wanting here? To me, it appears not absolutely unreasonable that the superior ruling class of the new neolithic race in Danmark, the bearers of these grave forms, did not live in Uppland during these periods, since the graves are only found in southern Sweden mainly in its western parts; but, of course, also Uppland was inhabited in these same postglacial times. This apparent contradiction seems only explicable in this manner that another different race lived in Uppland, after the glaciation arrived from Denmark or from Finland. As already mentioned in „Palæolithic Chronology," the 3 Danish postglacial kitchen middens with only neolithic objects can hardly be attributed to the new neolithic people from Asia; but the first postglacial invasion of Denmark, partly represented by the

[1] The Vittinge type has „a somewhat curved dorsal surface, transverse edge, narrow sides, in the frontal section somewhat tapering against the butt-end" (Brögger jr.).

3 mounds, must probably have been the same preglacial tranchet people that were driven away by the Ice Age and again returned to their old homesteads, when Denmark and the Scandinavian peninsula anew became free from ice. Later also the new superior neolithic people invaded Denmark and partly subjugated the older inhabitants. To avoid subjugation this older people escaped, however, by and by northward to the Scandinavian peninsula, followed by the megalithic people into southern and western Sweden, and accordingly escaping farther north. This older people knew, of course, partly the neolithic culture, but did not use the megalithic grave forms. If Uppland at that time was also inhabited from Finland round the Gulf of Bothnia or across the Isles of Åland, I cannot tell.

However, it is but the preglacial palæolithic period that interests us here. As already mentioned, the dwelling-sites at Åloppe and Tierp must be preglacial. The preglacial round axe was numerous at Åloppe where the butt-necked type[1] is not found, but also in many other places; even in the south-eastern parts 2 round axes are mentioned. Of 261 round axes many occurred in the basin of Vittinge, where no axe with shafthole was found, probably also preglacial. Ekholm remaks that all round axes in the western part of Uppland are almost without exception localised to the valleys, „the bottoms of which were at that time bays of the sea;" but the people lived not out in the sea, and in the supposed postglacial times these implements must now have been found *in situ* ashore and not out in the bays where all these axes can hardly have been lost. That the sea went so far into the land either in preglacial or postglacial times, I cannot acknowledge. The almost exceptional occurence at the bottoms of the valleys may, perhaps, indicate a removal from higher lying dwellingsites, accordingly removed by the Ice Age. The palæolithic Lihult type from Bohuslän is not found in Uppland, while it is not uncommon in Södermanland, just south of Mälaren; has this anything to do with an invasion from Finland? However, it must probably be a common evolution of the so-called south-Scandinavian culture; the evolution of the Lihult type seems specially localised to Bohuslän and its surroundings in Sweden and to the adjacent regions of Norway as the similar Nöstvet type. The palæolithic culture of Uppland cannot have its origin from the arctic people of the northern parts of Sweden, though arctic implements are found in Uppland in more than 30 specimens (in all found 37)

[1] The butt-necked type is also found in Denmark in the Klinteso mound and in the Brabrand find, all preglacial; but by a mistake this axe type is in „Palæolithic Chronology" called thick-necked.

and of these 10 in the dwelling-sites at Åloppe, these arctic implements must be a later admixture when the Ice Age drove the arctic tribes southward.

Ekholm's argument against the occurrence of slate implements in the older stone age, because they are not found higher up than about the level of 100 feet while in northern Sweden up until the mountain lakes, is of no value, since all levels are referred to the non existing Littorina sinking in postglacial times, and at least the finds of Åloppe are not postglacial, but preglacial. In the basin of Vittinge no slate objects were found, but 2 slate chisels occurred in this parish.

Only implements found in dwelling-sites can be distinctly determined as to age, but also similar implements found in other places may probably belong to the same age. The Vittinge type (in all 21), the Gullrum chisels (36), and the 3 other deviating types of rock may probably also be preglacial, at least partly.

The thin-necked axe may also partly be preglacial. Of 68 thin-necked axes 20 were of flint, but it is not mentioned if these flint axes were ground or only chipped. The 48 axes of rock are of a variating type, but technically they show an influence of the round axe, being chipped and ground only at the edge. This characterisation does not, at least, tell against a preglacial origin.

The most numerous group may be the thick-necked axes with rectangular section, 214 of rock and 50 of flint; they are commonly regarded as neolithic, but most of them may be preglacial; here at least it is impossible to decide it.

Most of the rock axes with shafthole about 1200 are postglacial, if not all. The miniature of a double-edged axe of fired clay (at Åloppe) with shafthole is concidered as the forrunner of the new type, the axe with shafthole. But it may indicate that some rock axes with shafthole already existed in preglacial times.

Of pointed-oval axes 2 of rock and 3 of flint are mentioned, one flint axe being unground, one ground, and one remade from a larger ground axe.

The primitive style of the ceramic ornamentation of the dwelling-sites at Åloppe is certainly preglacial, and as Ekholm compares this ornamentation with the river Laga, Ringsjö, Braviken, Gotland, Finland, and Russia towards Ural, these places are probably also preglacial.

It would be of interest to refer all these rock axes to their proper place in preglacial or postglacial times, but only actually preglacial dwelling-sites can do that. As an argument against the

preglacial man in Scandinavia is maintained that the various axe types are developed the one from the other in continuous series, so it is impossible that a between-lying Ice Age can have existed. However, the Ice Age was brief, about 1.000 years and perhaps even less, and it was the same tranchet people who returned to their old homes and their old use of rock implements, where flint was scarce or wanting. Under such circumstances an apparently uninterrupted progress seems not quite unreasonable.

Gotland.

The Cavern of Stora Förvar in Stora Karlsö.

H. Hildebrand and C. Retzius: Ymer X 1890, pp. 276—7 and 285—7.
Knut Kjellmark: Ymer XXIV 1904, p. 215.

„This cavern lies in the islet of Stora Karlsö, west of Gotland, in a rather steep seaside. It contained a 3.2 m. thick cultural stratum from the stone age, consisting of 29 various layers alternating of ashes and coal and overlain by cultural layers from the Bronze and Iron Ages; the entire thickness was 4.2 m. The uppermost layers mostly contained bones of domestic animals and some few later objects, in recent times having been used as retreat for pasturing sheep in winter. The thick stone age stratum contained simple fireplaces, an enormous amount of animal bones (mostly seal), some human bones, objects of stone, bone, and horn, and fragments of pottery. The rudely made implements were few, one quite well-made axe of rock and at a depth of 2.7—3 m. a fragment of another rock axe besides numerous chippings of flint mostly more like refuse than actual implements. Bone implements, as awls etc., of a rough nature were more numerous than the stone implements. The fragments of pottery partly had simple ornaments typical of the stone age. Several bits of human skulls, in the margins worked by cutting tools, had been found, but Hildebrand did not, however, believe that we could from this conclude that the former inhabitants of the cavern were cannibals. Almost deepest, in the 29th layer, entire skulls and other human bones were found, to be accounted for by Retzius later on.

Kjellmark: The habitation lasted the greatest part of the first period of the younger stone age. No argument of the sea level at that time is left in the cavern, but the Zostera layers, found in the stratum from the stone age, indicate that the percentage of salt in the then existing sea was actually greater than now. Hildebrand

(p. 277) mentions layers of sea-weed (Zostera marina), remains of the beds of the former inhabitants. Also some other caves in Stora and Lilla Karlsö seem to have been inhabited, however, to a less degree.

C. Retzius: More than 3 m. deep, in the 29th layer, distinctly undisturbed 2 human skulls were found besides implements of bone and stone. The skulls were formerly regarded as a Lappish or Finnish race, but in 1860 in a grave near Falköping in Västergötland 20 skulls of the same type as the present Scandinavian race were found, and somewhat later in graves in Västergötland all skulls, except one, were like the present. The 2 skulls of Stora Förvar appeared first somewhat like the Neanderthal find and the find from Spy in Belgium, characteristic of a low front, strongly developed arcus supraorbitalis, and strong muscular insertions. Though these 2 skulls had rather low front and rather strongly developed arcus supraorbitalis, Retzius means, however, that they nearest are like the skulls of the dolichocephalic form in the graves of Västergötland. It appeared more likely that the inhabitants of Stora Förvar were standing very near to the race that in the stone age inhabited the middle Sweden. Of the human bones some were cleft longitudinally, but there were no traces of the stroke of an implement, why it is a question if it indicates cannibalism. Also Hildebrand doubts the cannibalism."

It appears to me most probable that the inhabitants of this stratum from the stone age were palæolithic and preglacial, at least no neolithic object was found here; the people arrived, perhaps, from the adjacent Russian coasts. The first invasion of Europe certainly occurred from the east, from Asia. And it may be that the first impression of Retzius, the conformity of the 2 skulls with the most ancient people of Europe, is actually much more correct than his reference to the neolithic people of middle Sweden. The Baltic Sea may probably have been salter in preglacial times. I quite agree with the two authors that there has hardly existed any cannibalism; at least at Åloppe there has been none.

Hans Hansson: En stenåldersboplats på Gotland.

Svenska Fornminnesföreningens Tidskrift X, 1900.
The plateau of Näs is called **Gullrum.**

„On the west coast of southern Gotland, in the parish of Näs, a low ridge lies about 11 m. above the present sea level, corresponding to 70 per cent of the supposed Littorina maximum that here was 15 m. This dwelling-site is, then, from the first period of the younger stone age (according to Kjellmark, Ymer 1904 p. 216). The

ground consisted of rather coarse bottom gravel and thereupon 30—40 cm. deep sandmixed light mould, being meagre and therefore not cultivated at present, though it had formerly been cultivated as here and there antiquities were found towards the surface. Lowest in the mouldy layer the 5—10 cm. thick cultural stratum rested upon the underground („alfven"). In places where the mould had been removed on account of its manuring quality, there occurred pottery shards, flint refuse, animal bones, and one human fragment, all lying on the not removed underground.

In 1891 to 93 about 1,000 square meters were investigated, and the cultural stratum was found lying undisturbed upon the underground. About 800 square meters belonged to Gullrum and the rest lay in the neighbourhood at **Hemmor**. The following objects were found:

1. Fragments of *human* skeletons, of which an almost entire skeleton was found in an exceedingly simple grave, a hollow in the ground not quite 0.3 m. below the present surface, with 3 small stones in a line on each side of the corpse that was lying on the back; the skull was crushed by the plough, but the other bones were unremoved and rather well preserved. This grave belongs distinctly to the same age as the antiquities, since close by the skull, at the margin of the grave, a small grinding stone of sandstone occurred and in the grave several objects of stone and bone were lying. If the beds of coal and ashes close by the grave had anything to do with an arvel (burial feast), is uncertain, since such beds were commonly met with near the fireplaces. In some other places even nearly entire skeletons were found, however, disturbed by the cultivation; but here no traces of a grave occurred. At one place many perforated teeth of seal were found, probably ornaments of the dead. Single human bones occurred remaining, where the owner had laid bare the underground, probably graves also here. It is remarkable that the dead was without further ado buried quite simply on the dwelling-site among the living.

2. *Animal* bones were abundantly found over the whole area with greater accumulations in some places, many exposed to the fire as relics of meals. Only the greatest amount from 1891 is investigated by Stolpe, mostly being wild boar and particularly seal and fish. Of domestic animals only the dog was found, while bones of tame swine are dubious. Since several implements are wrought from elk horn and a bone comb with the head of a horse is found, also these animals might have been present or known.

3. *Fish* bones occur often in great abundance. Even out in deeper waters the people must have been on the move, as small

boat-shaped bones of the cranium of cod are found. They might probably have used excavated trunks of a tree that are not, however, found.

4. *Flint* chippings, about 3,500 pieces, are remarkable as compared to the insignificant number of flint implements. Commonly they are very small and of light-gray colour. Working of flint implements on the spot appears distinct, but it is uncertain where the implements have taken their way, probably carried away when the people left the place. In great abundance over the whole area smaller pieces of white quartz occurred, the use unknown, but perhaps used as arrowheads. They are certainly collected from other places, since in these regions quartzitic grains are but seldom found.

5. *Earthenware* fragments, more than 22,000 pieces, are too small to give any idea of dimension or form, except some fragments of the mouth of a vessel, 3—4 dm. in diameter. The material is coarse and the outer side of various colour. It is handiwork. A great amount of the shards have ornaments characteristic of the stone age: combinations of impressed punctate markings as small round hollows, smaller points, and straight lines. Sometimes the hollows are so deep that they form a prominence on the inner side. No fragment with perforating holes for hanging occur here as on Ringsjö. No sooted shard is observed. Few fragments of the bottom occurred.

6. *Implements* and weapons are wrought from flint, slate, greenstone, limestone, and sandstone besides from bone, horn, and the outer part of large teeth of wild boar. It is mostly fragments often so small that their destination is uncertain. Both rock and bone implements are well ground, except the flints of which but one apparently had, perhaps, traces of grinding.

Of flint occurred arrowheads and some flakes, probably used as knives. The arrowheads were pointed, double-edged except a couple with triangular and one with transverse edge like those of Lindormabacken (fig. 23 and 26 in Montelius's Les temps préhistoriques en Suède). In a few cases the margins were serrated.

Of **slate** occurred fragments partly of an arrow- or spearhead, partly of a couple of small grinding stones. An entire grinding stone of sandstone is already mentioned as found close by the human skeleton, certainly used for grinding of bone points as two small furrows indicate.

Of arrowheads of flint and slate are mentioned 5.

Of greenstone were most of the rock objects, consisting of some axes of which *a couple with shafthole*, besides of straight and

hollow chisels, in all 51. The majority of the chisels were unusually small, commonly well ground and polished, with even and sharp edge.

Bone and horn implements and weapons were:

Harpoon- and eel-spears occurred, all in fragments, commonly with one or more barbs only on one side except one single specimen, in all 46. Only a couple had a hole for fixation of the rope at the back. There were 2 kinds: large ones of elk horn like those in Karlsö, and smaller ones of some flat animal bones, often well ground.

Fish-hooks, 30, were also fragmentary, but both upper parts and hooks are found. The upper parts had either a hole or an incision in the margin.

Awls, 56, were commonly the best preserved of the bone implements, several entire and some rather large.

Chisels, some of elk horn, and some bone knives besides one tusk of wild boar with one margin ground sharp, in all 6, occurred.

Some small rolls of the outer bark of birch as fishing floats were found.

Upon the whole, the implements were smaller, more finely wrought, and better ground than in Karlsö.

7. *Ornaments:* one bone comb, probably from a scapula, had carved figures of a horse head and a human face besides zigzag lines on the upper part. The only objects formerly known from the stone age with somewhat similar appearance, are the comb-like objects in the Danish kitchen middens, probably used for cleaving tendons but having a handle. Perforated teeth, about 70, were particularly of seal. Near disturbed human bones more than 60 were found. Two pearls of clay, but none of amber occurred.

8. *Fireplaces*, at least 6, consisted of small stones, sooted by fire and surrounded by beds of charcoal and ashes besides burnt animal bones, specially fish bones.

A few pieces of **pumice** and some few nuts of hazel were also found, but no relics of huts.

This dwelling-site must have been inhabited for a very long time on account of the abundant fragments of pottery. The people must have lived, safe and sound, upon the hunting and fishing station; of domestic animals only the dog was present. But the age may be uncertain; Munthe refers the Littorina maximum here to 15 m.

Erland Nordenskiöld who has also investigated the bones, remarks that human bones have not been cleft to obtain the marrow, and

they are not gnawed by beasts of prey. Bones of the dog are only sparingly found, and no animal bones show traces of having been gnawed by the dog. Phoca foetida occurred in great abundance, while of Phoca vitulina perhaps some and of Halichoerus gryphus none were found. Sus scrofa aper was very common, but tame swine was not found. Two bones of elk besides implements of elk horn occurred. One tooth of horse is hardly any argument, but a later admixture. Some bones of Phocæna communis and very seldom bones of birds (5 species determined) occurred, while bones of fish were numerous but not determined by him.

Brøgger jr. in „Den Arktiske Stenalder i Norge", p. 25, says that the ornaments of the pottery at Gullrum are composed of straight lines that form zigzag lines, between which round hollows are arranged. Sometimes the straight lines are arranged in horizontal rows. In one shard the ornamentation is produced by a comb-like implement which is found also in other places. It is important that in the dwelling-site of Hemmor, the neighbouring farm near Gullrum, the zigzag ornament is also found, produced by such a comb-like implement."

Also this dwelling-site I must absolutely consider as palæolithic, preglacial, and removed. No actually neolithic object is found; of flint „but one apparently had, perhaps, traces of grinding", what may accidentally have been produced beforehand or during the removal, and the comb is probably palæolithic. The scattering of the contents over large areas at Gullrum and Hemmor and the peculiar relations of the human skeletons and bones, all tell in favour of a removal from a not far away lying original dwelling-site or sites, probably partly removed in a frozen state. The plough has hardly made all the mischief, and of an arvel there cannot be any question. The many bits of white quartz must have been used in the manufacture of the very abundant pottery. The implements are probably mostly carried away by the people, retreating in front of the Ice Age. The very few slate objects cannot prove an arctic culture; they are, perhaps, even native or brought thither by a retreating arctic people (from Finland?). Peculiar is a couple of greenstone axes with shafthole. Should they really prove the existence of such axes also before the Ice Age? The supposed excavated trunks of trees are certainly used also in preglacial times. To be remarked is that no trace of cannibalism is found here.

Knut Kjellmark: The Dwelling-site in the Parish of När.

Ymer XXIV, 1904.

This find lies on the eastern coast of southern Gotland and was in 1902 investigated by Wennersten, but I have not seen his report published. Kjellmark has but a short note. It was lying at about the same height above the sea as Gullrum, upon an old coast, the bottom gravel of which contained Mytilus and Cardium, being of the same age. According to my opinion, this old coast with marine shells must date from the upheaval in Middle Tertiary.

H. Hildebrand: En stenåldersgraf på Gotland.

Månadsblad 1887.

„From a gravel pit in the parish of Gothem, near the river Gothem on the eastern coast just north of middle Gotland, some antiquities were in 1886 sent to the Museum. Here had been found an unburnt, extended skeleton lying about 2 feet below the surface of the field inside a semicircle of larger stones that were standing in the field and reaching until 1 foot or less above the surface; above the gravel in which the skeleton was lying, there was an about 1 foot thick layer of dark cleaned soil."

At the skeleton 20 objects had been found by the workmen: 1—2. Two chisels of flint; 3—8. six entire, well-worked spearheads of **slate** of the arctic slender type with barbs; 9. one fractured spearhead of slate; 10. one bit of a spearhead of another kind of slate; 11. one spearhead of bone of a somewhat similar type; 12. the lower part of an arrowhead of bone; 13—20. eight tusks of boar, of which 2 with a hole near the point and 1 with a hole at the hinder part and partly with transverse grooves. One arrowhead of slate found later may also originate from the same place.

Slate is certainly found in Gotland, but it is impossible to make implements from this slate; the slate of the implements must be imported. There has, of course, been a lively communication and suitable boats must have existed."

This find has not been investigated and the description is not quite clear. It appears, however, as if the semicircle of protruding stones has no connection with the skeleton, but must be of a later origin. The implements seem to be arctic, and it my be that an arctic tribe, probably from Finland or Russia, has crossed the Baltic Sea either in, for instance, excavated trunks of trees or across the

ice on their retreat in front of the Ice Age, and has buried one of their tribesmen here. It must at least be a preglacial burial, though it is hard to give a distinct explanation.

A. Hj. Olsson: Om de älsta spåren af människan på Gotland.
Geolog. Förenings Forhandlingar 33B. 1912, p. 139.

„L. von Post found chipped flints imbedded in the Littorina mound at *Snoder* in southern Gotland. The dwelling-sites at Visby, Gullrum and Hemmor belong to the first period of the younger stone age. According to Munthe, all these sites lie at about 70 per cent of the Littorina maximum and are younger than Snoder.

The author's investigation occurred in 1909—10 in the regions of the peatbog of *Lina* in northern Gotland.

The dwelling-site at *Svalings* in the parish of Gothem showed the oldest traces. In a gravel pit a cultural stratum lay in a littoral mound; the lowest gravel layer, 1 m. thick, was deposited by the Ancylus Lake, and the upper gravel bed, 0.50 m. thick, was thrown up by the Littorina Sea. Between these 2 layers the cultural stratum was lying, up to 7 cm. thick and 8 m. long. The Ancylus layer contained shells of Limnæa ovata and perhaps of Ancylus, while the upper layer consisted of 2 portions, the lower containing several freshwater molluses (Limnæa ovata and 7 other species) and the upper portion only marine shells, 4 species mentioned.

In situ in the cultural stratum were found 2 distinctly chipped flints, one **pumice,** some small pieces of a brownish yellow sandstone containing iron ochre (as colour), several bones of Halichoerus gryphus, and 4 stones lying lowest (huts), but no fireplaces that had certainly lain in the already removed parts. The dwelling-site lay 17 m. above the present sea level, 20.5 m. being the Littorina maximum here.

On the other side of the at that time existing bay of Lina, at the bridge of *Fjerdinge*, at the same level a thin cultural stratum without cultural objects or fossils was covered by some littoral gravel.

Another dwelling-site at *Hoffmans* in the parish of Bara lay at the highest coast line of the Littorina Sea. Here were found chipped flints, a small ground transverse chisel, a fragment of a somewhat larger axe of diorite of the Gullrum type. The objects were rather eroded.

A dwelling-site at *Medebys* in the parish of Vallstena was first inhabited at 80—90 per cent of the Littorina maximum. The highest portion of this rather elongated cultural stratum rested here on Cardium-bearing sand. The lowest portion had traces of being rolled.

Here were found numerous flint pieces, the edge of a small ground axe of diorite (perhaps of the Gullrum type), a bone implement, and a small piece of a red iron ochre sandstone like that at Svalings, but here red from being scorched.

Traces of man were found at the peatbog of *Källunge in situ* between Zostera mud and overlying snailmire. Here were found a black scorched bone originating from a dwelling-site, pieces of charcoal, one certainly chipped flint, and other small stones.

According to Munthe, „all flints as at Visby, Gullrum and Hemmor, and Stora Karlsö are undersilurian and found in Gotland only as loose blocks. Consequently, until 70 per cent of the Littorina maximum no better flint was used; the Scanian flint is imported."

As mentioned already, the Ancylus Lake and the Littorina Sea never existed. These „littoral" mounds are deposits from the Ice Age; first the overlying layers from Pliocene with terrestrial contents were removed, becoming the underlying so-called Ancylus layers with terrestrial (freshwater) fauna and flora, while the originally lowest-lying layers from Miocene and the uplifted sea bottom in Middle Tertiary, containing marine contents, were removed later during the glaciation and became the upperlying so-called Littorina layers with marine shells and rolled stones besides freshwater and terrestrial fauna and flora from the warmer Miocene, according to my views; but if the contents had their origin from the Littorina Sea with salt-water, as the present supposition is, then the contents ought to be only marine. However, at Svalings the cultural stratum is described as lying between Ancylus and Littorina layers, but at the same time the author says that the lowest portion of the overlying Littorina layer contained not marine, but freshwater shells (even 8 species); however, a salt Littorina Sea cannot deposit freshwater shells. This lowest portion of the Littorina layer with 8 freshwater species must, then, have been deposited by the Ancylus Lake; but when the cultural stratum is, in fact, lying between 2 Ancylus layers, then the people must have lived here in the Ancylus epoch. Since the people could not have lived in the Ancylus Lake, they must have lived here at least between various levels during the rising of this lake. Such an explanation seems, however, little reasonable. But on the other hand, the removal of an originally preglacial dwelling-site explains easily. Of course, it is rather a mere accident during the removal that settles the situation. At Medebys the highest portion of the cultural stratum rested on Cardium-bearing sand and the lowest portion had traces of being rolled; accordingly the cultural stratum seems to lie in layers from the

upheaval. At Källunge traces of man were found *in situ* between Zostera mud (Littorina deposits) and overlying snailmire (probably a later terrestrial deposit in a little lake). At Snoder chipped flints occured in the Littorina mound.

The cultural strata are very thin, but extend over large and various regions, always containing palæolithic objects of the older stone age and sometimes even no cultural objects or fossils; the only dubious implement may be that mentioned at Hoffmans: „a small *ground* transverse chisel." This chisel is mentioned between chipped flints and an axe of diorite, but if it was made of flint or rock I cannot tell; perhaps it was made of rock. Fireplaces are not found, but charcaol and some scorched objects. It appears never to have been collections of objects, but they are few and scattered. This indicates a removal during the glaciation. The rolled condition may originate from the fluvio-glacial floods or from the sea before the upheaval in Middle Tertiary. The removal may partly have occurred in a frozen state. The configuration of the land was probably somewhat like the present, but partly altered by the glacial removals.

It is hardly possible to be in doubt with respect to the preglacial and palæolithic nature of these finds.

O. V. Wennersten: Boplats från stenåldern i Visby.

Fornvännen 1909.

„During the construction of a sewer in the town of Visby in Gotland the author in 1909 found a cultural stratum from the stone age resting upon a littoral mound. In its lowest layer this littoral mound contained a rich amount of granitic blocks and fragments of Mytilus, this latter one becoming less upwards. The stone age stratum was of a very various thickness, apparently 5—80 cm. thick, and was overlain by layers of the thickness of about 1.25—1.50 m. In the lower parts of these overlying layers there were found many remains of human skeletons, even some entire ones in stonelaid graves; here were also found objects of bronze and iron. Even down in the stratum from the stone age human remains occurred in some places. It is, however, but a summary account of the stone age finds. Here occurred:

2,108 fragments of pottery, about 500 ornamented. The patterns are here quite independent. The form of the mouth in several cases deviates from När and Näs. The large rude hollow ornamentation is most prominent, then comes the group of punctate markings. It is liner or greater punctated smaller hollows and short somewhat

concave streaks arranged in lines. Also longer lines are arranged in zigzag. A good deal of the streak ornaments is characteristic of this place. No flat bottom occurred, only pointed or rounded bottoms.

2 nearly entire and 4 fragmentary fish-hooks; 14 awls, one of a bone of bird; 3 chisels (?); 1 needle with eye (said to be found here); 2 arrowheads of bone; 1 seal harpoon; 1 ground tooth; 2 worked bones; 199 perforated teeth of seal of which 2 lying loose, 91 at the pelvis of skeleton no. 1, and 106 at the pelvis of skeleton no. 2, mostly perforated from one side.

Of stone implements occurred: *Axes*, 1 entire of rock, 1 cleft near skeleton no. 1, both with oblique edge; 1 thick-necked with rounded quadratic diameter; 1 with shafthole, strongly eroded, below the pelvis of no. 3; and 1 preparatory work for a „Trindaxe" (butt-necked round axe). All these were made of rock. *Arrowheads*, 1 flake of flint, 1 similar of flint, and 1 of bone (these 2 last ones sitting in the skeleton no. 4). *Flints* as flakes, chippings, scrapers, etc., in all 83. They were apparently not wrought from cretaceous flint.

Besides, 4 human skeletons and some animal bones mostly of seal. Relics of fish were only represented by 2 bones of perch."

This account is, the worse, but preliminary. In fig. 23—27 about 41 meters of the cultural stratum are found. This long, but in thickness so variating stratum may, perhaps, indicate a removal; it lies at least at a considerable depth below the surface. The implements may indicate the older stone age; the simple, strongly eroded rock axe with shafthole may also belong to this period, according to my views. At least 2 of the human remains seem actually to belong to the stratum from the stone age. Somewhat higher up, even down to the upper margin of the cultural stratum from the stone age, many later burials from the Bronze and Iron Ages occur.

Knut Stjerna: Före Hällkisttiden.

Antiquarisk Tidskrift för Sverige, XIX 1911.

This posthumous treatise suffers under the two common confusing mistakes that in Scandinavia man lived but in the postglacial neolithic period, though the oldest epoch is called the older stone age, and that, particularly in Sweden, the various levels of the non existing Littorina Sea determines the age of the different civilisations. But here, too, another formidable mistake upsets the whole determination of age, viz., Stjerna's so-called epipalæolithic civilisation

that, according to the views of Sarauw, places the Maglemose find anterior to the 5 older kitchen middens, while it is, in fact, *vice versa*. It is impossible and quite contradictory to the whole palæolithic evolution that the bone industry, at least in its more advanced phase, was succeeded by the flint industry. The older kitchen middens of Denmark are referred to the maximum of the Littorina Sea, while they, as well as Maglemose and Kunda, are preglacial. The epipalæolithic civilisation is characterised by the types of Maglemose and Kunda, and the Asilian and Oban epochs are considered antecedent to both, while Asilian is late-glacial or almost postglacial and Oban postglacial. The Kunda civilisation can hardly be later than the Maglemose one since the first invasion of Europe occurred from the east from Asia, but must rather be anterior and lasting longer, as some bone forms at Kunda are not found at Maglemose. In my „Palæolithic Chronology" all these relations are formerly treated.

The author says: „The origin of these types (in Maglemose) is not lying in Western Europe. Some types as the transverse chisels of horn without shafthole, the daggers, the awls, and the perforated tooth-pearls certainly have their analogons in the West-European palæolithicum, but they are too simple and have a too extensive propagation in civilisations of dissimilar age to serve as argumentative material. However, as soon as the palæolithic types show more developed forms, their complete analogons are not refound in the Maglemose horizon of the North The latest Magdalenian time has, for instance, tooth-pearls with more holes above each other, carefully worked. The oldest tooth-pearl of the North, however later, is much ruder and has but one hole. Although Maglemose shows a lower evolutionary stage of the civilisation of dwelling-sites than a Magdalenian layer of Western Europe, it presents, however, quite foreign types as the shafthole axes with straight or transverse edge. Later, in neolithic times these axes become known in Western Europe and there generally used. Dwelling-sites with pure Maglemose types are not common. There are found a couple from Denmark as from the lake Söborg, others at Kiel and along the southern coast of the Baltic, but such finds are not made in the Scandinavian peninsula."

The apparent contradiction is easily explained. The Maglemose culture was late-preglacial and accordingly anterior to the succeeding Magdalenian culture during the Ice Age. The Maglemose civilisation of the southern coast of the Baltic Sea only marks the way from Asia to Denmark in preglacial times. The horn axe with shafthole in palæolithic Denmark is remarkable; a hole is certainly more

easily bored in greenstone than in horn, why it seems not to be an unreasonable conclusion that greenstone axes or chisels with shafthole occurred in the North also in the preglacial period.

„In the rich Maglemose find, as a rule, several specimens of formerly known objects of bone occurred, but in respect to chronology it is more remarkable that of 2 types, not seldom in other places, only one of each is found here as the small-dentated bone point and the coarse bone implement with pointed edge, while the latter type with rounded or transverse edge was quite wanting. A bone point with lance-shaped edge and lost flint barbs was also found in Maglemose, but must not be confounded with the numerous bone points with flint incavations (Kunda type a), which are not represented in Maglemose and accordingly must be a later type.

The Kunda types are the following:

a. bone point with incavations for larger flint barbs.
b. unilateral coarse harpoon with few barbs (cut out in the bone) and with a hole for fixation.
c. unilateral coarse harpoon with few or more barbs without the hole.
d. unilateral, long and slender bone point with many barbs and with or without tang.
e. bilateral, finer dentated bone point with the barbs more or less compensated by flint barbs, with or without tang.
f. plane, shallow-dentated bone point with tang.
g. broad stick-implement of bone.
h. broad bone implement with slanting edge.

Kunda types are found:

In Scania: in the Åmosse a, c, e, and i; in the peatmoss at Torup 1 d and 1 g; and in the peatmoss at Hylteberga 2 a and 1 c (?).

In Dalsland: at Hästefjord 1 c and 1 g (?).

In Maglemose: 1 d and 1 g.

In a peatmoss at Hillerød (also in Zealand): 1 c, 1 d, and 1 h besides a transverse axe of elk horn.

The Kunda types are represented even in the Danish kitchen middens, why these types are lying between Maglemose and the kitchen middens, and are contemporary with the older kitchen middens, which period is called the Ertebölle types.

Kunda types together with Ertebölle types are found:

In Scania: at Limhamn 1 a besides even later types; on Ringsjö several of g and harpoon points of bone and horn; at Bastanäbbet, Börringe, 1 a; on Räbelöfssjö several of a and e, one lance-point with flint barbs besides harpoons.

In Bohuslän: at Multorp 1 a in a layer later than the Littorina maximum.

In Zealand: at Sölager 1 c; at Kassemose 1 a in the ground below a kitchen midden with unground flints. (This may indicate a removal of the mound across the ground with 1 a).

In Jutland: at Fannerup 1 c (?) and 1 g.

In the Norwegian Viste find in Jæderen: a, b, c, and g besides a plane bone point without barbs.

Accordingly, some Kunda types in Denmark, for instance, at Kassemose are earlier than the kitchen middens, the Kunda types in the Danish islands, in southern and western Sweden, and in southern Norway are contemporary with the kitchen middens, and in certain respects they reach beyond the epoch of the kitchen middens.

Maglemose types and Kunda types indicate upon each other following stages of the same epipalæolithic civilisation. Many implements are common to both, others are changed to the better, but the principles of working and use are the same, even in the later palæolithicum of Europe. Peculiarly characteristic of this epipalæolithic people is their partiality for the lakes, while very few finds occur along the coasts."

All this is easily intelligible, since the preglacial epipalæolithic civilisation of the North was posterior to the Ertebölle civilisation and anterior to the Magdalenian of Europe. The so-called partiality for the lakes indicates only the removal of the dwelling-sites out into the lakes during the glaciation.

„The real harpoon dates from Magdalenian II, it was cylindric with tang as long as reindeer horn was used in Magdalenian II and III, but later in Asilian and Arisian more flat with a hole for fixation, wrought from stag's horn. The long, unilaterally barbed Maglemose points of a more accidental diameter are of the same type used during the oldest part of Magdalenian II, but not during the epoch III that ought to have formed the transition to our epipalæolithic civilisation. The cause of the slow evolution of the northern harpoon lies therein that they must begin with a bad material and wanted the palæolithic traditions of southern Europe. However, in the elk horn they got a material more like the reindeer horn."

In fact, it is quite *vice versa*, and all these reasonings tell more in favour of a transition from the epipalæolithic civilisation to the posterior Magdalenian, the actual evolution.

„The figures 22—49 in Stjerna's treatise represent partly decorated bone implements from Scania, Blekinge, Östergötland, Södermanland, Bohuslän, Dalsland, Dalarne, Hälsingland, and Ångermanland; also

Västergötland and Nerike are mentioned. Fig. 52, page 31, is a map of Sweden with the extent of bone implements. Of elk horn axes (3 figured) 21 occur from Södermanland and 50 from Bohuslän, both with a hole, besides 51 from Jämtland with a cleft at the base instead of a hole."

If all of these are preglacial, may be a question. The southern ones may date from Denmark and the northern from Finland.

Stjerna remarks „that the Kunda types a, e, and i reach up to Hästefjord in Dalsland and to the lake system of Västergötland. Far in the north 2 lance points occur i Jämtland at Offerdal and Refsund. The enormous lacuna on the way from Scania to Jämtland is in many places filled out by the Kunda types b, c, and g. One axe of elk horn is also found in the Norwegian kitchen midden at Stenkjær near the inner end of the Trondhjemsfjord."

„Tardenoisian seems not represented in the epipalæolithic civilisation of the North. The transversely edged flint arrow at Bastanäbbet near the lake Börringe and on Ringsjö in Scania, at Skalleröd in Bohuslän, and the rhombic arrow at Bastanäbbet belong to the Ertebölle civilisation."

That Tardenoisian does not exist here, is but a matter of course, since it belongs to a much later time at the close of the Ice Age when the North was not yet reinhabited.

„In the Ertebölle civilisation the flint surpasses the bone and the ceramic art appears. Certain antiquities, however, are common to the Maglemose-Kunda and the Ertebölle types, as of bone and horn: axes with shafthole, daggers, knives of wild boar, pick-shaped points, and fish-hooks without barbs; and of flint: around-chipped axes, regular flakes, scrapers from flakes, scrapers from discs, knives, borers, and small one-edged points. The axes of the kitchen middens, as the tranchet and the pick, are formed after the same simple principles as the coup-de-poing. The same is the case with the chisel, the transverse axe, of flint. During Magdalenian in France the massive, rather narrow bone chisel is not uncommon, in Asilian and Arisian more common, in Oban rather frequent, in Maglemose occurring, but in Kunda rare, and in the Norwegian Viste find one specimen that shows an admixture of Kunda and Ertebölle types. During Arisian the bone chisel begins to be imitated in stone, in Campignian in flint, and the same type is found in Maglemose, but yet in only single specimens. The form of the tranchet in Maglemose is identical with that in northern France and Belgium, rather narrow as its prototype in bone, with an almost pointed projection outside the surface of the edge. The discoidal flint flakes as scrapers,

belonging to Mousterian and Aurignacian, still occur in the epipalæolithic civilisation and flint chippings or more imperfect flakes are very abundant there, while the more perfect flakes hardly occur. But in the Ertebölle civilisation the discoidal implements have almost disappeared and the imperfect flakes are compensated by beautiful flakes, while many bone implements are compensated by the transversely edged flint arrows, and, on the whole, the still used bone implements are relics of former types without evolution. The beginning primitive ceramic art is of importance here. The tranchets of northern France and Belgium correspond to the Maglemose type and not to the Ertebölle type, and the developed technique of the flakes and the pick of the Ertebölle type are local types in Western Europe."

The preceding remarks of Stjerna are remarkable and prove that his views are not right. These relations are easily explained by the simple fact that the older kitchen middens, specially the Ertebölle Mound, are the most ancient, then comes the also preglacial Maglemose, and at last the Magdalenian etc. „The tranchet and the pick are formed after the same simple principles as the coup-de-poing" and „the discoidal flint flakes as scrapers, belonging to Mousterian and Aurignacian,.... have almost disappeared in the Ertebölle civilisation etc."; how is it, then, possible to place these chipped flints in the postglacial, neolithic period? „The tranchet of Maglemose is identical with that of France and Belgium,.... and the French-Belgian tranchet corresponds not to that of Ertebölle"; accordingly, can this indicate anything else than that the tranchet of Maglemose was the prototype of the French-Belgian tranchet, when the Ice Age drove the tranchet-people away to France and Belgium?

In the succeeding chapters Stjerna treats of the periods of the dolmens and the giants' chambers, considering the preglacial dwelling-sites as belonging to these postglacial periods, while his own statements actually indicate their preglacial, palæolithic position.

The Period of the Dolmens.

„Already during the ancient palæolithicum the people began to fashion the chief implement with a pointed-oval diameter. In Egypt the ground pointed-oval flint axe occurred, but not commonly. Also in Tunis and Algier this axe is found and from there up to Britain, where also unground axes occurred. In Scandinavia these axes were both unground and ground, but Stjerna does not consider the

unground axe as anterior to the ground one, because the greatest number of unground axes occurred in regions rich in flint and were in France, Belgium, and England abundantly exported in a more or less worked state. Such great workshops, besides unground axes, contained even ground axes of the same type, why they must be considered as preparatory works for exportation, particularly at Spiennes in enormous masses. In regions rich in flint a relatively much greater number of unground pointed-oval axes occurred than in regions where native flint was seldom or wanting. For instance, in Scania rich in flint an enormous abundance is found, while no such axe is known from Småland and Dalsland. The reason of this is not an earlier occupancy of Scania, but the unground preliminary works were left behind in the neighbourhood of the workshops, while the completely wrought axes were exported widely about."

Why are not all these many preparatory works in the workshop itself, but in the neighbourhood? Most of these preparatory works may, perhaps, have been used in their present state in preglacial times as unground working axes, while the supposed exportation was wanting or scarce. But, of course, many unground axes of this or other types are also found late in the neolithic period. The ancient preglacial people had not many or any actual weapons, since they had nothing to defend except their fishing lakes.

„In Scandinavia axes with rectangular section, thin-necked and thick-necked, occurred with and without grinding. These are undoubtedly contemporary. As a rule the axe was ground, but sometimes left unground and sometimes lost before it was ground. Analogically, the same must have been the case with the pointed-oval flint axe. In the opposite case we ought to have an enormously great number of unground axes of this type, when these axes at the same time must fill out an epoch by itself and, besides, during the succeeding time correspond, for instance, to the following epoch of the thin-necked axes. But the necessary number is absolutely not present. Certain facts show, however, that the pointed-oval flint axe was contemporary with the thin-necked axe and in some forms even lasted longer, under the form of the concave chisel even until the close of the period of the giants' chambers."

But if the unground pointed-oval flint axe actually was in use in the latest preglacial times and also in postglacial times, then there would not be any necessity for its filling out a whole epoch by itself, the between-lying glaciation accounting for the minority of the unground axes. We must, then, see if there is any hold of this supposition to be got from Stjerna's enumeration of such finds.

„After having mentioned several cases of ground pointed-oval flint axes in Denmark and Sweden, Stjerna proceeds: In Bohuslän only one ground flint axe with pointed-oval section and pointed neck is found, but of unground axes only such ones that, according to their largeness, correspond to the Ertebölle type even in dwelling-sites. Bohuslän is, however, very rich in dwelling-sites from the Ertebölle civilisation, and the periods of the thin-necked and the thick-necked axes are exceedingly numerously represented. If the pointed-oval axe indicated a period, we should here have a quite unacceptable empty space.

In Dalsland the relations are about the same. Here no pointed-oval axe is found, but Kunda types and rock axes of the Ertebölle type besides objects from the periods of the thin-necked and particularly the thick-necked axes. Any objects from an intervening time do not occur.

In Östergötland 19 pointed-oval axes occur of which only 4 are entirely ground, and here but one dwelling-site with Ertebölle types is known, while in Norway whence flints of Ertebölle type are known in several places, only 4 single finds of flint axes with pointed-oval section occur. This fact is hardly imaginable, if the pointed-oval axe type should represent the flint during a period between the Ertebölle types and the dolmen types.

In Småland no pointed-oval axe is found, but several thin-necked axes."

In these Swedish provinces, at least poor in flint, no argument of a preglacial existence is found; only in Östergötland several unground flint axes with pointed-oval section occur, but they only prove that no period existed between the types of Ertebölle and the dolmens, between which the Ice Age is lying. Somewhat earlier Stjerna remarks that „in Scania, rich in flint, in 1871 one tenth of the whole number of flint axes were ground or unground flint axes with pointed-oval section, and in Halland 3 of 140 flint axes; also in Scania the number is too small to maintain a period by itself."

„Dwelling-sites with Ertebölle types and later objects from the stone age are of value, but such conditions are only found in the Danish kitchen middens.

In the Ertebölle Mound an implement with rounded edge and pointed-oval section of another habitus than the here treated axes, occurred besides later objects as one scraper, a fragment of a ground axe with narrow sides certainly thin-necked, 2 unground thin-necked axes, and the edge-end of a ground axe with narrow sides; these 5 flint pieces were found uppermost or outmost in immediate contact with the proper Ertebölle objects.

In the Havnö Mound were found one preparatory work for a thin-necked axe, a fragment of a ground thin-necked axe, and one similar from an uncertain layer.

In the Faareveile Mound 30 large discoidal scrapers (these are, however, palæolithic), but no ground axe.

In the Klintesø Mound one fragment of a thick-necked axe occurred in the upper layer.

In the Brabrand find the round axes (Trindyxar) ought to be reckoned to the Ertebölle type.

In the Orum Aa Mound (neolithic) all determinable axes were thin-necked.

In the Aalborg Mound (neolithic) 10 axes of flint and rock occurred. The determinable were thin-necked except one of rock with round section and butt-necked.

In no Mounds axes with pointed-oval section were found. In all of them the Ertebölle types are succeeded by axes with quadratic section. Accordingly, here a period with pointed-oval axes without contemporary quadratic ones are excluded.

Raus (Raa), near Helsingborg in Scania, had pure Ertebölle types. Halland's Väderö had partly rolled objects, between which fragments of ground thin-necked axes.

No neolithic grave has objects belonging to the period of the pointed-oval axe. From all other Scandinavian dwelling-sites of the stone age not more than one pointed-oval axe, with exclusion of the quadratic axe, is mentioned. The course of the axe with pointed-oval section is from the Orient to Britain. The want of these axes along the German coast of the North Sea indicate that they are brought from Britain by sea. In Scandinavia dolmens, agriculture, and the ground flint in the shape of axes with pointed and broad butt-end and with pointed-oval and subrectangular section, appear about contemporaneously, scattered in western Scandinavia during hundreds of years. Certain it is that thin-necked axes occur in Blekinge and Småland, thin-necked and pointed-oval in Västergötland, Östergötland, etc. with megalithic culture but without dolmens, the submegalithic zone."

It is difficult to arrive at a certain conclusion. It may appear that the pointed-oval flint axe[1] and the thin-necked axe occurred, perhaps, in late preglacial and in beginning postglacial times. In Ertebölle one pointed-oval axe but of another habitus, perhaps a

[1] Somewhat later are related finds of pointed-oval flint axes in the preglacial finds in the peatmosses of Bare and Södra Lindved, so their occurence in the preglacial period seems quite certain. Also at Ulfö and southern Bohuslän.

prototype, occurred, but Stjerna says that in no mounds the pointed-oval axe is found. „It is certain that the thin-necked and the pointed-oval axes occurred in Västergötland and Östergötland, etc. with megalithic culture but without dolmens, the submegalithic zone;" this so-called submegalithic culture is, however, certainly in some cases nothing else than a palæolithic, preglacial culture. From all other Scandinavian dwelling-sites no more than one pointed-oval axe, with exclusion of the quadratic axe, is mentioned; but Stjerna does not mention the place so it is uncertain if pre- or postglacial. At least the quadratic rock axe is preglacial. Of the thin-necked axe 2 unground occurred in the preglacial Ertebölle Mound „uppermost and outmost in immediate contact with the proper Ertebölle types," so it may be somewhat dubious if they are intermingled later in neolithic times. In the also preglacial Havnø Mound a preparatory work for a thin-necked axe occurred, accordingly unground. The few ground fragments must be later intermingled. In the 2 postglacial Danish Mounds from the beginning neolithic period all determinable axes were thin-necked. As certain are mentioned thin-necked axes in Blekinge and Smaland, but not mentioned from what places. In the preglacial Klintesö Mound is even mentioned a fragment of a thick-necked axe in the upper layer. It might be a question, if a closer investigation of the French Campignian is able to solve this problem. That the pointed-oval axe has come by sea from Britain, since it is not found along the German coast of the North Sea, is a mistake; it must rather prove that the pointed-oval axe has come from the east, from Asia.

Inland Civilisation.

According to Stjerna, the civilisations of Kunda in east and of Ertebölle in west are parallel, what hardly is quite right, but the Kunda civilisation certainly was older and consequently longer lasting than the Maglemose civilisation. The dwelling-sites on land with Ertebölle types (Bohuslän), on rafts with partly modified Ertebölle types (in Scania the peatmosses of Bare and Södra Lindved), on rafts with mixed megalithic flint forms and bone forms of epipalæolithic types (in Scania Ringsjö and Räbelöfssjö), all these dwelling-sites must be preglacial on land and by the ice partly removed out into the lakes.

„In Öland, Uppland, Helsingland, Ångermanland, and Jämtland several bone objects are found, typologically connected with earlier Kunda types, but not corresponding to the western Scandinavian

regions." This seems to indicate an origin from Finland and Russia.

„North of southern Sweden flint was wanting and rock took its place. The world-wide type without prototype, the round axe (Trindyxan), is found everywhere. A form of this round axe is already found in the upper epipalæolithic layer of Mas d'Azil (according to my views it must be a relic form, perhaps from Scandinavia). Also in the Brabrand find chipped round axes were found (5 butt-necked greenstone axes). Later this axe got a pointed neck. Northward the horn axe with shafthole was lost, as stag seems not to have been common more northerly." But it appears not unreasonable that some of the rock axes with shafthole were used instead of the horn axe also in preglacial times.

„Stjerna means that the round axe with circular or oval section lasted to the close of the stone age. In Öland some bone implements are found in peatmosses, indicating living on rafts." But more probably it indicates a removal by the ice into the lakes.

To determine exactly which axe types were in use in preglacial times in Scandinavia, may be even impossible. The unground flint axe or the ground rock axe cannot absolutely solve the question, as they were also used in postglacial times, at least as working axes. However, the contents of really preglacial dwelling-sites at least give some hints.

Civilisation of Dwelling-sites Transformed under Megalithic Influence.

„In Scania in the *peatmoss of Bare* no ground flint axe or pottery were found, but a small pointed-oval flint axe with pointed butt-end. In the *peatmoss of Södra Lindved* on the lake Börringe true Ertebölle types occurred, except that the around-chipped axes were compensated by small unground pointed-oval axes as in the peatmoss of Bare. In the same layer rude pottery, tranchets, scrapers, transversely edged arrow points, etc. occurred, but no ground flint absolutely as in the Ertebölle Mound. Besides flint objects even rock axes of the submegalithic types mentioned above were found. Bones of sheep, goat, and tame ox show that these ancient types existed immediately near agriculture and stock-keeping." These bones of domestic animals must, however, be later admixtures; these 2 finds must be preglacial, removed out in the ancient lakes by the ice; it was not a living on rafts. It is remarkable to find, in these 2 preglacial finds, flint axes with pointed-oval section, so it appears quite certain that pointed-oval flint axes belong to the palæolithic, preglacial period.

„On Ringsjö Kunda types occurred together with Ertebölle types, tranchets, and ordinary megalithic flints. The pottery consisted of large vessels of rude material with rounded bottom and ornaments arranged after a simple system. This ceramic art certainly is an evolution of Ertebölle forms.

Räbelöfssjö and Näsbyholmsjö are of the same type as Ringsjö.

In Småland in *Ulfö* is found an axe somewhat similar to the newly mentioned pointed-oval axes, but the relations of this find hardly seem to refer it to this group.

In *southern Bohuslän* dwelling-sites occurred with Ertebölle types and small pointed-oval axes as in the peatmoss of Bare, but no pottery. In northern Bohuslän and adjacent Norwegian regions, where the Hästefjord variants of the Ertebölle types were ruling, there occurred rock axes of almost round or round-oval section, but no pottery.

In the later Danish Mounds (the postglacial) the Ertebölle types were slowly succeeded by subrectangular ground axes."

All these finds mentioned here, except the 3 postglacial Danish Mounds, are actually palæolithic and preglacial. Both in Ulfö and in the dwelling-sites of southern Bohuslän there existed pointed-oval flint axes as in the peatmosses of Bare and Södra Lindved, accordingly indicating the occurrence of these axes in preglacial times.

The Period of the Giants' Chambers.

„As the most important finds of this period are mentioned: Gullrum and Hemmor, Stora Förvar (Gotland), Åloppe and Tierp (Uppland), Rangsta [1] (Södermanland), and Kvarsebo (Östergötland). These sites were chiefly fishing places with implements for fishing and enormous masses of bones of fish and seal. The graves were lying in the dwelling-sites. Bone, horn, slate, flint, rock, and clay were used.

Of bone and horn: harpoons, javelins, eel-spears, fish-hooks, awls, chisels, knives of boar's tusk; single are the decorated axe with shafthole, the comb from Gullrum, whistles, daggers, pendant ornaments, etc. Stjerna remarks that the old traditions are still ruling, several forms are still chiefly wrought from bone, and very ancient traditions as the otherwise palæolithic whistle are retained. Stjerna knows but one neolithic whistle from Belgium, and the same implement occurs in the particularly primitive stone age of Wedda in Ceylon." But according to my views all these dwelling-

[1] Arne: Södermanlands Fornminnesförenings Tidskrift 1909.

sites are preglacial and palæolithic and have nothing to do with the period of the giants' chambers. The Belgian site is, however, unknown to me.

„Of slate: knives and javelin-points for fishing.

Of flint: besides refuse only arrowheads of various forms and quite few imported objects.

Of rock: ground axes with round or almost oval section, rather small chisels with transverse edge and rectangular section (Gullrum type), and single axes with shafthole.

Of clay: vessels commonly of large dimensions and seldom small, single pearls, and animal figures.

The richness of types in the eastern territory has, then, very essentially increased since the period of the dolmens. The cause is partly a closer contact of the epipalæolithic civilisation with foreign civilisations, partly an intern evolution.

The intern evolution is represented by new bone forms, the broad harpoon, the slender javelin-point with furrows for fixation, and the transfer from bone to slate. The Gullrum chisel may be a transfer to stone from the bone chisel, of which one specimen was yet found at Åloppe. Still more important is the transfer of the javelin-point and the knife from bone to slate. Brögger jr. founds his opinion of the transfer of the slate javelin-point from bone on the zigzag line, which he considers to be of palæolithic origin from western Europe, while Stjerna considers the large javelin-points of slate to be a transfer from the bone points with flint barbs and not from the bone harpoons, as Brøgger means.

The burial custom and the ceramic evolution are intern. The ceramic art is distinctly connected with that of Ringsjö, but the decoration has gone new ways. Perhaps, it is an imitation of the basket both in form and decoration. Intern is also the rock axe with round or oval section.

The tenacity of tradition shows itself also in other more important respects. No stock-keeping, probably no agriculture are observed. No impressions of seed-grain occurred in the thousands of potsherds, and the dog was the only domestic animal. Only the ancient hunting, fishing, and perhaps even gathering of vegetables existed. The harpoon, one of the most important hunting implements of the palæolithics, but disappeared in megalithic Europe, still remains in the Baltic civilisation of the dwelling-sites, where even the efficiency of the fish-javelin has increased by transfer to slate. Flint is compensated by bone, slate, and rock. The imported flint chippings are very few in the great dwelling-sites. One of the dwelling-sites of Gotland

apparently had a small flint workshop, but exclusively for arrowheads. Weapon never was the strength of this civilisation. Of axes, specially intended as weapon, one single fragment is found in one of the dwelling-sites. Clubs, lances, and warlike daggers hardly occurred; even the small arrowhead of flint is exceedingly rare. This people has not been warlike, as little as their epipalæolithic ancestors. As these they, however, had no other property than their fishing lakes to defend. The completely military accoutrement of the megalithics they had not copied, as little as their graves and custom of life."

Does the reader wish for a better description of a palæolithic preglacial people?

„The megalithic or probably more distinctly the submegalithic culture has exercised an important influence, specially in the working of clay and in the transfer of bone to slate and rock. The worked flints were directly imported from the submegalithic area. The arrowhead occurred seldom. The ceramic decoration stood partly under megalithic influence. Some smaller objects showed the influence of the adjacent agriculture as, for instance, from Åloppe a bone pendant (from uncertain place), evidently imitated after the western slate pendants, a double-edged miniature axe of clay, etc. At Mjölkbo (the Åloppe find no. 6) a fragment af a shafthole axe with sharp edges indicates contact with another foreign culture.

As the horizons of Maglemose and Kunda had their identical correspondences on the eastern coasts of the Baltic Sea, and Kunda later also eastward to Siberia, so their neolithic sprigs in Scandinavia have their near relations eastward. The dissimilarity of the east-Baltic and the east-Scandinavian contents in the dwelling-sites depends thereupon that the civilisation eastward lasted much longer and thus also the evolution of the artistic intensions, besides upon the absence of the megalithic culture that alters all.

Even in the Scandinavian peninsula this neolithic form of civilisation has prevailed, but not against the submegalithic culture for which it succumbs step by step except northward. It appears, chiefly near the river Ångerman, that finds of slate occur. Here are also the relatively greatest number and the best of them found, and from here truely export occurred southward. Amongst the rivers of Norrland the river Indal was the common thoroughfare to the Trondhjemsfjord, and from here the slate civilisation was carried southward and northward along the coasts of Norway. The most southern influences are found in the region of Bergen (Vespestad) etc. (cfr. Brogger), but here strong elements of the submegalithic culture occurred. In the northern Scandinavia several large rock implements

of one from Finland coming type with plano-convex section („Schuhleistenkeile") occurred.

Already in Uppland, but as yet not known from the dwelling-sites, there appear new large transversely edged rock axes: one with rectangular section, strongly bent back, and broad edge (the Vittinge type), to which the reduced Gullrum type corresponds; one with subrectangular section, less bent back, and small edge; besides, one with trapezoid section. These forms, with a peculiar but common working of the surface, occur over large regions of the Scandinavian slate area and have relations in Finland, according to Brøgger jr. Certainly all have their origin from bone forms."

It appears, then, reasonable to consider these forms of rock axes as preglacial, though they are not found in dwelling-sites except the corresponding smaller Gullrum type. As already mentioned, the finds in the basin of Vittinge seem to be preglacial.

„Pointed axes with lateral prominences, on the whole, belonging to the same area, have no known prototypes, but analogies in the east-Baltic specimens with the butt-end transformed into animal heads. All these forms and corresponding ones ought certainly to be considered as north-Scandinavian and Finnish, some belonging to this form of civilisation in the period of the giants' chambers and others more rudimentary in the period of the cists.

They are interesting as the last proofs of a transformation of groups of bone objects to another material. So in Belgium at last the earlier bone pick in the mines of Spiennes is transformed to flint (in Obourg). The bone and horn axes with shafthole yield, in the area of the North, to the rock axes with shafthole. In the eastern Scandinavia, as eastward, form after form is later transferred from bone to rock and slate.

In the custom of dwelling, living, burial, and industrial or artistic technique the here treated people of the dwelling-sites are the last Scandinavian successors of an unknow palæolithic civilisation. Finds from the Scandinavian period of the cists everywhere show the superiority of the foreign cultures."

But is „unknown" an adequate expression? Is not this people of the dwelling-sites an actually palæolithic and preglacial people?

„The megalithic culture receives no elements from the retreating civilisation of the dwelling-sites. Even the slate points are pure rarities in the nearest lying submegalithic area." Of course, not at all since at least the Ice Age is lying between.

Consequently, all these dwelling-sites were preglacial and belonging to the ancient palæolithic people, while the megalithic people was a quite new postglacial and neolithic race, invading Scandinavia at

much later times and reaching far up in Sweden. How can it be possible to regard this actually palæolithic culture as belonging to the much later postglacial megalithic civilisation? As already mentioned, the scarcity of slate objects in southern Sweden must be explained by the southward retreat of the arctic culture in front of the Ice Age. The new neolithic and megalithic race invaded only Denmark and southern Sweden, while the postglacial inhabitants of the Scandinavian peninsula were the returning descendants of the ancient tranchet people, driven southward by the Ice Age. But this returning tranchet people had in many respects acquired the neolithic culture, but not the burial form. As already explained in „Palæolithic Chronology", the returning tranchet people of, for instance, the 3 neolithic kitchen middens of Denmark were subjugated by the new neolithic race from Asia, but to escape the subjugation probably most of them emigrated to the Scandinavian peninsula and populated it, while the new really megalithic people followed them later only to southern Sweden. That the returning descendants of the ancient tranchet people were by the superior new neolithic race driven northward from Denmark to the Scandinavian peninsula, might certainly be partly correct. But I suppose that this returning ancient people invaded not alone Denmark, but also inhabited their old homes of the Scandinavian peninsula, already before the invasion of the new neolithic race pressed the older inhabitants still farther northward. This new neolithic race seems only to have occupied southern Sweden and probably the south-eastern part of Norway in the neolithic stone age; only some few cists are found on both sides of the Kristianiafjord. But the ancient people, however, inhabited most of the Scandinavian peninsula in the neolithic stone age, having during their exile learnt a great deal of the neolithic culture. The ancient preglacial and palæolithic dwelling-sites of the Scandinavian peninsula are still, at least partly, preserved by the covering removals of the Ice Age, while the first postglacial dwelling-sites are, for the most part, destroyed except in the few caves as, for instance, in the upper layers of Stora Förvar near Gotland.

However, if the reader is still in doubt, I must recommend a new perusal of Stjerna's description.

The Burial Custom.

„At Kieler Föhrde with Maglemose objects remains of 2 skeletons and in Maglemose relics of 2 individuals occur. But first in the Danish kitchen middens better informations are to be found, where

entire skeletons are preserved in the Ertebölle and Aamölle Mounds, besides at Fannerup, Kassemose, and also in Svarthala Viste, Jæderen) in Norway.

At least 3 graves are now known from Mousterian as in Moustier, Chapelle aux Saintes, and Spy. Here the corpse is lying extended or bent „in a sleeping posture" in the dwelling-sites of the hunting races. This custom, to bury the dead in the dwelling-site, lasted until the ice masses were definitively removed. At Menton the dead was deposited in its most splendid dress, and at the close of the palæolithic period the dead was provided with food. In the oldest graves weapons and implements were few, but later more. Still during later times the dead was sometimes placed in a sleeping posture, but commonly in a squatting attitude.

In Scandinavia the dead was lying extended on the back, partly with the heels together as in Ertebölle and partly not as in Amölle. Accordingly, here is no connection with the last epoch of the palæolithic, when the squatting posture with splendid dress and often colours and several corpses together were usual. But in the North the dead was lying single, extended, and colours or dress have not been found. On the other hand, there is a likeness between the burial in the North and the oldest palæolithic one in Mousterian, but it consists only in features, on the whole, common to the primitive burial." In other words, the burial custom of the North corresponds to that of the older palæolithic period.

„From the civilisation of the dwelling-sites quite few graves are found; however, still during the period of the giants' chambers they show the same simple character. The most prominent dwelling-site is Gullrum, where an almost entire skeleton was lying in the region of the dwelling-site and partly covered by the stratum of it. There was only made a 3 dcm. deep grave of satisfactory dimensions for accommodating the corpse, lying on the back with stones arranged on each long-side. It is uncertain if burial goods occurred, at least very simple. In other places in Gotland only more or less entire skeletons lay extended in the layer of the dwelling-sites. And probably the human bones at Aloppe are disturbed graves of the same kind. When the dead was forgotten or a new tribe came to the place or the same tribe returned after an absence, then they trampled asunder the skeleton, and the human bones were scattered like the animal bones. The larger long-bones were later cleft by humidity and sun." This explanation has probably the intention of obliterating the supposed cannibalism. At Aloppe the removal by the ice is the real cause, but at Stora Förvar in the cave it is

difficult to explain. „Disturbed graves with loosely scattered bones from palæolithic times are in France found at the side of still preserved graves. The ancient graves of the dwelling-site have, then, been retained as long and at the same parts of Scandinavia as the civilisation of the dwelling-sites." Also the burial custom indicates the palæolithic period.

The Art.

„Almost constantly the zigzag line in the epipalæolithic civilisation is either single or a main part of the ornamentation. The zigzag line is not rare during the Magdalenian, but at the same time several other ornaments, quite wanting in the North, occur there, why the art of the North cannot have a west-European origin, since it is incredible that the North only preserved the zigzag line and the slanting square. The Magdalenian, too, has a great number of antiquities that are not found again in the North. The zigzag line is found in all primitive art. Besides these 2 forms also series of short parallel lines occur." The cause is quite simple, the art of the Magdalenian was a later evolution of the palæolithic art of Sweden.

„The oldest stage, the Aurignacian, only shows the profile of animals. The Magdalenian stands highest. During Aurignacian the same mode of life existed as in the North. In the North the art only put forth its heart's leaves, but the wild flowers perished in the agricultural seed. An animal from the Aurignacian, compared with one from the North, shows an almost complete likeness. All characters, mentioned above, are common. When the primitive man began to draw, he acted in the same manner. The same causes have produced the same effects." Accordingly, the art of Aurignacian in France is palæolithic as well as the corresponding art in Sweden.

„For instance, a horn axe from Scania has the image of 2 four-footed animals in profile and a square ornament with every second square filled by small squares (fig. 176). Free sculptures are the two elks from Aloppe, the comb-like object from Gotland, and the heads of animals on the handles of slate knives. Stjerna mentions also the rock-sculptures and rock-paintings in Swedish Norrland and northern Norway. These figures of animals have been correlated to the palæolithic ones, quite justly. They have been regarded as representatives of a palæolithic tradition, but unjustly. Between the beginning of the art during Aurignacian and its culmi-

nation during Magdalenian thousands of years are lying. Between an animal from Jämtland and one from Magdalenian a comparison immediately shows that no connection exists between them."

The rock-sculptures and rock-paintings I have already treated during the arctic stone age, where I have characterised them as postglacial and neolithic. All the other figures of animals mentioned above are, however, palæolithic. My conclusion is that also the art tells the same tale that the civilisation of these Swedish dwelling-sites must be palæolithic and preglacial and, of course, anterior to the Magdalenian period. The art came from east from Asia and not from France; but it may, perhaps, be more correct to say that the people came from Asia and that the art was an autochthonic evolution, turning out in the same manner in different regions.

My chief result must, then, be that the preglacial and palæolithic stone age is richly represented in Sweden. And when the so-called south-Scandinavian stone age is palæolithic, then the arctic stone age must also be preglacial and palæolithic. For, how is it possible to find some arctic slate implements in these preglacial dwelling-sites, covered by the deposits of the Ice Age, if the arctic stone age was not actually preglacial? The present archæological mistakes are obvious; they are evidently the result of the geological mistakes.

III.

THE PALÆOLITHIC SOUTH-SCANDINAVIAN STONE AGE OF NORWAY.

In Denmark, as mentioned in „Palæolithic Chronology", it was comparatively easy to prove that the older stone age of the North was preglacial and palæolithic, and even in Sweden it has not been so very difficult to prove it. But in Norway the relations are more precarious, as the finds are few and seldom scientifically investigated. However, the seldom found tranchet of flint or rock, the Nostvet

type of rock, the Vespestad type with its evolution the Westland type, and the round axe (partly called in Norway the butt-necked Trindaxe and in Sweden the Trindaxe) also of rock, all these axe types must with certainty be considered as preglacial and palæolithic. The first four axe types are all chipped or roughly hewn, an imitation of the Danish chipping of the flint axe; but most of the rock axes are more or less ground, the grinding of rock being a common palæolithic process in Scandinavia and certainly an actual invention of the North or, perhaps, more correctly of the Scandinavian peninsula, where flint was wanting or scarce. But the trimming of the round axe of rock certainly was a preliminary chipping, though the subsequent formation was a prick-cutting, „Prikhugning or Afknusning" (Danish „Tilknusning" and Swedish „Bultning"). Evans in his „Stone Implements" p. 102 says: „the butt-end is rounded in both directions, and appears to have been worked with a pointed tool or pick." The turning round during the prick-cutting produced the rounded shape.

According to Professor Brögger sen., no flint existed native in Norway, but was imported or by drift-ice during the glaciation brought to Lister, Jæderen, and the western coasts of Norway; the Scandinavian peninsula existed long before the general upheaval from the sea in the Middle Tertiary. This cannot, however, be correct as explained in my „Deviating Views of the Glacial Period"; Norway, as all the terra firma at present, was lifted up during the horrible catastrophe of the Middle Tertiary that probably was the Deluge. In the Cretaceous seas of the now low-lying flat Lister and Jæderen, rather rich in flint and more like the present Denmark, flint-containing chalk must have been deposited and also to a less degree on the Norwegian coasts farther north. The Ice Age has, however, destroyed these chalky layers in the mountainous Norway where the effect of the glaciation was much greater than in the flat Denmark, at present leaving behind but the flint. Only 10 tranchets of flint [1] are found in Norway, but many small pieces of flint are found in several places along the coasts, partly worked. If these small flints are actually imported, then it appears strange that not large flints are imported. All this flint in Norway is not brought from Denmark and adjacent seas by drift-ice, but it is actually native. If my supposition is right that man lived and used flint in Norway *before* the Ice Age, then the flint cannot have been brought by floating ice that did not exist at that time; but it must be native.

[1] Previous to the many finds of Nummedal in 1910 etc.

Norway is divided in 5 Stifter and each Stift subdivided in some Amter. Nordenfjelds, north of the mountains, is all the country north of the mountain-range of Dovrefjeld, and sondenfjelds means south of it. The sondenfjelds is subdivided in Ostlandet, the Eastland, east of Langfjeldene, and Vestlandet, the Westland, west of this long mountain-range.

A. W. Brogger (jr.): Øxer af Nostvettypen.

Norsk Geologisk Undersogelse No. 42, 1905.

The Swedish Limhamn type, the rugged four-sided axe of rock, is exclusively or chiefly limited to Scania and Blekinge relatively rich in flint, why this rock axe here occurs only in smaller numbers. The other Swedish Lihult type, the rugged two-sided axe of rock, is chiefly limited to Bohuslän and the adjacent regions of Dalsland and Västergötland where flint is wanting, why at Lihult only axes of rock occurred. This Lihult type, an actual correlation of the Norwegian Nostvet type, is not an evolution of the Limhamn type, but is „chipped after the fashion of the Danish flint axe."

„The Nostvet type, figure R. 4 in O. Rygh's „Norske Oldsager," has its name from the most prominent find at Nostvet near the bottom of the Bundefjord, a southerly bay from the northern end of the Kristianiafjord. This axe is chipped from hard, fine-grained sedimentary or eruptive rocks, but never from quite schistose varieties, the cardinal feature being a mussel-like rupture like that of the flint, its prototype. It is a transverse axe (Tverox)[1], pick-like; of 600 investigated axes only very few may be called straight axes (Retoxer). The many varieties partly depend upon the very heterogeneous material. It is a chipping technique, whereby a tolerably flat face and another ridged roof-formed face are formed, at first producing a triangular section, and the edge has a rounded form characteristic of the older axes. It is a known flint technique transported into rock. At least half of the axes are ground, as a rule only at the edge, but some few also partly on one face. Grinding stones are also found and some diminutive flint pieces, partly worked." When Brogger says that the grinding of rock is no invention of Norway and Bohuslän, it is not correct as mentioned formerly. The grinding of flint is neolithic, but not that of rock; the axe of rock wanted a grinding at the edge to make it more effective. However, even a little grinding

[1] Ox (axe) is also spelt oks, for instance, by K. Rygh (Kjerneoks).

of flint may, perhaps, have been practised even in palæolithic times of the North, particularly where grinding of rock implements was in common use.

„No axe has an actually pure section, variating from triangular to trapezoidal, rhomboidal, or pointed-oval. Some evolution from bad to better may exist, but all types were partially ground."

Brogger considers the various levels of the finds, always indicating the then existing sea level, as being of great importance, but I do not mention these relations, since the finds are not at present lying *in situ*, being removed by the ice from their original preglacial sites.

On the eastern side of the Kristianiafjord in the Amt of **Smaalenene** the following dwelling-sites are lying:

„At *Fuglesangen* in Onsö have formerly been found 3 Nostvet axes together with fragments of grinding stones, probably a dwelling-site. Brogger senior[1], p. 146, mentions also the upper part of a butt-necked round axe (Rygh 12) and refuse of flint and rock.

At *Hasledalen* in Raade Brøgger sen., p. 144, mentions a considerable number of Nostvet axes besides flint refuse, grinding stones, etc., but no butt-necked round axe. The antiquities are mostly found in a sloping hillock consisting of gravel with rolled stones, probably littoral gravel; some occurred in another neighbouring place on a little flat, the remnant of a clayey terrace.

At *Sandbakken* in Raade Brøgger sen., p. 146, mentions the find of one real Nostvet axe and that the houses are lying upon the „Ra" (the moraine), deposited by the melting ice during its retreat;" but according to my views, the advancing glaciers produced the real moraine that was later covered by deposition of gravel during the melting stage of the retreating glaciation[2]. „Close by at *Missingen* one rudely worked axe was found, probably a butt-necked round axe, but by Rygh referred to the Nostvet type."

On both sides of the river Glommen south of the lake Oiern several finds occurred:

„On the western side in Spydeberg the dwelling-site at *Giltvet* is the most prominent. Brogger sen., p. 140, says: Lying on a difficultly accessible river side, almost without room for turning, quite down on the river, while the large cultivated fields lie up on the great plateau, it is accordingly impossible that the natural relations for a dwelling-site in Nostvet time were as at present; the sea at that time reached up so far." But Brogger sen. did never think

[1] Strandliniens Beliggenhed under Stenalderen. Norges geolog. Undersøgelse No. 11.

[2] My „Deviating Views of the Glacial Period," p. 17.

of the actual case, a removal by the ice from a preglacial dwelling-site upon the above-lying plateau. „Also single finds of Nostvet axes occurred from 5 near-lying and high-lying places, partially associated with flint refuse (p. 143). In the only almost 6—700 square meters large flat on the river side, at least 200 Nostvet axes were found, rudely chipped and partly ground at the edge, besides rich flint refuse and some few rock axes with the form of tranchets, but without a single butt-necked round axe that are, however, so common on the lower-lying dwelling-sites in Sande west of the Kristianiafjord. The ground here consisted of stony gravel with traces of clay underneath; in this gravel the antiquities were found about one third of a meter deep. Some hundred meters higher up on the river a mass of flint refuse, of which several flakes etc. but not one Nostvet axe, occurred. Brogger jr. remarks that the place lies in excellent shelter from wind and storm, and that here 3 **tranchets** of **rock** are found, 2 from Giltvet and one assignably found higher up at Mamrelund[1]). Brogger sen., p. 143, mentions single finds of real Nostvet axes, partly associated with flint refuse, from several adjacent places in the parish of Spydeberg, naming 5 different places of which 3 are lying more than double so high as Giltvet.

Just opposite to Giltvet on the eastern side of Glommen, near this river at *Svinekle* in Askim 7 Nostvet axes, grinding stones of sandstone, and partly abundant flint refuse are found. Brogger sen., p. 144, mentions several single finds of these axes in the parish of Askim and eastward in the lake-regions along the Swedish boundary, all from high-lying places."

The supposed dwelling-site at Giltvet of such a comparatively diminutive size and at least with 200 axes, must have been quite inhabitable; even if the sea went so far up, it can hardly have altered the relations, and at least we cannot eliminate the river. It is peculiar that no remains of meals or charcoal are found here when lying *in situ*, and it is still more strange that no shells of molluscs occurred when lying on the coast of the sea. Besides, in adjacent higher-lying places everywhere smaller finds also occurred; all implements here belong absolutely to the older stone age. That the dwelling-sites were lying on the seaboard, depends only upon the desperate axiom that the people of the stone age always lived in the actual coast line. Of course, the only reasonable explanation must be that the original preglacial dwelling-site was lying higher up, probably on the plateau, and during the glaciation the remains

[1] Brogger sen., p. 302, mentions 4 tranchets, but according to Gustafson the Museum of Kristiania has but 3 certain tranchets from these finds.

were by the ice removed to their present places. The implements are all palæolithic.

„In the Amt of **Akershus** only one dwelling-site of importance is found at Nostvet at some distance from the bottom of the Bundefjord. The principal find is a slightly sloping potato field between to rocky hills, to the north quite open but to the south bounded by an exceedingly low rocky prominence. Here were found about 300 Nøstvet axes, often more together, besides grinding stones, flint refuse, etc. Several axes were found single in another larger and more easterly field, also sloping southward and with rocky hills on each side; it is the same hill that lies between these two fields. Close by this hill on its south-eastern side one axe was also found during the construction of a road; the axe was lying underneath a thick cover of a down-slidden rockfall. The axes occurred in mould mixed with gravel and disturbed by cultivation; the gravel had the character of littoral gravel. The axes were found until 6—8 inches deep. Here were also found 2 or more **tranchets** of **rock** (Brogger sen., p. 302, mentions only 2 tranchets), but none of flint, though flint refuse was abundant. Both triangular unground and better worked trapezoidal large axes were found, probably indicating a longer occupancy. Brøgger sen., p. 138, remarks that only a quite small number of butt-necked round axes occured in the environs, and that no certain remains of meals or any fireplaces are found at Nostvet. The cultivation and a not scientific investigation are related as the cause."

But it appears to me more probable that the cause is a real removal by the ice; it cannot be an original dwelling-site, and at least the implements belong all to the older stone age, palæolithic and preglacial. In spite of abundant flint refuse no larger flint implements are found here as in many other finds, what seems to tell against any import of flint; why do we never find large flints if imported? It appears that also in the eastern part of Norway flint must partly have been found native in the preglacial period, but probably only in smaller pieces.

„Moreover, in this same Amt at *Labu* in the parish of Sáner 2 Nostvet axes, ground at the edge, are found, and also 2 other single Nostvet axes are mentioned."

„In the Amt of **Buskerud** no certain dwelling-sites occur, perhaps one at Rud in Modum where in a higher-lying place one Nostvet axe and one butt-necked round axe are found. In this neighbourhood on both sides of the outlet of Tyrifjord such round

axes are found. In the parish of Lier one Nostvet axe occurred in a high-lying place.

2 single **tranchets** of **rock** are found, one underneath the viaduct at Lysaker in the river and one from Sandviken. A fragment of a third axe is dubious.

On the western side of the Kristianiafjord some prominent dwelling-sites occur, but the informations are less complete.

In the Amt of **Jarlsberg** and **Laurvig:** From the 2 following dwelling-sites in *Sande* there have been sent several axes of the butt-necked round type and of the later Nostvet type, but only few of the simple axes of Giltvet, why these finds must be later.

Sjølshagen, lying in a sloping hill, had both Nostvet axes of a later form and butt-necked round axes.

Leikås, also lying in the slope of the Dalsrudas (ridge), had 12 butt-necked round axes and higher up on the ridge some Nostvet axes occurred besides one **tranchet** of **rock.**

On these two hills abundant morainic gravel with boulders was found, and lower down terraces of clay existed around them, according to Brøgger sen. p. 152. (These relations must tell in favour of a removal during the Ice Age). Besides, in Jarlsberg not less than 15 single Nostvet axes are now found.

At *Torp* in Brunlanæs a couple of hundred Nostvet axes with some refuse and some butt-necked round axes are found.

At *Aros* (Klever) 2 Nostvet axes; in *Tverdalen* 4 butt-necked round axes, abundant flint, and probably 2 **tranchets** of **flint** at Tuftenjordet, besides several Nostvet and butt-necked round axes on the sides of this valley; and at *Hesterød* one butt-necked axe and a fragment of one Nostvet axe have been found, according to Brøgger sen. pp. 154—8.

At *Skorpe-Borge* in Stokke one Nostvet axe is found.

In the Amt of **Bratsberg:** near the pit of *Nysten* in Bamble one Nostvet axe is found 9 feet deep, probably covered by a slide. In Bamble several axes from the older stone age, particularly butt-necked, are found, according to Brøgger sen. p. 159.

In the Amt of **Nedenæs:** at *Vormeli* one Nostvet axe of a late form was found about half a meter deep in undisturbed gravelly soil.

Along the coast line from Bamble to Lister no Nostvet axe is found.

In **Lister** at *Sigerspold* in the parish of Vanse one Nostvet axe, triangular and ground at the edge, one butt-necked round axe, ground only at the edge, one **tranchet** of **flint,** and an abundance of flint refuse are found. According to Brøgger sen. p. 58, the

tranchet was found during the construction af a road, and the flint refuse covered an area of at least 12 square meters, lying 0.3 m. underneath the surface and covered by soil and gravel. In an area af 75 square meters here were also found separated small layers of charcoal and scorched soil just underneath the turf. Here has, then, been a dwelling-site. Brøgger jr. says that analogous to Danish relations also here tranchet and butt-necked round axe[1] occur in the same dwelling-site. The Nostvet axe is identic with the Swedish Lihult axe at Lihult and the Hästefjord; Brøgger jr., p. 36, says that at Lihult some butt-necked round axes are also found, what is evident from the first description. The flat Lister is comparatively rich in flint as Jæderen.

Moreover, in „Norges Vestlands Stenalder", pp. 10—15, Brøgger jr. says: the dwelling-site of Sigersvold on the inner side of Lister must have had a heavy area, since here remains of charcoal and bone were found and it is not, however, improbable that also potsherds occurred. On the other side of Lister towards the sea numerous collections of flint from the stone age are found at the near-lying farms of Næsheim, Kviljo, and Volden. A portion of this region is called Haknipmarken, where great numbers of flint occurred. However, the accounts are badly wanting and the found objects may belong to many dwelling-sites, perhaps from different epochs. Specially characteristic is the great amount of flint, quite contrary to the Eastland. Marked axes are wanting in these flint fields, only dependent on wanting investigation; the flint tranchet of Sigersvold lies only about 10 km. from here. In Lister as in Jæderen flint arrowheads with tang are particularly common, but apparently not so frequent in other regions and seldom in the Eastland; this form certainly is not Westlandish as found in several places of foreign countries. Only the occurrence of the transversely edged form, common in Lister and Jæderen and so well-known from the Danish and Swedish older stone age, makes it probable that these dwelling-sites reach very far backwards in time. The leaf-formed type is also common and the heart-shaped form is abundant in Lister and Jæderen. Besides the arrowheads there also occur in Lister and Jæderen scrapers of both oblong and round form, small flake borers, larger flake knives, and flake blocks. The flint pieces are, however, seldom large and the flint partly very simple."

At Sigersvold we have a real tranchet of flint and the two other axe types of the older stone age, but no neolithic implement, while

[1] In the Klintesø Mound 3 and in the find at Brabrand 5 butt-necked axes occur, but by a mistake the axes are by me called „thick necked".

charcoal is found in separate small layers just underneath the probably postglacial turf. The implements indicate a preglacial palæolithic period, and the exceedingly few implements in combination with the scattered charcoal without any fireplaces may indicate a removal during the glaciation. Of the many small flint implements some as, for instance, the heart-shaped arrowheads may, perhaps, belong to a postglacial neolithic period; but they are not, however, ground, why they may also be palæolithic, being found abundantly both in Lister and Jæderen. The accounts are, however, too incomplete and uncertain, but it appears at least reasonable that Lister was actually inhabited in preglacial palæolithic times.

„The number of Nostvet axes is, no doubt, less on the western side of the Kristianiafjord than on the eastern side. In the Westland this type is found in one dwelling-site at *Vespestad* in Bommelo, probably contemporaneous with Nostvet. Schetelig remarks that at Vespestad no axe is found formed by prick-cutting (the round axe of rock), but only by chipping that represents an older age. Vespestad has presented such particularly characteristic axe types as fig. 1 in Schetelig's account of augmentations in 1902,[1] quite like the Nostvet type. Also the triangular axes of close-grained rock have in many respects an ideal modified flint technique, characterising the whole material of the Eastland. The expression of Schetelig that Vespestad may be regarded as a little younger than Nostvet, Brogger is inclined to supply by saying that Vespestad is a westlandish representative of the dwelling-site of Nostvet, but hardly needs to be younger.

To the Museum of Bergen there are several times sent single found axes, characterised as „little marked form, ground only at the edge, etc.", what distinctly points to the Nostvet type (2 certain specimens are named). Somewhere in Jæderen is found a *flint* axe, two-sided, rather rudely chipped, and ground a little at the edge (Schetelig), by Brogger considered as probably indicating the extension of the Nostvet type to western Norway, probably a transformation of stone to flint, viz., using in flint the common grinding of the edge of rock axes."

This last remark of Brogger is very interesting. It has been my supposition that the people of the North, accustomed to the grinding of rock implements, have, perhaps, also practised a little grinding of the flint edge already in preglacial times; but the actual grinding of flint was a neolithic invention, from Asia introduced by the new neolithic race. Any polishing by friction during the use

[1] Bergens Museums Aarbog 1903, 3. p. 17.

can hardly have been of any greater avail; at least I have never seen it mentioned in the palæolithic Europe.

That the Littorina maximum, the Tapes time in the postglacial period, has anything to do with the age of all these supposed postglacial finds, I have always denied, since the Littorina Sea has never existed; the Tapes time was, in fact, preglacial. Besides, Brøgger sen., pp. 160—1, mentions more than 14 finds at higher levels, adding that probably most of them represent only single finds, but 5 finds on lakes and perhaps 1 in Spydeberg are probably dwelling-sites. All these preglacial palæolithic finds from the older stone age are more or less removed.

The Butt-necked Round Axe.

„This „butnakkede Trindøx", Rygh 12, with a truncated butt-end is found in several dwelling-sites, specially 10 at Nostvet and about 90 in the parish of Sande in the northern part of the Amt of Jarlsberg and Laurvig, but comparatively rare compared to the Nostvet axe, Rygh 4. This axe is chiefly found single, about 155 in the Eastland of which 50 in the Amt of Smaalenene, 40 in Jarlsberg and Laurvig, 20 in Akershus, etc.; besides, in the Museum of Stavanger 10—20, in Bergen about 40, and in Trondhjem 10—15, in all 60—70.

R. 12 is younger than R. 4 and indicates a new stage in the evolution, the making by prick-cutting.

In Denmark R. 12 is found uppermost in the kitchen middens of the older stone age, but is missing in the barrows. Kjellmark regards it as belonging to the older stone age and Müller as introducing the younger stone age. According to Almgren, at Slänge in Bohuslän one flint tranchet occurred together with 2 round axes in an undisturbed dwelling-site. In the same layer of the Klintesö Mound one round axe, one flint tranchet, and potsherds of the form of the older stone age occurred. Quite similarly, in the Dalsrudas in Sande 12 round axes were found lower down and higher up one tranchet of rock, some Nostvet axes, and perhaps also the round type. Brøgger means that as the tranchet generally belongs to the whole older stone age, then Kjellmark's conclusion is reasonable. In Norway the Nostvet type chiefly occurs along the southern and western parts, while R. 12 is found single until the lakes Mjøsen and Tyrifjord etc. and northward as far as Nordland (the southern Amt of Tromsø Stift). However, considering the sea level as the salient point, R. 12 is found lower down than R. 4 and consequently belonging to the close of the Tapes time and the succeeding time.

Brøgger seems to regard R. 12 as an evolution of the modified R. 4. In Denmark and partly in Sweden no prototype of R. 12 occurs, the older stone age being here characterised by flint. R. 12 has certainly come from without and is introduced from Denmark and Sweden to Norway. R. 12 is found in more southern and western parts of Europe, even in England.[1] It is remarkable that many axes of R. 12 are uncertain in form and carelessly worked reminding in many cases of R. 4, while R. 4 is sometimes so well made that it appears to be a variation of R. 12."

According to my views, R. 4 is very likely an imitation of the Danish flint technique and R. 12 may be a later evolution, but R. 12 is not transferred from Denmark to the Scandinavian peninsula, where the original starting point must probably exist. R. 12 is in Denmark only found in some few specimens, and it may be that these few axes were brought down from the Scandinavian peninsula when the Ice Age drove the people southward; however, it may also be that they date from southern countries as the butt-necked round axe had a world-wide extension, probably being of an autochthonic origin. In Denmark are mentioned in the Klinteso Mound one butt-necked axe of greenstone, one fragment of another, and one fractured butt-end of a ground butt-necked axe, and in the Brabrand find 5 ground butt-necked round axes of greenstone. It is evident that R. 12 is palæolithic and preglacial, belonging to the older stone age of the North.

„In Sweden the Lihult axe type of rock is the same as the Nøstvet type, while the 4 rock axes at Limhamn, the so-called Limhamn type, is a near but distinctly deviating type with four rugged faces, while the Lihult type has but two rugged faces. The Limhamn type, limited to Scania and Blekinge, is not the prototype of the Nøstvet axe. Brøgger mentions that at Torp in Brunlanæs (Jarlsberg) one (perhaps 2?) axe of undoubtedly Limhamn type occurred, and perhaps also at Nostvet some specimens, but that is dubious.

The material of the Nostvet type necessitated modified flint technique and modified forms. The Danish-Swedish flint axe is two-sided, both „Ret-axe" and „Tver-axe", tapering towards the butt-end, in the more developed specimens of a pointed-oval section. The Nostvet axe is a „Tver-axe", two-sided, tapering towards the butt-end, in the earlier specimens of a triangular section. The borders were rounded, the whole form as if more rounded, not so

[1] Evans: Stone implements fig. 68. Mortillet: Musée Prèhistorique pl. XIX fig. 446 etc.

sharp and marked as in the flint. The Nostvet people hardly knew the grinding at their arrival. On the whole, Nostvet is contemporary with the older kitchen middens. The same people made the flint axe and the Nostvet axe. The unground Nostvet axe was the first, probably used unground."

In the Ertebølle Mound, for instance, there were found 374 Skivespalters (les tranchets) and 415 flint axes (les pics). These axes were, as a rule, still more badly chipped than the tranchets, and must be older. Brøgger sen., p. 44, says: in the older Danish Mounds two distinct types are characteristic, the around-chipped longish flint axes and the tranchets. These rudely chipped axes occur often in Sweden, but in Norway only 10—15 specimens are found according to Brøgger jr. In the note on p. 42 Brøgger sen. writes: „that these coup-de-poing resembling flint implements of the North should originate in such an old time as the Chellean time, there is not much probability of, but certainly they are older than the time of the kitchen middens." That Denmark was inhabited already in the French Chellean period, is not so improbable according to my views. We must not forget that the invasion of Europe occurred from east from Asia and not from France, and it is certain that Denmark was inhabited in a warmer time than the present, in Miocene. It is not improbable that the Nostvet axe was an imitation in rock of these oldest flint axes of the Danish Mounds; real tranchets both of flint and rock, indicating a later palæolithic stage, are found in several places of Norway. About 1908 in all 21 tranchets, 13 of flint and 8 of rock, were found; but in the last 2—3 years not so few are found along the western coasts of Norway as shown afterwards. However, it is quite natural that the archæologists must be in such a lamentable confusion about the palæolithic period, as long as the present geological mistakes of the Ice Age are still prevailing. These 21 tranchets are:

Of flint: 1 from Mullerup in Spydeberg, Smaalenene's Amt.
1 from Svinøre in Grue, Hedemarken's Amt.
1 from the city of Kristiania.
1 from w. Sjølshagen in Sande, Jarlsberg and Laurvig's Amt.
1 near the railway station of Vittingstad in the valley of Lougen, Jarlsberg and Laurvig's Amt (formerly called from Otterstad). It is a rather rudely chipped tranchet of a bad gray-yellow flint.
1 from Sigersvold in Vanse in Lister, Lister and Mandal's Amt.
1 from Strand in Ryfylke, n. Stavanger's Amt.

1	from somewhere in Jæderen	s. Stavanger's Amt
2	from near the Orrevand, Klep in Jæderen	
2	from Svarthåla at Viste in Jæderen	
1	from Randeberg near Viste in Jæderen	
13		

Of rock: 3	from Giltvet in Spydeberg, Smaalenene's Amt.	
2	from Nostvet	Akershus' Amt.
1	from the river Lysaker	
1	from Sandviken	
1	from Leikas in Dalsrudåsen in Sande, Jarlsberg and Laurvig's Amt.	
8		

Besides, Brøgger jr. mentions as probable a tranchet af rock[1] from Vespestad, in which case 9 tranchets of rock are found in Norway about 1908. „Brøgger jr. mentions that organic remains are wanting because lying in a slope (Lihult, Nostvet, dwelling-sites in Sande, etc.) or on a little flat with a steep wall behind (Giltvet etc.), and all lying in gravel with running water. Remains of fire-places and charcoal are not yet found. One axe from Skorpe-Borge shows traces of having been in the fire. A great amount of flint refuse is found at Giltvet, Nostvet, and the dwelling-sites in Sande, besides grinding stones." This treatise is, however, written before the discovery of Svarthåla at Viste. Of course, the want of organic remains etc. may be produced by the removal during the Ice Age, at least partly. Actually to prove a removal is difficult; some hints are already given, at Sjølshagen and Leikås is to be noted that on these two ridges abundant morainic gravel with boulders and lower down terraces of clay occurred. At least, all axes as tranchet, Nostvet axe, and butt-necked round axe are really palæolithic and preglacial. The rolled stones at Hasledalen and the littoral sand at Nostvet may have its origin from rolling during the glacial floods or from the upheaval in middle Tertiary.

[1] Must probably be the tranchet-like axe of rock, described in 1910, 88 c, in the increase of Stavanger Museum, where also, in 90, is mentioned one tranchet of flint in the parish of Torvestad, Ryfylke. Accordingly, in 1910 were known in southern Norway in all 14 tranchets of flint and 9 tranchets of rock.

A. W. Brogger: Vistefundet 1908.

An older Stone Age's Kitchen Midden from Jæderen.

In the peninsula of Tungenæs, about 17 m. above the sea level and about 5 minutes' walk from the sea, the rock-shelter of *Svarthala* was lying in a Silurian hillock. From the interior the shelly soil was mostly removed formerly, while the outer parts between the rocky sides were intact, and here about 45 square meters were investigated. The overlying mouldy soil, 30—35 cm. thick, only contained some few stones. The cultural stratum of a thickness of from 35—50 even almost 60 cm., was uppermost somewhat mixed with mould. About 10 cm. deep a distinct shelly layer extended over the whole dwelling-site, chiefly consisting of Littorina littorea and oysters with very little mould and without sand, but towards the bottom the layer was more mouldy, resting on the usual underground. In some places of the cultural stratum layers of ashes and charcoal were more prominent. Two fireplaces lay deep in the stratum, one at the bottom. In some places there were larger schistose stones, probably fallen down during the first occupancy, and one big stone, already lying there, had probably served as table or work-bench etc.; inside of this big stone one of the fireplaces lay. No separation of older and younger portions existed. Great masses of bony remains of larger and smaller animals, fish, birds, etc. occurred, but implements and refuse of stone were comparatively in minority. Worked bones were few, but numerous remains of animal bones were lying near the fireplaces.

The animal remains chiefly contained species of cod in abundance; many birds as duck, heath-cock, 3 species of Podicipes (specially the southern Podicipes nigricollis?), Alca impennis (garefowl), and many others; beaver, Felis lynx, fox, dog (at least 4 bones of Canis familiaris), Ursus arctus, *Mustela* putorius (ferret) otter, Phoca groenlandica, Halichoerus gryphus, Cervus elaphus, Alces machlis (elk), *Sus scrofa ferus* in abundance, Phocæna communis, and some others.

The Dane H. Winge remarks that the animal bones in the find of Viste are dealt with in quite the same manner as in the Danish kitchen middens from the older stone age. Bones, containing marrow, are broken; on many bones fine marks of cutting are seen; many are gnawed by dogs. An entire bone is seldom found, and only few bones are burnt or scorched. Only one bone of a young bird occurred. No other domestic animal except the dog is found. The vertebrated animals partly had a somewhat more southerly character than at present, showing a surprising similarity to the Danish fauna

of the stone age. The most conspicuous difference from the Danish relations is that the roe is missing, in Denmark one of the most important hunted animals of the stone age. Alca impennis was almost the most commonly found (more than 60 bones), the richest find from the stone age besides that of the Danish Klintesø Mound; this bird is not now found, probably on account of extermination by man. The same is the case with Sula bassana. To find the arctic Phoca groenlandica in these warm times was curious, but it was common in Denmark in the stone age. Pointing towards the south were 3 species of Podicipes (nigricollis?, griseigena, and cristatus), Mustela putorius, and Sus scrofa ferus. The 3 Podicipes breed now in Denmark and are very seldom found at present in Norway. Mustela putorius is not now known from Norway, but lives at present still in Jutland and southern or middle Sweden. Also Sus scrofa ferus has not formerly been known from Norway. To find it in Jæderen in the stone age, even of a gigantic size and as the most prominent game, conveys the best impression of the luxuriance of that time. Even in Sweden where it is found fossil, it seems now extinct.

Of 53 *animal* species 28 were birds, 17 mammals, and only 8 fish, an uncommonly rich find in about 25 square meters. At Skeie, Klep in Jæderen, J. Holmboe has in a peatbog found remains of stag, Phoca groenlandica now visits Finmarken in April—May, but only exceptionally it goes somewhat more southerly; it occurred relatively frequently in the Danish kitchen middens. Of Alca impennis only 5 bones are formerly found in the kitchen midden at Kværnevig in Jæderen. Of mammals only 7 species are now living in Jæderen. Bear, elk, heath-cock, and some others indicate a wooded Jæderen. Fish supposes boat, but none is found. Not one freshwater fish is found at Viste.

Remains of *plants* were quite small pieces of charcoal: Populus tremula, Betula sp., Pinus sylvestris, and Quercus sp., represented about uniformly. Of Alnus sp. only one not carbonized piece occurred. According to J. Holmboe oak is found fossil in 10 places in peat-mosses of Jæderen. As at Vespestad also thin branches were used, more seldom larger pieces.

The human *skeleton* of one individual, 14—18 years old and 1.2—1.5 m. high, was more like a pygmy, without traces of violence. All vertebræ were without discs of epiphysis, having a great porosity and fragility; the pelvis, the femoral trochanters, and caput were united by synchondrosis. The Swedish anatomist M. Fürst[1] considers it, however, as a less developed idiotic person.

[1] Skelet von Viste. Kristiania Videnskabsselskabs Skrifter 1909.

Implements of *bone* and *horn* have, as yet, been exceedingly seldom in the Norwegian stone age, western cave finds of uncertain age not taken into account. Except the finds at dwelling-sites near Varanger, Finmarken, only 2 fish-hooks and 2 axes of elk's horn are found besides a couple of bone pieces of uncertain use. At Viste mostly bone, but little horn implements occurred.

One „*Slagstok*" was found, formerly not known from the stone age of the North except in Denmark[1], where it was frequent in the older Mounds and in the Brabrand find, but missing in Maglemose. It is the tine of a stag's horn, the point of which is smoothed and cut off in a certain manner, probably used for the finer retouch of flint (Müller). Another stag's horn, entirely polished but without point, is of uncertain use. Two supposed polishers were, perhaps, wrought from whale bones.

Bone *harpoons* were for the first time found in Norway. *One barbed harpoon* of stag's horn for fishing is figured in pl. II fig. 16, also found at Mas d'Azil, Tourasse, Oban, North Germany, Slesvig-Holstein, Kunda in Estland, and in other places in Russia as the lake Ladoga and the Åland-isles, in Maglemose (not in the Danish Mounds), and in Sweden in Gotland and Uppland. *Bone harpoons with flint barbs* are as yet not found in Norway, and in Sweden not north of 2 finds in Västergötland. Of this form 6 beautiful fragments and perhaps 3 other fragments occurred at Viste; 3 are bisymmetric with grooves on both sides and 3 asymmetric with only one groove. Pl. I fig. 9 has a conifer-like ornament and fig. 10 a square-shaped ornament. This form is found in North Germany, Poland, Kunda, Denmark (abaut 40), and in Sweden (at least 50—60). Brøgger mentions that in Sweden only 19 finds with 27 specimens are localised: 16 finds with 23 specimens from Scania (8 in peat-bogs and in one of these at Åmosse even 5 specimens); in Bohuslän 2 specimens in the peatbog of Tjørn; in Västergötland one was found 3 m. deep in Ancylus clay during the lowering of the river Nossa that runs into Vänern, and one in turf when the Göta-canal was dug. In Öland also one is found. According to H. Winge, the harpoons at Viste were wrought from the metacarpal bones of the elk. The here once occurring square-shaped ornament is very common on bone implements from the oldest and older stone age in the North and in Europe." This remark, however, is not right, being founded upon the wrong hypothesis that Maglemose is older than the Danish

[1] In Bror Schnittger's Förhistoriska Flintgrufvor och Kulturlager vid Kvarneby och S. Sallerup i Skane I have mentioned the find of one Slagstok.

kitchen middens where these harpoons seem to be wanting. Maglemose is younger and belongs to late Pliocene.

„*Fish-hooks.* 3 entire and 7 fragments (from Ertebölle only 4) were found at Viste. In Norway only 2 are formerly known: one from Sande in Jarlsberg and one in Hitterö near Flekkefjord. In Sweden Brögger mentions one large hook with barb and hole for the line at Gullrum in Gotland, in Scania one on Räbelöfssjö, and at Näsbyholm Kurck found, in a dry-laid lake at the bottom, a mass of objects from the stone age and about 25 hooks; and in Jämtland P. Olsson found one bone hook in a sound.

Horn and *bone axes:* One small transverse axe (Tverox), pick, of stag's horn, polished like the rock axes and being in distinct relation to the Vespestad type, one of the oldest rock axes of the Westland. Also one little piece may be considered a small bone chisel.

Pointed implements of bone were several, but actual awls as in Denmark were not found.

Preparatory works of unknown use were many as a large piece of a fractured horn of elk reminding of a horn axe with hole, a large tine of elk in 3 fragments, and a boar tusk probably used as knife.

Implements of *flint* and *rock.* In all 428 chippings of flint, but few of rock occurred. 371 flint refuse, 2 **tranchets of flint,** 43 flakes with distinct form, 6 flake scrapers, 3 *discoidal scrapers,* and 3 borers besides 3 flint nuclei were alle of flint. The largest flint nucleus at Viste was 10 cm. long and 4 cm. in the greatest diameter; one of them had bulb marks of percussion as a hammer stone. The great mass of flint pieces at Viste was of the gray, black, and on the whole dark flint, quite similar to the Danish cretaceous flint from the region of Aalborg in Jutland. Many of the flints had been in various contact with fire.

In the neighbouring find at *Randeberg* Helliesen in 1907 in a cultivated field found some flint refuse and *one* very beautiful **tranchet** of **flint** besides some pieces of charcoal. Formerly were in southern Norway fond 10 tranchets of flint, of which 3 from the Westland, viz., one from Jæderen, one from Lister, and one from Ryfylke [1].

[1] However, these 3 from the Westland (already mentioned by Brogger sen. in 1905 who had in all only 8 flint tranchets) are but a lapsus calami instead of 5 from the Westland, since Brogger jr. in „Norges Vestlands Stenalder 1907 p. 9, published the precedent year, mentions 2 new finds of flint tranchets near the Orrevand, Klep, in Jæderen. Accordingly, it is 3 from Jæderen, 1 from Lister, and 1 from Ryfylke. At the end of „Oxer af Nostvettypen" I have mentioned all finds in 1908.

In Jæderen are found flint nuclei as large as a child's head. Remarkable is the occurrence of rocky blocks from the territory of Kristiania together with flint from the Danish cretaceous formation, explained by Helland as boulders brought from the east by the mighty ice-masses along the coast of Skagerak."

The present axiom is that the Baltic Sea and the North Sea were completely filled up by ice-masses during the glaciation, but that cannot be right. Both seas were only covered by a thick sheet of ice, and floating flakes of ice in summer or at least during the later stage of the Ice Age carried boulders from the region of Kristiania along the coasts to Jæderen. But the cretaceous flint in Jæderen was native there as in many other regions in the preglacial period. These relations of the native flint in Norway will be treated later, when we have to speak of the rich flint finds farther north, discovered of late by Nummedal.

„The refuse of *rock* at Viste was only about 30 in 25 square meters, while at Vespestad in Bommelø 7—800 per one square meter. 9 were ground, but of uncertain use (1 or 2 more like an axe). One fragment of a grinding stone. The grinding of rock is anterior to that of flint as shown in France, why Brøgger means that grinding of rock is no invention of the North." The fact is that grinding of rock actually was an invention of the North and brought to France when the Ice Age drove the people of the North southward.

„*Hammer stones* were not frequent, only a couple.

Of *rock-crystal* 7 small pieces were found at Viste, 2 with bulb marks and 2 formed as flakes. It is found in several places in Jæderen.

Of **slate** one plate-shaped piece occurred at Viste, ground at one end. Slate knives are not found so far south as in Jæderen, where slate points occur very frequently in dwelling-sites.

Of *pottery* small simple fragments were found in 14 different places, hardly belonging only to one vessel. All were of a badly fired material mixed with grains of quartz and feldspar, about 9 mm. thick. Impressions of the fingers were found in several places. The fragments gave no idea of form and were not ornamented. Only one larger potsherd of the mouth indicated a quite strong curvature, perhaps corresponding to the Danish type from the older stone age; it does not agree with the younger stone age.

Determination of *age:* The find agrees with Steenstrup's oak time with a 2° Celsius higher temperature. Formerly the oldest dwelling-sites of Jæderen and Bommelø were referred to the middle stone age of the North, the flourishing epoch of the butt-necked round axe, but the find of Viste is the first certain argument of

reaching backwards to an older occupancy. The bone harpoons and the axe of stag's horn remind of Maglemose, and the bone harpoon with flint barbs characterises the Ancylus time, while it might be only rarely found in the deposits of the Littorina-Tapes epoch. But this find belongs not to the Ancylus epoch; wild boar, Mustela, and perhaps Podicipes nigricollis indicate a warmer climate than at present, accordingly the Tapes epoch."

The contradiction between the cold Ancylus epoch (Pliocene) and the warm Littorina-Tapes epoch (Miocene) is but a common mistake as explained in the Tångstad find of Munthe near Norsholm in Östergötland; and Maglemose was late Pliocene. The find of Viste is, as yet in 1908, the most prominent find in Norway proving a preglacial position, the only found actually *in situ* lying dwelling-site of a rock-shelter. It is preglacial and palæolithic from late Miocene and Pliocene, why both warmer and colder animals occurred here. The few warmer animals probably continued to live some time also in the not long-lasting Pliocene. At least, the really cold part of Pliocene might not have lasted long, since the Gulf Stream's deviation into the Pacific Ocean must soon have produced the Ice Age of northern Europe. We have, at Viste, not alone the tranchets and the animals of the Danish older kitchen middens, but also implements of the younger Maglemose without any neolithic antiquities. The pottery also indicates the palæolithic period. In Denmark the older Mounds, Brabrand, and Maglemose are already proved to be preglacial and palæolithic, as explained in my last treatise „Palæolithic Chronology", where the duration of the Ice Age is estimated to be about 1,000 years. The precedent description of the author, however, distinctly indicates the preglacial position of this find. No actual removal of the find has taken place on account of its sheltered state in and at the rock-shelter and because the glaciation of the flat Jæderen has wrought little mischief, compared with high-lying regions.

In 1910 (Oldtiden, I bind 1910, V. 65, p. p. 20—24) Brøgger found some new objects in the dwelling-site of Svarthala at Viste in Jæderen.

„A. Objects of *bone* or *horn:* An almost entire arrow of bone with two grooves for the setting of flint edges. Remarkable is that one face had a fine groove like the „Blutrinnen" of palæolithic implements. The length was 16.4 cm., the point being broken off. The arrow was found fractured in 5 pieces, lying close together. 2 fish-hooks of bone; fragments of 2 other fish-hooks. 2 small bone needles without eye. Moreover, several small worked tools of bone

as 2 pieces of a round bone object and the point of a probable arrow, besides some small pieces of bone of which 2 small pieces of a bone arrow with grooves for flint edges.

B. Objects of *flint* and *rock*: An almost entire small rock axe without shafthole, ground nearly all over in facets, two-sided, flat oval section, and *pointed* in the butt-end (fig. 9). A fragment of the butt-end of an unusually regular rock axe without shafthole (fig. 10) with regular elliptic section, ground in facets and tapering towards the butt-end. A fragment of the butt-end of a large rock axe, probably of the *point-necked* variety from Vespestad, being of greenstone with scars not covered by the grinding, and with a nearly circular section. A fragment of the edge of a rock axe probably of the same form, being of greenstone and ground in facets, but the edge is not the usual one of the Westland axes, but of the same form as the oldest two-sided axes of the Westland (the edge in the centre of the blade) (fig. 11). A small triangular arrow point of *flint*, scorched. The found flint refuse is not yet thoroughly investigated.

C. Objects of *other material*: 10 small pottery fragments without the slightest indication of the form of the vessels, like the formerly found of coarse material, badly burnt, unornamented, etc.

Moreover, a good many remains of animal bones, not yet investigated. About 8 square meters were investigated this year, to be continued."

All these objects are palæolithic, and remarkable it is that *point-necked* rock axes are here found in a preglacial dwelling-site *in situ*.

H. Schetelig: Et bosted fra stenalderen paa Bommeløen.

Bergens Museums Aarbog 1905, no. 5.

„From *Vespestad* in the Isle of Bommel, southern Bergenhus' Amt, the farmer had, from the field and later from an 11 m. long trench, to the Museum of Bergen sent several hundred stone objects all of greenstone, as few ready made ground implements and mostly more or less rudely chipped preparatory works for a great part spoiled and useless, besides blocks, refuse, and smaller fragments, various hammer stones and a fragment of a grinding stone. Of the still undisturbed part the author investigated but 4 square meters.

Brøgger in „Norges Vestlands Stenalder" p. 21 remarks that this find is characterised by want of flint, not as in Jæderen the series

of types of arrowheads and far from so many blocks and flakes of flint. But the axe form is the same; the find is strikingly rich in hammer stones.

„An about 130 m. long peatbog, the Stokkemyr, lying 3—4 m. above the sea, is separated from the sea by an 8 m. high mountainous hill. Traces of the stone age people were found in several places at the margin of the peatbog, upon the hill, and in the adjacent valley south of the bay of Langevag, besides in the garden of the neighbouring farm of Eide. Everywhere the finds were homogeneous and of the same stamp, accordingly contemporaneous. The investigated portion was lying in the margin of the peatbog where many objects had been found during the cultivation. A greater part was still undisturbed and now drained by ditching of the peatbog.

Underneath the turf, here 25—30 cm. thick, a cultural stratum was about 50 m. long and 8—9 m. broad. Farther out the peatbog was deeper and here no traces of antiquities were found, probably at that time a bay of the sea." This is the common mistake that the people of the stone age always lived on the sea coast, while the finds are removed during the glaciation often out in lakes. This is still more shown by the succeeding remarks of the author. „South of Langevag in the valley antiquities were found partly lower than the level of the peatbog and here and there even down in the present coast line; but here the objects were not found *in situ*, partly scattered over cultivated fields or partly lying loose in the beach. The cultural stratum rested on fine gray littoral sand with a slightly sloping level towards the middle of the peatbog, and, on the whole, the sand was quite free from antiquities, except that at one spot a couple of sharp refuse and a small hammer stone were found until 15 cm. deep in the sand, probably sunken down from above in the rather soft bottom." A removal during the Ice Age appears to me a more natural cause. „The cultural stratum was distinctly separated from the light sand."

„The cultural stratum was chiefly a brownish black sandy soil, darker and lighter in various places, and the admixture of sand was not the same everywhere. The soil was abundantly impregnated with particles of charcoal of coniferae (fir or juniper) and foliferous trees (probably birch), the largest charcoals being 2 cm. in diameter but mostly smaller. They were rather evenly and quite closely distributed, but never collected in greater layers indicating fireplaces. No fireplaces were found in the small investigated area, but probably to be found somewhere else. Several of the found stones seemed also scorched, at any rate some flints were Through the entire thickness

of the stratum there was intermingled an abundance of stones, particularly pieces of native rocks, quartzitic particles, small pebbles of various size, and here and there some flint chips. At various depths lumps and smaller incoherent beds of light sand were interspersed in the dark soil, even at one spot as an extensive layer along the surface of the cultural stratum over a larger area. This sand was free from charcoal, but contained some antiquities, perhaps admixed in ancient times, at least contemporary with the other materials." A removal of sand and some antiquities above the removed cultural stratum appears to me more likely. „In the boundary line between the sand of the bottom and the stratum, a larger rolled stone was lying and oftener also flat stony fragments. One rather large flat rolled stone was also deposited in the middle of the cultural stratum, probably by man. These stones, too large for hammer stones etc., have probably been used as substratum for the very extensive chipping here. A pointed wooden stake was driven down in the stratum until 5 cm. from the bottom, somewhat inclined and 10 cm. long. Its upper part was rotted away and the rest badly decayed; as in the overlying turf no trace of it occurred, it must have been driven down there before the formation of the turf. The surface of the cultural stratum was not level, having a series of elongated depressions and prominences, as always the case is where the soil augments by human work.

About the lower one third of the turf had a somewhat darker colour than higher up and was separated from the upper part by a black stripe of carbonized plant remains, lying across all the investigated area and more particularly produced by a conflagration of the grass. In this lower darker part of the turf some antiquities were found, partly close underneath the black stripe, but never above it." Of course, also removed. „It appears inadmissible that these pieces of stone originally lay lower down and afterwards were in some way or other pushed up in the turf. The only explanation is that the people of the stone age lived here quite down to the time when the dwelling-site was covered by vegetation of the boggy ground. The formation of the peatbog supposes that the bay at that time was no longer connected with the sea and accordingly no longer had the natural conditions for occupancy. The black stripe of the turf indicates the close of the occupancy by a conflagration of the whole dwelling-site." A rather curious explanation; why not removal?

„The higher lying portion of the turf was of no archæological interest being of the so-called „Startory" (sedge), the slowest-growing

species of turf. The peatbog had been undisturbed, until the present owner began to cultivate it and discovered the antiquities.

About exclusively, the antiquities were objects of stone; only one single fragment of pottery was found by the owner after the author's investigation. No organic remains of meals as bones, shells, etc. were found. The prominent feature was the exceedingly scanty occurrence of flint, of actual implements only a small double-scraper, some few small chippings with chipped scraping edge, and some flakes. It is also observed that the scanty flint has been used to the utmost. An excellent flint point is found at Mosterhavn some miles farther north. At Vespestad a lance point, perhaps of flint, is said to have been found some years ago, but thrown away.

The chipped implements of rock consist chiefly of greenstone, mostly not schistose, and of some dark quartzitic kinds besides a small grinding stone of mica schist. All are native in the adjacent mountains. Of not schistose greenstone 600 to 800 refuse were collected per one square meter, slate and quartz occurred in similar abundance.

The method of chipping has many traits reminding of Nostvet, apparently, however, here younger according to the more developed axe forms. Similar axe types occur also at Holeheia, where some splinters of ground flint[1] distinctly indicate the younger stone age. A single trait, however, speaks in favour of an early part of the period, as chipping and grinding was about exclusively used and a gradual prick-cutting („Avknusning") of the surface could only be seen in one small axe of R. 12 (the butt-necked round axe). This technique is also unknown in the finds of Nostvet[2] and Holeheia. At Vespestad is also found one so-called arctic **slate** point, geologically shown to have been chipped from native slate.

Of implements were found:

Flint: 8 small scrapers of which one double, 11 flakes, 15 fragments, 1 nucleus, and some refuse.

Greenstone: Many axes occurred partly entire, partly fragmentary and with various sections as quadratic, rounded, oval, more or less irregular. Of axes are mentioned: 6 Tveraxes or picks; 3 Retaxes; 1 nearest like Rygh (fig. 9) but somewhat thicker and less regularly formed; 1 like R. 8, but somewhat narrower; 1 with oval

[1] These splinters of ground flint are not mentioned in the original description of Holeheia, but Gustafson found them in the succeeding year at Holeheia.

[2] In „Oxer af Nostvettypen" is mentioned that Brogger sen., p. 138, remarks that only a quite small number of butt-necked round axes occurred in the environs of the Nostvet find. My opinion is that the Nostvet find is removed.

section; and 1 with rounded section. This last one is described as a Tveraxe of greenstone, Rygh 12 (the butt-necked round axe), entire with a damaged edge, ground near the edge, but the rest shows a rude, „afknust (?) surface („afknust" is prick-cut). The axes are sometimes rudely chipped and more or less ground. Besides, many more or less large pieces of greenstone occur as, for instance, 2 chipped with triangular section, 8 triangular with *pointed* neck, 10 chipped blocks, 8 fragments with more or less pointed-oval section, about 30 chipped with roundish or oval section, about 150 chipped pieces of very rough workmanship and uneven variating forms, etc.; all these are regarded as preparatory works, and many are long.

Moreover, there were found 27 small flakes of quartzite, 4 fragments of grinding stones, 105 hammer stones, and 33 rolled stones with marks of percussion."

Concerning this find of Vespestad, Brogger jr. in „Norges Vestlands Stenalder 1907" pp. 23—28 remarks: „The but few arrowheads of flint show a conformity with the dwelling-sites of Lister and Jæderen. It is not unimportant that here is found potsherds of the same coarse kind as in Holeheia. The axes, however, are the most important here. One single axe (fig. 18) may, perhaps, be regarded as an imitation of the **tranchet** in greenstone. In „Oxer af Nostvettypen" pp. 29, 32, etc. tranchets of rock are mentioned. The 8 pointed picks (the 8 triangular with pointed neck) Schetelig (p. 16 f) has compared with the flint picks in Denmark, but they are only 9—11 cm. long and different in several respects, why they may be considered as preparatory works for axes of the Nostvet type, what is also suggested by Schetelig. The Nostvet axes are relatively not seldom at Vespestad, fig. 19 is very typical. A type as fig. 20 no longer is the clean Nostvet type, specially the character of the transverse edge („Tvereg") is a new trait; here it is an oblique or slanting grinding from one side, a typical trait of the Westland. The other axe type of Vespestad is represented in fig. 21, where the whole surface is ground, but so carelessly that in many spots the scars of the chipping are still visible; it is the same slanting edge and a characteristic curvature of the back-line. There is a relation between this type from Vespestad and the type from Holeheia (fig. 14). In fig. 22—23 are seen two variants of the same fundamental type. Also in fig. 24 this same fundamental type is seen. Accordingly, Brogger sets up these types as his so-called Vespestad-type, which he defines as: comparatively short and broad, more or less quadratic section, in the frontal section some variants tapering from edge to butt-end, in the lateral section narrow sides („Smalsider"),

the oblique edge produced by slanting grinding from one side, the characteristic curvature of the back-line, ground all over most often in facets. The primary formation is always chipping. Consequently, this axe has nothing to do with the Nostvest axe. Besides, in the region of Vespestad there are also found axes of the butt-necked round type, but not *in situ* in the cultural stratum of the actual develling-site of Vespestad."

It can hardly be dubious that the find of Vespestad is removed, preglacial, and palæolithic; not one single fact tells in favour of the neolithic period. The cultural stratum is found in a peatbog as in Maglemose; but the underlying layer is here fine gray sand called „littoral". The peatbog may, perhaps, have been a little lake in preglacial times; no marine shells are found. In this underlying sand at a depth of until 15 cm. some antiquities occurred, indicating rather a removal. The cultural stratum is partly mixed with sand and its surface uneven, and the overlying black stripe of the lowest turf contains some antiquities; no fireplaces or remains of meals are found, what is hardly explainable in a postglacial dwelling-site lying *in situ*. Besides, antiquities are found at different levels in other places outside the peatbog as on the hill, in the valley, even in the beach, and in the neighbouring farm of Eide. All this indicates a removal from an original preglacial dwelling-site, produced by the glaciation. All the found antiquities are palæolithic and none of the few flints are ground. Particularly interesting here is the quadratic section of some ground rock axes, distinctly indicating the existence of the quadratic section in preglacial times; also other sections occur. Nøstvet axes are found in the cultural stratum, but only one probably butt-necked round axe, while several such axes occur in the environs, perhaps also originating from the same dwelling-site or sites. The single potsherd is coarse and palæolithic, resembling those of Holeheia. The single point of native slate can at best indicate that the arctic people has been here for a short time during their southward retreat before the advancing Ice Age; the find itself is absolutely south-Scandinavian.

In 1910 (Oldtiden, I bind 1910, the increase of the Museum in Bergen, 88, pp. 38—39) H. Schetelig relates new finds from the dwelling-site of *Vespestad*, Bommelo.

„a. A small transverse axe of greenstone of the Westland type, originally entirely ground, but now eroded; b. narrow axe or chisel of greenstone, coarsely chipped and incompletely ground; c. an axe of greenstone, completely formed as a **tranchet,** as the edge is formed by two coterminous broad-sides or faces of percussion, the

butt-end is *pointed*: d. a transverse axe of greenstone, long and narrow with pointed-oval section and *pointed* butt-end, incompletely ground; e. the piece of the edge of a similar greenstone axe; f. an axe of greenstone of the same type, but very rudely chipped, a little ground; g. transverse axe of greenstone, rudely chipped and somewhat ground, oval section, rounded butt-end; h. butt-necked round axe of a schistose rock, all over prick-cut and the edge ground; i. butt-necked round axe of a schistose rock, prick-cut, of a regular form; k. the butt-end of a butt-necked round axe of greenstone, all over prick-cut; l. a fragment of the middle part of a butt-necked round axe of a fine-grained rock, prick-cut all over, of an entirely circular section; m. a flat greenstone axe of a section as a narrow rectangle and tapering towards the butt-end, little ground; n. 2 smaller fragments of ground greenstone axes; o. 2 coarsely chipped greenstone blocks, used as hammer stones; p. 9 narrow oblong chipped pieces of greenstone; q. 2 small flakes of gray flint and a flake of black quartzite; r. 4 flake nuclei and one knot of quarzite; s. a flat grinding stone of sandstone; and t. 8 hammer stones like natural pebbles.

The find was occasionally found in different localities of the very extensive dwelling-site of Vespestad."

All objects are palæolithic from the older stone age, and the different places of the very extensive site speak in favour of a removal. To be noted is that several butt-necked round axes of rock are found here, and that some point-necked axes of rock occurred here as at Viste in 1910.

Gabriel Gustafson: En stenalders boplads paa Jæderen.
Bergens Museums Aarbog 1899 nr. 1.

„In Jæderen flint refuse, arrowheads, scrapers, etc. are more or less abundantly found in some places where the grassturf is turned up by spade and the wind has blown the sand away. Some years ago the author found some very small fragments of pottery near the railway station of Ogne somewhat north of Egersund, probably belonging to the stone age though found now on the surface; however, no more could be found here.

1898 Gustafson began a regular investigation in the well-known flint field of Holeheia near the river Figgja or Figgen, immediately south of the new church of Borre. Accidentally he investigated some square meters in several places, in all about 20 square meters. He

found 3 fireplaces besides charcoal, nutshells, and a rather considerable number of pottery fragments, but no animal bones or mussel shells. Soil and climatic conditions in Jæderen have, however, only exceptionally preserved ancient bony remains. In Jæderen probably a not inconsiderable population lived in the stone age in proportion to the comparativele many found antiquities. But no dolmens, no giants' chambers are found here, and the author finds it remarkable that these large grave forms cease in Bohuslän." However, according to my deviating views the first postglacial population of Scandinavia must have been the ancient preglacial people, after the glaciation returning from southern Europe and soon afterwards followed by the actual neolithic race from Asia who only used these grave forms. But this neolithic people arrived not, in the period of the barrows, farther north than until about Bohuslän[1], driving northward to the Scandinavian peninsula the ancient inferior population. This ancient people had acquired very much of the neolithic culture, but they did not use the neolithic grave forms; that must be the reason why we now find no such large graves in Jæderen. Besides, it appears somewhat strange that potsherds are preserved, but not remains of animal bones and mussel shells, while rather abundant in the find of Viste. Would a removal by the ice explain it?

„Particularly along the northern borders of the river Figgja, specially arrowheads of flint are often found, as in many places round the lake Grude and out towards the sea in the fields of the large farm of Sæle near the lake of the same name. But the richest findplace is the ground („heia"), upon which the new church of Bore in the parish of Klep is built, across the whole region on the northern border of the river from the highroad and halfway to the lake Grude. Flint refuse was particularly frequent in the *slope* down to the river, and here the investigation was made.

I. At the highroad, a little east of it, in a pit 2.20 square meters were investigated, having the following section:

Overlying grassturf and mould	15 cm.
An ash-like layer . . . . . about	5 „
The cultural stratum from the stone age	45 „
Sand and gravel with stones partly stratified, distinctly a litoral or river formation	110 „
A layer of fine, light gray-white, clean sand, perhaps a little clayey . . . . . of unknown thickness.	

[1] Also some very few cists are found in the south-eastern part of Norway so the neolithic race must have invaded the regions around the Kristianiafjord.

The cultural stratum was more or less blackened by remains of charcoal, mostly at the bottom, and it contained flint refuse, fragments of pottery, and other human traces. In some places 2 flint-bearing layers seemed to exist, but not in other places.

II. About 125 m. east of the highroad, about 10 m. from the riverside and about 2.5 m. above the river, a fireplace (A) was found, forming a nearly circular flat of smaller stones and splinters mostly of mica schist. The stones were strongly scorched so they fell into pieces during the picking up, and the surface of them was covered by remains of charcoal. Around the fireplace in the soil occurred stones, flint refuse, some potsherds, one point of **slate,** etc. Also here underneath the 20 cm. thick layer the cultural stratum was about 45 cm. thick, in the bottom of which the fireplace was lying upon an undisturbed gravel layer.

III. About 10 m. east of the fireplace A a little round fireplace (B) occurred, and only 30 cm. from B a large unregular fireplace (C) was found. Here about 11 square meters were investigated. The overlying layer, 20—30 cm. thick, had mostly been removed (as manure) so the cultural stratum was strewn with flint refuse. The fireplace B was a single flag of mica schist, 40 cm. in diameter, quite scorched and cracked into many pieces. Above and all round much charcoal occurred and between B and C rather many and rather large fragments of pottery. The fireplace rested upon an undisturbed gravel bottom. The large fireplace C consisted of smaller stones and splints, partly in several layers above each other; first about 15 cm. underneath the middle part of C the common bottom of gravel was found. This can hardly be explained so that the fireplace is built in an excavation of the gravel bottom, but probably it is used for a longer time, whereby the underlying gravel is blackened and altered by fire and organic remains after cooking and the like. Here underneath was, however, found a tough, black, somewhat clayey mass, but the clay appeared to be too little as substratum for the fireplace. The entire stony surface was covered with a dark layer with remains of charcoal, being rather hard and tough down between the stones. In a broad stripe across the stony surface there were lying masses of carbonized nutshells of hazel, also found scattered all round. Higher up were found one **slate** point, 2 pieces of rock-crystal, a considerable number of potsherds, several of which were ornamented and some rather large, besides some flint refuse. The flint refuse occurred much more frequently and in great abundance outside the fireplaces, particularly on the northern side where also the half of a dentated arrow (a saw) and 2 pieces of **pumice** with ground

1grooves were found together with some potsherds, which were however, more friable than those above the fireplace." It was in, this place that the author during the investigation of the succeeding year found the *ground* flint splinters, mentioned by Schetelig (the find of Vespestad).

„IV. In some places, as on the southern side of the river, investigations were tried without result.

V. Farther out towards the sea, near Sæle, a rich but small flint field is formerly found, still rich in flint. Here were on the surface found 6 hammer stones with distinct marks of percussion and several „hafted" flint blocks for fine flakes, not formerly found in Jæderen but known from Ringsjö in Scania.

Lorange in 1874 on Solesanden, north of Holeheia, found 6 small littoral stones lying together, perhaps as the floor of a hut. Above these stones several arrows, nuclei, blocks, flakes, etc. of flint besides 2 arrows and 2 chisels of **slate** occurred. These 6 small stones formed a flat of a diameter of 5.34 m.

The potsherds of Holeheia are the first known in Norway, but they could not be united into a vessel. Remarkably, 8 pieces of **pumice** used for grinding occurred, what is not mentioned from other countries. Pumice is found everywhere in Jæderen, probably from the volcanoes of Iceland. The hammer stones are also of interest as found in a covered dwelling-site (1898), while formerly only found on the surface.

On Holeheia in three places there were, in all, found 3 **slate** points of arctic type. Already earlier slate objects are found in Jæderen in several flint fields. One in the Museum of Bergen was found east of Holeheia at a depth of 67.8 cm., but they are mostly found by collectors on the surface. However, here they occurred in dwelling-sites, one in each of the 3 investigated places, together with objects also found farther south in Scandinavia. The author mentions Hildebrand's find at Gothem in Gotland, where 8—9 slate points of arctic form and 1—2 bone points of a similar type occurred, what may point to a connection with the eastern ramifications in the regions of the large Finnish-Russian lakes.

Description of the Found Objects.

I. The foremost part of a **slate** point with oval section.

II. One arrow point of slate with ridged blade, less pronounced barbs, and broad tang.

III. One arrow point of slate with ridged blade, short barbs behind, and broad tang.

The fragments of pottery were chiefly found in III and some in I and II, several being of a ruder and thicker material filled up with stony grains. One fragment had a pointed bottom. As well large and high as small and low vessels were found. Some were of a finer material, but badly burnt. Many were ornamented, mostly with short transverse streaks arranged in rows. Streaks of half-circular impress occurred also in rows, and else only impressed lines of punctate markings or small slanting streaks; sometimes more perpendicular small streaks were found. Sometimes also the inner side is upwards ornamented. Some were blackened from soot; otherwise no traces of being used occurred, except that some on the inner side had a kind of a dark crust, perhaps remains of the food.

Of axes none is found (in 1898) except in III a little fragment of a ground implement of sandstone, probably an axe. But of late the author told me that he during the investigation in the following year (1899) found 6 or 7 quadratic ground axes of rock like those of Vespestad, 3 of which in the Museum of Kristiania are one Retaxe and two Tveraxes. Besides, the first year he found in IV 2 preparatory works of flint for axes or chisels. The very greatest amount of objects are of flint as 4 saws (one larger), 4 flake arrows, 2 flake knives, 44 scrapers (2 double), and 2 fractured borers. An abundance of flint flakes (more than 700), nuclei, blocks, discs, and refuse (some scorched). Several chipped splinters etc. of quartzite, 8 pieces of **pumice,** and some hammer stones. A couple of red chalk (perhaps used as colours). Scorched nutshells of hazel in considerable abundance. All these objects were found in the covered finds I to III.

From the uncovered surface occurred: In IV the 2 preparatory works of flint mentioned above, one piece of **pumice** with traces of grinding, many flake arrows, scrapers, nuclei, simple flakes, etc besides one little piece of quartz and one disc of sandstone. In V (near Sæle) 8 flint blocks, several flint refuse, perhaps one thick discoidal scraper, 6 pebbles of white rock-crystal, some flint nuclei, some fine flakes, some simple flakes, pieces and refuse, etc.

According to Brogger jr. Holeheia lies 4.8—5 m. above the sea.

All flint found in the first year (1898) was unground, but in the following year during the investigation of III the author found some few small ground splinters of flint here and there dispersed in the cultural stratum. It was residual splinters from the restoration of broken ground flint implements."

All the implements and objects seem to tell in favour of a preglacial palæolithic period as, for instance, particularly the ground

quadratic rock axes of the same type as in the preglacial find of Vespestad. The only difficulty is the few ground splinters of flint, indicating a postglacial neolithic period; but no bones of domesticated animals are found here, as little as relics of meals. In these low-lying flat regions the Ice Age must have produced only diminutive removals; at least the fireplaces appear to be lying *in situ*. After the glaciation the cultural strata have probably not been covered by an actual grassturf, when the neolithic people lived here, so these few ground splinters might be a later admixture. In these open sandy regions the common storms have brought about many changes. At least, these few neolithic splinters can hardly prove a postglacial state of this find.

A. W. Brogger: Norges Vestlands Stenalder.

Bergens Museums Aarbog 1907, no. 1.

1. *Single-found Flint Implements from the Older Stone Age.*

„In 1873 Montelius remarked that in Sweden some coarsely chipped flint pieces, by him called preparatory works for lance points, according to form and technique originated from west-European flints of palæolithic types and that they, then, must represent the very oldest stage of occupancy in the North. To Brogger jr. it, then, appears reasonable that they date from the later part of the Ancylus epoch. In Sweden, particularly in Bohuslän, about 100 specimens are found; many occurred in peatbogs as, for instance, 16 in a peatbog at Lerdal in the parish of Tanum. Also in Denmark not few specimens are found, in 1873 „a whole series of partly similar antiquities" existed in the Oldsagsamling of Copenhagen. As remarkable Brogger mentions the great find of 150 roughly and coarsely chipped flint pieces from Dybsofjord, Presto's Amt, of which 142 were found below the normal level of the sea; the form is quite as in the palæoliths. In Norway about 10—15 different specimens are found. Characteristic is the rude and, however, specially distinct chipping into a certain form; as a rule they are oblong, sometimes pointed in the lower part. In form and method of chipping the undoubtedly correspond well with the French palæoliths. As to age the relations of the finds in the peatbogs are not decisive; according to Nilsson one specimen is found in a turf layer underneath Jæravallen at Limhamn in Scania, consequently older than the Scanian littoral formations of the Littorina epoch. Professor Brogger sen-

says in „Strandlinjens Beliggenhed" p. 42, in the footnote that these coup-de-poing resembling flint implements of the North should originate from such an old time as the Chellean time, there is not much probability of, but certainly they are older than the time of the kitchen middens." [1]

From the Westland of Norway at present 6, perhaps. 7 belong to this type: 1 from the peatbog at Rorvig near Aalesund in Romsdal's Amt (fig. 1), 5 from Jæderen, and 1 from Ryfylke in northern Stavanger's Amt. From the Eastland 6 are known: 3 from Smaalenene, 1 from Buskerud, and 1 from Jarlsberg (the findplace of the last one is not mentioned by Brøgger). From southern Norway in all 13 of this remarkable form occur, and accordingly Norway was inhabited in the period af the Danish Mounds, what is besides proved by the finds of tranchets. Brøgger mentions 2 new finds of **tranchets** in Jæderen: 1 around the lake Orre, being a region particularly rich in dwelling-sites, and 1 hardly 2 km. distant in the Horpestadmark, both in Klep, Jæderen.[2] Besides, Brøgger mentions a remarkable implement (fig. 3), found also near the lake Orre, probably belonging to the same epoch; it is a pick-like implement of yellow flint, coarsely chipped and still partly with remaining crust, of triangular section. These implements, above mentioned, are very interesting in regard to chronology."

Of course, it is not without reason that these old implements remind of the coup-de-poing of France, but the evolution of the North was another than in France. They must represent the oldest epoch of Miocene in the North. These and the tranchets evidently prove the preglacial and palæolithic period of the North.

II. *Finds of Dwelling-sites.*

„Most of these are not systematically investigated. Particularly Lister and Jæderen are rich in such finds.

The dwelling-sites in Lister are already mentioned.

Jæderen abounds in flint fields, but only a little part of the collected enormous masses of flint is kept in the museums. At Tu, east of the lake Orre, one single **slate** point is found, and on a ridge from this lake towards the lake Grude, near 3 farms, not few slate points occurred.

[1] This is already mentioned during „Oxer af Nostveltypen.

[2] At the end of „Oxer af Nostveltypen" I have mentioned 13 tranchets of flint and 8 (9) of rock about 1908), but later Nummedal found many more, 50 if not 65 of flint.

Holeheia and Vespestad are formerly treated.

At Rigen in Ullensvang, Hardanger, 2 axes of the Vespestad type are found.

At Åstveit, hardly 10 km. n. e. of Bergen, axes of the Vespestad type occurred, but it is uncertain if 3 butt-necked round axes are found in the cultural stratum.

At Arne in the parish of Haus 3 axes of the Vespestad type occurred.

At Breivik in Askoen, also near Bergen, 2 axes of the Vespestad type and 2 butt-necked round axes were found.

In the Westland the levels above the sea give no indication of age. The age of the finds at Holeheia and Vespestad must belong to the flourishing time of the butt-necked round axe and be contemporaneous and somewhat younger than the find at Nøstvet.

Brøgger recapitulates the axe types of the dwelling-sites from the Westland:

1. The Vespestad type: a) Axes with somewhat rounded, most often faceted section, partly fading into quadratic; b) with a more distinctly quadratic section, grinding into facets common. They are comparatively short and broad axes. The characteristic traits are mentioned in Schetelig's find of Vespestad. As yet no prototype is known from the Eastland.

2. The Nøstvet type: only 7 found in the Westland. It is chipped and ground at the edge. The transverse edge here lies nearly in the centre of the axe chipped from both faces, while in the Vespestad type about in the prolongation of the one face, lying almost in the same plane as this face and like a chisel, produced mostly by grinding. This type occurs at Vespestad, partly somewhat deviating in details from those in the Eastland.

3. The butt-necked round type: also mentioned from Vespestad, but hardly in the cultural stratum; it is formed by prick-cutting, however, with extensive use of grinding. This type indicates a somewhat younger age than Nøstvet."

III. *Single-found Axes without Shafthole.*

1. *Axes of the Westland type.*

„The *Vespestad type*, already mentioned, seems bound to the dwelling-sites and the 3 single finds are from such regions as 1 from Askoen near Bergen, 1 from Klep in Jæderen, and 1 from Gård near Haugesund. Brøgger remarks that the *Westland type* originates

distinctly from the Vespestad type and that of this type only about 25 are found in the Eastland, why he calls them axes of the Westland type. In the Eastland these axes are never found in dwelling-sites and they are probably imported from the Westland." I may ask if these axes are not brought eastward, when the glaciation drove the people away? „The Westland type has transverse edge („Tvereg"), a more or less quadratic section, and it is commonly without facet-grinding; it is larger and as a rule more beautifully and regularly worked than the Vespestad type. Also chisels of this type occur. All are of rock, in all 150."

However, of 11 figures (fig. 28—38) from Jæderen to southern Romsdal only 2 (fig. 31 and 32) show a more central position of the edge, and in several the curvature of the back-line is somewhat more prominent, but they appear only to be variants of the Vespestad type that may be the oldest. It may be that only one name is necessary, viz., the Vespestad type; of course, material and time has produced smaller variations.

2. *Axes of Butt-necked Type.*

„In the Westland this type passes through a quite remarkable evolution that did not occur in the Eastland.

A. The normal (Scandinavian) butt-necked type (fig. 39) is prick-cut with the usual central edge and found in many places in the Westland even up to Nordland, but apparently only single. It has the common Scandinavian edge chipped from both faces, but not the transverse edge. In all 27 are found, why they are hardly all imported from the Eastland where the prick-cutting is used in all Scandinavian types of rock through the entire younger stone age.

B. This butt-necked type is influenced by the peculiar technique of the Westland, viz., grinding in facets and with the characteristic transverse edge. The European prick-cutting has not had a greater extension in the Westland, where only exceptionally the Scandinavian types, as the point-, broad-, and thin-necked, occur. Only the thin-necked type is common in the Westland, but prick-cutting is seldom used as the axe is here ground all over. Perhaps, the dark fine-grained rock is the cause. In the Westland the greater number of the butt-necked type is carelessly worked so the scars of the chipping are badly covered. In all 75 occurred (fig. 40).

A peculiar variant, not found in the Eastland, is pointed at the butt-end and of considerable size, well ground all over, often in facets. One from Sondfjord in northern Bergenhus' Amt is figured

(fig. 41), but one is also found uppermost in Hallingdal, perhaps indicating that the upper western parts of the long valleys of the Eastland are inhabited from the Westland. Similar forms are also found in the Eastland in Botne and Sande on the western side of the Kristianiafjord."

Brogger speaks here of the butt-necked type that in Norway is the abbreviated expression of the butt-necked round axe, answering to the form A, but the form B seems to me to be only a variant of the Vespestad type, so common in the Westland; it has hardly anything to do with the really butt-necked type. The form B is, in fact, belonging to the usual transversely edged axe of the Westland, and this is probably the cause and not the material. The peculiar long variant may also be a preglacial palæolithic axe as the form A and B. The western parts of the long valleys in the Eastland were, in fact, in the first historic times reckoned among the cantons of the Westland.

3. *Axes of Finnish Type* (fig. 42).

„This type is triangular, transversely edged, ground, and partly with scars after the chipping: 3 in Jæderen, 6 found at the bottom of a peatbog in Sondmore in Romsdal's Amt, 3 others from Romsdalen, 1 from northern Trondhjem's Amt, and but 1 in the Eastland in Bratberg's Amt. Arpi has mentioned 1 of the same character from Uppland in Sweden. Hackmann mentions some from north-eastern Finland and Russian Karelen."

The find of 6 at the bottom of a peatbog appears to tell in favour of the preglacial period.

4. *Axes of Broad-necked Scandinavian Type* (fig. 43).

„This type with oval section and carefully ground is very seldom in the Westland, only 5—6 of which one (fig. 43) from Jæderen. These are all of rock. Brogger remarks that these few axes have not occasioned any evolution here." It seems, however, not quite unreasonable that these axes are a combination of the preglacial butt-necked round axe and the Vespestad axe.

„Furthermore, Brogger mentions from Jæderen a depot-find of 7 unground flint axes, all forming a transition between the point- and the broad-necked type. One flint axe of the point-necked type is also found in Ryfylke, but he mentions not if ground or unground." At least the 7 unground flint axes may be preglacial.

5. *Axes of the Thin-necked Scandinavian Type* (fig. 44).

„In the Westland Brøgger only knows in all 6, of which 1 of flint is found in Ryfylke. Also fig. 44 has transverse edge. They have had no influence on the evolution."

6. *Axes of Thick-necked and Broad-edged Type.*

„This type is very common in the Westland, since we here again have flint axes, most of which belong to the broad-edged type. Of rock many and beautiful occur. Most of them are ground all over. One is newly found in Trondhjem's Stift. In all 138." All or at least most of them belong to the neolithic period; of the single found axes it is, of course, impossible to tell, if really postglacial or preglacial.

Brøgger remarks that the Vespestad type is about contemporary with the oldest of the butt-necked type and with the later forms of the Nöstvet type, of which 10 are found in the Westland. Brøgger places the tranchets, the Nöstvet type, the Vespestad type, and the early butt-necked axes in the older stone age, but the Westland type, the later butt-necked axes, and all the rest in the younger stone age. The Westland type must, however, also be probably palæolithic.

IV. *Axes with Shafthole.*

„It is a common supposition amongst Norwegian and Swedish archæologists that the axes with shafthole in the North appear first at the beginning of the copper age, and that accordingly the axe type of copper is the oldest. Salin means that certain axes of horn are copied in copper and from these copper axes the axes with shafthole have their origin. Brøgger means that both of them originally date from the horn axe, but without passing a copper stadium the stone axe is copied direct from the horn axe. Some of these axes of stone are autochthon in the North and hardly imitated from the scarce copper of the North, but more likely copied directly in stone."

At least many of the horn axes are, in fact, preglacial and palæolithic in the North, and at least some of the axes or chisels with shafthole must also be preglacial. But these axes are, on the whole, probably neolithic and do not interest us here. The existence of rock axes with shafthole also in the palæolithic period of the North is already treated. That they have their origin from the horn axe with hole and not at all from the copper axe, that must be a fact.

My conclusion is, then, that the Nöstvet, the Vespestad, the Westland, the butt-necked round axes, and the Finnish types of axes without shafthole were actually preglacial and palæolithic. And the same may, perhaps, also be the case with several axes of the other here related axe types. But the thick-necked and broad-edged type with the central edge must probably all be neolithic and postglacial. The peculiar transverse edge of the Westland, ground from one side of the rock axes, seems to tell in favour of a preglacial existence. Also some of the axes of rock with shafthole must be preglacial.

O. Rygh: Om Affaldsdyngen ved Stenkjær.

Foreningen for Norske Fortidsmindesmerkers Bevaring 1871.

„Close by the northern end of the Trondhjemsfjord, somewhat north of Stenkjær, a kitchen midden was found in a slope, about 28 m. above the sea. The cultural stratum, about 30—35 cm. thick, rested on common gravel as in the underground here. The principal mass consisted of 12 species of molluscs: Ostrea, Cardium, Mytilus, Littorina littorea, L. obtusata, Patella vulgaris, P. testudinaria, Tritonium undatum, T. despectum, Modiola vulgaris, Cyprina islandica, and Purpura lapillus. Littorina littorea was the most numerous and Ostrea edulis, Cardium edule, Tritoneum undatum, and Cyprina were present in a greater number, while the other species were but one single or quite few. According to K. Rygh, originally an abundance of Mytilus edulis and a comparatively greater number of Ostrea than now had occurred here. These species are still common in shallow waters except the oyster. The 4 first named species formed the principal mass of the Danish kitchen middens, and some others were unknown there.

Fish bones were but very few and so fresh that they hardly were contemporary with the other contents, probably an admixture from later times as manure. Such bones are easily destroyed, and a fishing implement was found in the upper part of the thin mound.

Mammalian bones commonly were strongly eroded, occurring only as undeterminable particles. One piece of the human frontal bone probably got accidentally into the mound. One tooth of beaver, occurring here, is also found in the Danish mounds. Of the dog a couple of bones were in all probability found. Larger bones of elk or horse and of cow or reindeer occurred. Horse and cow are improbable and in the mound an implement of horn of elk or reindeer was found. Marrow-bones were cleft or broken.

A surprising number of antiquities, great in proportion to the small size of the mound, occurred:

One transverse axe of horn of elk or reindeer with shafthole.

One elongated piece of horn, pointed at one end and fractured at the other end, undoubtedly nothing else than the tang of an arrow point.

One flat oblong quadratic piece of **slate** with a groove in the middle of the flat faces, probably for the string as the sinker of a fishing line.

One arrow point of slate with barbs.

One knife of slate, the edge broken off.

One wedge of slate with the upper part slightly ground.

One arrow point of rock, now lost.

The 4 slate objects are, then, a difference from the Danish mounds.

Shortly afterwards there were in the place found a fragment of a slate point and a somewhat damaged wedge of slate. In all 6 objects of **slate** occurred here."

The contents of molluscs and implements point all to the older stone age, preglacial and palæolithic. The kitchen midden must be south-Scandinavian, while the 6 slate objects are arctic. The arctic people lived, at least chiefly, along the coast, while the south-Scandinavian culture seems to have existed in the interior regions of Trondhjem's Stift. Here has been a point of contact between the two peoples, perhaps towards the beginning of the glaciation. It must not be forgotten that this find was investigated about 40 years ago when bones were not properly examined. Of course, there is no reason for the horse or cow.

In the last few years exceedingly interesting and extensive flint finds have occurred along the coast of the whole Trondhjem's Stift, specially by Nummedal.

K. Rygh: Oversigt over Trondhjems Videnskabsselskabets Oldsagsamlings Tilvækst i 1910.

The new archæological periodical: Oldtiden 1 Bind, 1910.

„Rygh first relates many antiquities sent to the Museum of Trondhjem, particularly several flint finds from the outer (western) part of Romsdalen [1], but no investigation is made. Of flint finds

[1] Trondhjem's Stift is devided in 3 Amts (Romsdal's, southern Trondhjem's, and northern Trondhjem's Amt). Romsdal's Amt is subdivided in 3 Fogderier (sheriffships) from south to north: Søndmøre, Romsdalen, and Nordmør.

only those, containing **tranchets**, will be mentioned, all lying in the islands out of Molde. At *Hegdalsvik* (p. 31) in Ottero of about 50 flints 2 small tranchets occurred. At *Rakvaag* (pp. 33—4) in Ottero of 45 flints 1 tranchet was found, being of a complete form, but only 3.5 cm. long and as broad at the edge; such small tranchets occurred also in the Danish mounds (Affaldsdynger p. 29). Behind the church of Akero (pp. 35—6) in *Gorsø* a little collection of flints contained one form like a tranchet.

Moreover, **slate** implements were found: in Romsdal's Amt in the parish of Veø 1 fragmentary large lance point together with a flint nucleus, in Gorsø 1 knife, and in southern Trondhjem's Amt in Hevne 1 arrow point, in the dwelling-site of Lovstrand in the parish of Bjornør 3 knives, 5 arrow points, and 2 preparatory works. From Lovstrand many similar implements of slate are also formerly sent in.

But of much greater interest are the following finds from Romsdal's Amt (from p. 36), investigated by Numinedat and partly by K. Rygh."

Stenaldersfund i Ytre Nordmøre.

„These finds had another character than the formerly related ones and here it was remains from an older part of the stone age than formerly known from the „nordenfjeldske" Norway. This is a rather preliminary account.

A. More Prominent Finds.

The town of Kristiansund N.[1] is built on the 2 islands of Kirkelandet and Nordlandet.

In **Kirkelandet** 3 valleys with flat bottom are separated by low ridges. Here occurred the first 4 finds.

I. *Christies Minde.* Of about 400 flints but an unusually little part is actual refuse. Besides, in the following year 1911 about 200 flints were found, mostly refuse.

20 **tranchets** of which a couple, perhaps, somewhat uncertain. Form and size are a little variating, but all have the characteristic marks, from 4.5—10 cm. long and the edge 3.5—7 cm. broad. Besides, in 1911 one little, rather certain **tranchet**.

2 **around-chipped axes,** by Rygh called „Kjerneøxer" (nucleus-axes).

6 flake scrapers and several uncertain. In 1911 several.

[1] Kristiansund N. (north) as distinct from Kristiansand S. (south).

9 one-edged arrow points[1] with the edge at one side and with tang, and 2 transversely edged ones. In 1911 12 and 1.

5 borers at least, and probably 5 saws. In 1911 6 borers and perhaps some saws.

Some few flake knives and a great many uncertain. In 1911 6 flake knives.

About 100 good flakes. In 1911 a great deal.

Several nuclei and blocks and many more uncertain pieces. In 1911 some small nuclei.

During the ploughing the position of the flints were disturbed. Most of the flints were found in less than 4 square meters. The turf and the mouldy soil were about 20—30 cm. thick, and underneath a layer of hard stony and sandy gravel rested on the surface of the native rock, which in several places lay only less than 0.50 m. deep so the plough had in several places gone down into the gravel layer. It seems that the flints had only been lying in the uppermost part of the gravel layer. Pieces of coal were found in the entire ploughed region, but they are hardly reliable as also pieces of stone-coal and bits of glass occurred, probably from late times during a long cultivation. Some oyster shells and animal bones may originate from the same cause. But at one spot, about 10 cm. deep, many small particles of coal occurred. During the cultivation many stones were gathered in a heap, several of which seemed sooted, why there is much reason to believe that these stones belonged to a fireplace.

II. *Brunsviken.* The black marshy soil is said to be up to 2 m. deep in the middle of this valley. Here were investigated about 12 square meters. The marshy soil was 60 cm. deep with coarse sandy gravel below, in the upper part of which many flints were found. Where not disturbed, the flints occurred in the very lowest part of the marshy soil at the transition to the gravel layer. In some places big stones stuck down in the underground. Between some of these big stones a thin layer of rather dissolved coal occurred over about 1 m., perhaps a fireplace, but stones of an adequate size for a fireplace or scorched stones were not observed, and of organic remains of bone or mollusc nothing occurred. Here were found 600 flints.

10 **tranchets** and 1 uncertain. Most of them were rather pointed towards the butt-end. The forms were not so beautiful as in I.

1 small and 1 large **around-chipped axe** and 1 more uncertain.

[1] K. Rygh calls them „eneggede“ (one-edged), but in „Palæolithic Chronology“ I have called them „unilaterally edged flint arrows“. I use here the shorter name „one-edged.“

10 flake scrapers perhaps.

3—4 discoidal scrapers.

Of arrow points 2 transversely edged, 2 uncertain one-edged and 2—3 leaf-shaped.

2 flake borers and 2 thick borers besides some small pointed pieces.

4—5 flake knives of older form and some uncertain.

Several blocks and some uncertain tools.

III. *Øvrevaagens rope-walk.* In one place was dug down through the 60 cm. deep marshy soil with little result, but in the remains of an old trench more than 300 flints were found, mostly refuse.

2 **tranchets.** In 1911 one disc of flint somewhat like a tranchet.

1 **tranchet-chisel.**

3 flake scrapers.

2 flake knives.

2 one-edged arrow points and 1 other.

2 borers perhaps.

Some discs and broad flakes, some blocks and unused discs.

Some flakes with well cutting edge.

IV. *South of the rope-walk.* On the flat low ridge some flints have been found. Here in 5—6 square meters occurred about 250 flints underneath the turf or lowest in this, nearly all refuse.

1 small straight *axe* (Retox) or chisel.

Some flake knives, 2 flake scrapers.

Perhaps some borers and some arrow points.

1 block and 1 large disc.

In the island of **Nordlandet** the finds V—IX occurred.

V. *Røseren.* Below the turf or in its lowest part in about 10 square meters, lying sheltered between 2 low prominences, about 600 flints were found, nearly all refuse.

1 **tranchet-chisel,** about as fig. 20 in pl. V of „Affaldsdynger."

2 or 3 transversely edged arrow points.

4 flake knives.

Many good flakes, several with cutting edge, some probably scrapers.

Several roundish thin flakes, perhaps scrapers.

VI. *Voldvandet.* This is an artificially dammed-up lake. On the eastern side of the lake trenches were dug partly along the lake and partly up to the plateau; in the thrown-up mould Nummedal already in 1909 found several flints, even on the ridge. On the ridge several hundred flints occurred, and at some spots several coals and scorched flints, but no fireplace were discovered. Somewhat later, on the plateau abundant flints were found, in all a couple of 1,000 pieces, but almost only refuse.

2 **tranchets** and 2 uncertain.

10 flake scrapers and some uncertain, and 2 thin discoidal scrapers.

8—9 flake knives and probably some uncertain.

3 borers and some uncertain.

30 one-edged arrow points with tang.

Many flakes with well cutting edge.

2 long dagger-like pieces. Blocks and large discs.

5 pieces of **pumice,** probably for polishing of wooden tools.

Down below on the border of the lake some few flints occurred together. 1 flake scraper and 1 water-worn borer. Some pieces of rock of which 1 *greenstone axe* with quadratic section and without grinding.

Besides, in 1911 one discoidal scraper of flint on a mountainous knoll between V and VI.

VII. *Odegaarden.* At least 30 m. above the sea, with more than 450 flints. Here and there some coals and some scorched flints were found. Mostly refuse.

2 **tranchets** and 1 *axe* of similar form.

4 flake scrapers and some uncertain.

5 one-edged arrow points and 3 similar.

1 somewhat doubtful transversely edged arrow point.

Some lancet- or leaf-shaped arrow points.

2 or 3 flake knives and 1 flake borer.

Several good flakes probably used partly as knife, scraper, and saw.

Besides, in 1911 were found: 2 *axes* of flint, 1 very thin **tranchet,** 4 flake knives, 1 flake scraper, 3 borers, 1 one-edged, 1 transversely edged, and 2 lancet-shaped arrow points. About 130 flint pieces.

VIII. *Kolvik.* Probably 30 m. above the sea. Here also some coals occurred between the flints. About 400 flints, mostly refuse.

6 one-edged arrow points with tang and 1 uncertain.

Several flake knives. Some flake borers. 1 saw.

Some blocks, nuclei, and many good flakes.

In the neighbourhood some not investigated places seem to have been dwelling-sites.

Besides, in 1911 in a new findplace near southern Kolvik about 600 flints were found, of which 5 **tranchets** (some less certain or at least less well formed), 1 little piece like an **around-chipped axe,** several partly large discs with good edges, several blocks or nuclei, several flakes and some probable knives, 8—9 arrow points of various form. Also this place is about 30 m. above the sea. Some coals are of little importance, since some fires have occurred here later.

And in a new findplace at northern Kolvik 45 flints and some small pieces of rock-crystal occurred; mentioned here are 2 flake knives, 2 arrow points, 1 borer.

IX. *Gløsvaag* Only few flints occurred here.

1 **tranchet** and 1 water-worn uncertain one.

2 **around-chipped axes** (probably). 1 flake scraper.

Close by in a gravel pit 1 *transverse axe of greenstone* and 3 flints were found. This rock axe has a roundish section, ground all over, but the scars after chipping are not removed. It somewhat resembles the Vespestad type (Brøgger: Vestlands Stenalder fig. 20). Besides 1 badly formed **tranchet.**

Besides, in 1911 in Nordlandet in 3 different places were found: at *Omsund* 2 one-edged arrow points of flint, 1 flake scraper, 1 or 2 saws, 2 flake knives, some blocks, 1 probable borer, in all about 130 flints. Some small pieces are perhaps discoidal scrapers. A couple of pieces have faces indicating that they are broken off from the edge of a *ground* flint axe. The author remarks that this does not correspond to the older stone age, but it is not strange that later admixtures have occurred. In another place at *Omsund* a great find occurred: 1 **tranchet-chisel** of flint, 6 arrow points (one of quartzite), 7 flake scrapers, 3 or 4 knives, 2 saws, 3 flake borers, besides about 500 flints mostly refuse; remarkable here are about 150 pieces of a light-gray *quartzite*, all of a more or less marked flake-form, of which 2 arrow points, some scrapers, 1 borer, and some perhaps used as knives. These flakes of quartzite have the same forms and are chipped in the same manner as similar flakes of flint. At *Breivik* 17 flints occurred, mostly refuse; here were found 1 small discoidal scraper and perhaps 1 knife and 1 borer.

X. *Golma.* In this small islet near the larger island of Tusteren, east of Kristiansund N., one very great and two smaller insignificant finds occurred. In the great find, about 30 m. above the sea, a deposit of stones with coal around them may have been a fireplace. Here is undoubtedly a dwelling-site with about 600 flints.

1 **tranchet.**

1 **around-chipped** transverse **axe** of flint.

4 one-edged arrow points and 1 uncertain.

7 flake scrapers, 2 saws and 1 uncertain, 3 borers.

Some blocks and many flakes with very well cutting edge.

XI. *Sandviken.* In the island of Tusteren, about 40 m. above the sea, about 30 flints occurred.

4 flake scrapers and 2 less certain. 2 borers. 2 flake knives.

1 transversely edged arrow point and 1 leaf-shaped.

1 large fragment resembles a **tranchet.**

The 3 following finds (XII to XIV) were found in the most southern part of the island of Skarsø in the parish of Aure still in Romsdal's Amt, while the northern part of this island seems to belong to southern Trondhjem's Amt.

XII. At *Lesund's farm.* About 100 flints.

2 **tranchets.** 5 flake scrapers. 1 flake knife. 1 borer and perhaps 2 others.

1 dagger-like flint.

XIII. On *Lower Lesundvand* (lake). About 8—10 m. above the sea. About 350 flints, mostly refuse. Besides, one piece of **pumice,** perhaps with grinding faces, and some small pieces of rock-crystal.

1 **tranchet** or perhaps chisel. 3 flake scrapers and 3 fragments.

1 saw. 1 discoidal scraper and perhaps some others.

7—8 lancet-shaped and 3 or 4 transversely edged arrow points (but no one-edged).

XIV. On *Upper Lesundvand,* about 250 flints, mostly refuse, 6—8 m. a. s.

2 **tranchets** and 1 fractured or not finished.

5 flake scrapers. 4 discoidal scrapers. 2 borers and 2 uncertain.

XV. *Gjerde.* In the islet of Grisvaagen in the parish of Aure, at about 40 m. above the sea, 70—80 flints occurred, mostly refuse.

1 **tranchet.** Some probable flake scrapers. 3 discoidal scrapers.

2 lancet-shaped arrow points perhaps. Some blocks and nuclei.

XVI. *Edøen.* An islet somewhat s. w. of Skarsø at 24 m. above the sea (by Nummedal supposed to be the Tapes level here). About 700 flints, mostly refuse.

1 **tranchet.** 1 **around-chipped axe,** uncommonly thick and large, and 2 similar axes.

2 flake scrapers. Some uncertain saws. 1 knife of older form. 1 borer.

1 transversely edged arrow point and some uncertain.

1 small fine arrow point of *quartzite* with tang.

Several good flakes with cutting edge and several large discs with good edge.

Blocks and nuclei.

XVII. *Nælvikøen.* In the large island of Smolen, also in the parish of Edø, 4 finds occurred at this farm. 3 finds at about 30 m. above the sea.

a. 15 flints, of which 1 flake scraper and 1 borer.

b. 25 flints and a piece of rock-crystal, 1 borer and some like saws or scrapers.

c. About 50 flints. 1 **tranchet-chisel,** some borers, 1 dubious transversely edged arrow point and 2 leaf-shaped ones.

d. About 100 flints. 1 uncertain *axe,* 2 or 4 scrapers, 1 borer, 1 *triangular* arrow point and some uncertain ones.

XVIII. *Bremsneshatten.* 6 finds occurred in the long island of *Averø* in its northern part near the mount Bremsneshatten, some km. s. w. of Kristiansund N. At least 4 are lying so close together that a dwelling-site is probable.

a. 120 flints. 1 axe must be considered as an incomplete **tranchet,** some scrapers, 4 flake knives and some uncertain ones, 4 borers, and several nuclei; several pieces of rock-crystal. Besides, in 1911 were found 2 **tranchets,** 5 larger good flakes of which 4 knives and 1 saw, 1 flake knife, 2 flake scrapers, 3 borers, 1 leaf-shaped arrow point, 3 blocks and nuclei, and some refuse.

b. About 70 flints. 1 like a **tranchet,** 1—3 flake scrapers, 3 borers, and 3 flake knives.

c. 5 flints, of which 1 **tranchet,** the others much water-worn.

d. About 200 flints, but few tools. 1 probable **tranchet,** 2 or 3 borers, perhaps some saws, some blocks, some large flat discs, and several flakes.

e. 4 flints, all water-worn. One perhaps a transverse *axe.*

f. 1 single probably discoidal scraper.

Besides, in 1911 near this mount were found:

g. Near the *church.* Somewhat more than 40 flints, 2 flake scrapers, 1 discoidal scraper, 1 knife, and 1 borer.

h. Near a *spring* s. w. of the mount, at least 50 m. above the sea, 1 or 2 *axes* of flint, 16 or perhaps more arrow points of which 13 one-edged, 2 chipped along all the two margins, and 1 or more leaf-shaped, several flake scrapers, 5 small discoidal scrapers, at least 8 flake knives, 6 flake saws, 1 peculiar dagger-like piece of black flint, 7 borers, at least 10 blocks and nuclei, and besides more than 600 other flints of which an unusually great amount of good flakes.

i. At the *spring* about 200 flints, 1 or perhaps 3 **tranchets,** 1 **tranchet-chisel,** 6—7 flake scrapers, 6 discoidal scrapers, some flake knives, 1 or 2 saws, several borers, 3 arrow points, several partly larger blocks, and much refuse.

In 1911 on the same island of *Averø* were found in other places:

k. In *Løknyren* 2 **tranchets** and 2 dubious, 1 little transverse *axe,* 8 knives, 4 flake scrapers, some discoidal scrapers, 5 arrow points, 6 borers, and besides about 350 flints of which a great deal of larger pieces as some blocks and larger discs, but mostly refuse.

l. In *Rausand*, in all about 100 flints and a couple of pieces of rock-crystal and quartzite, several flake scrapers, saws, and knives, 5 borers, 2 arrow points and perhaps some more, several blocks and nuclei, and 2 pieces like badly formed **tranchets,** but they are dubious.

m. At *Storevand*, about 150 flints mostly refuse, 1 **tranchet** (in 1910 another tranchet was found here), 2 or 4 flake scrapers, and 1 flake knive.

n. At *Hjelset* nearly 20 flints, 2 scrapers, 1 knife, 2 arrow points, perhaps 2 discoidal scrapers, 1 piece like a **tranchet** and another like an axe or tranchet.

o. At the *road* between m. and n. about 80 flints, mostly refuse, 1 scraper or knife, 1 arrow point.

p. At *Futsæter*, about 50—60 m. above the sea, 1 **tranchet,** some flake scrapers, some small discoidal scrapers, 3 knives, 2 borers, 3 uncertain arrow points, besides more than 30 flints mostly refuse. (In 1910, at 30—40 m. above the sea here were found 1 **tranchet,** 2 discoidal scrapers, 1 flake scraper, 1 borer, 1 nucleus, and 2 pieces of rock-crystal).

In the nearlying islet of *Ekkilsø* 2 probable **tranchets,** 2 flake scrapers, 2 knives, 2 blocks, and besides 25 flint refuse.

In the isle of *Frei*, also in the parish of Bremsnes, several flake scrapers, some arrow points, and 30 flint refuse."

B. Smaller Finds.

„Some few, partly only single specimens occurred, besides some finds with a somewhat greater number of flints. No special investigations have, however, taken place here, the finds were quite accidentally lying open. It is then not improbable that some may indicate dwelling-sites. 33 various findplaces are mentioned, almost all of them lying in regions already related. The finds contain the common flint implements from the older stone age, but only some few are mentioned by me as containing particularly tranchets.

9. Near *Glospaag* (IX) 2 flint nuclei, 1 discoidal scraper, and 1 transverse *axe of rock* that had the form of a tranchet.

13. In the island of *Tusteren* (XI) 1 **tranchet** and 1 discoidal scraper.

14. Breivik, *Golma* (X). 1 **around-chipped flint axe,** 1 roughly chipped flint **tranchet,** 1 flake scraper, 2 borers, and a large discoidal block.

19. *Kuli* in the islet of Kuli, the parish of Edø. 1 flake scraper,

1 fragment of a flake scraper, but of a form like a transversely edged arrow point, called in Denmark „*Flekkespalter*," and some refuse.

20. Between Kuli and *Kulihoug* in the same islet of Kuli in the northern part of Romsdal's Amt. The lower part of a **rock axe with shafthole,** fractured lowest in the hole that only represents a narrow groove. The hole is bored from both faces. This axe must have been a form standing near to O. Rygh's fig. 32. Besides, 1 discoidal scraper roughly chipped and perhaps with tang, 1 irregularly chipped piece with the chipped edge of a scraper, 3 discs probably used as scrapers, and about 50 flint refuse. This find lies about 14—20 m. above the sea."

I have treated these 2 last finds more extensively, because it may be that this single implement, the rock axe with shafthole, may also be preglacial and palæolithic, but not postglacial and neolithic as K. Rygh means. That is very hard to prove.

„21. On *Storevandet* (lake) in Averø 1 little **tranchet** (already mentioned XVIII).

25. *Gjengstøen*, also in Averø, 1 transverse *axe* of flint and a piece of rock-crystal.

26. *Fulsæter* in Averø (already mentioned XVIII, p.) 1 **tranchet,** 3 discoidal scrapers, 1 borer, and 2 pieces of rock-crystal.

28. Down below the cave of *Valse* in Bremsnes 1 **tranchet.**

29. On *Rensvikelven* (river), in Frei in Bremsnes, a piece has the complete form of a **tranchet,** discoidal and flake scrapers, besides a fractured axe form.

33. *Aarsund* in Stromsneset 1 axe of **tranchet** form, evidently exposed to a strong fire, and one transversely edged arrow point."

K. Rygh's Summary and Conclusions.[1]

„These rich flint finds (in 1910) so far north are very remarkable, since formerly only few such places were known from the „Nordenfjeldske"[2] as some from Akero, Bolsø, and Bud in Romsdalen, two from Aure in Nordmøre, two from Agdenæs in Fosen in southern Trondhjem's Amt, and the most northern from Flatanger in Namdalen in northern Trondhjem's Amt. Besides, these rich finds indicate that many more may be found, (as actually the case has been in 1911 and 1912). It is but some parts of Jæderen that have a comparatively as great richness of dwelling-sites and workshops from

[1] Referring only to the finds of 1910.

[2] North of the Dovre.

the stone age. These new finds involve an unexpectedly full argument of a strong stone age population during a longer period as far north as nearest north of the latitude of the 63rd degree.

Besides, there is an essential difference of age between these finds and the former stone age finds in the „Nordenfjeldske". At least most of them belong to an older period of the stone age. The types of the implements undoubtedly refer the finds to a period essentially not different from the Danish kitchen middens. Formerly such finds were only known from the southern Norway and there only rather scattered and scarce.

Particularly the **tranchet** is safe in proving that the greatest part of the finds originate from the older stone age, since this form disappears at the close of this oldest period and is absolutely characteristic of the older stone age of the North. The tranchet is found in great abundance in Denmark and Sweden. From Norway only 10 (now 13) flint tranchets were formerly known and most of them as single finds. In these finds from Nordmøre in Romsdal's Amt tranchets are found in 28 various places to the number of at least more than 50, and when the uncertain ones are also taken into account, about 65 specimens, the so-called tranchet-chisels also included. K. Rygh believes that, at all events, the number may be estimated at 60." This is written before the finds in 1911.

„The **around-chipped axe,** „Kjerneoksen", ranks with the tranchet as indicating the older stone age. Of these and similarly chipped chisels there are about 20 of which, at any rate, 15 are quite certain, found in 14 various finds.

Of the findplaces A all, except VIII (Kolvik), have delivered axes of any of these forms, and besides 11 of the under B noted places. Already by these axe types 28 findplaces are, then, securely marked as belonging to the older stone age. And also a series of other implements confirm this age." But already the following year 1911 at Kolvik there were found 5 tranchets and 1 around-chipped axe of flint, and in other places several occurred.

„Flake *knives* of older form but, on the whole, of a somewhat different working fashion occur in a series of finds, most often several from the same place.

Of the *flake scrapers,* partly occurring in most of the somewhat greater finds, some forms may, at any rate, be considered as certainly indicating the older stone age, and there is nothing in the way of that they all may belong to this period. According to S. Müller, the straight and transverse flake scrapers occur also more often in the younger dwelling-sites and in the barrows, the concave, however,

hardly, and the convex seldom and they have then no chipped tang. In these finds the scrapers with convex edge are the most common and they are often chipped for hafting, partly by incision in the margin and partly by adjustment of the back or bulb of percussion.

Of *arrow points* some forms are little characteristic; these pieces are also often uncertain, wanting a marked chipping. The two most certain forms, the most interesting, are the transversely edged (Danish „Flekkespaltere") and the one-edged ones. The first form occurs in the finds both of the older and younger stone age, accordingly being no certain argument. But the one-edged arrow point, occurring at least in 7 of the greater finds and mostly in several specimens (in A. VI, Voldvandet, even 30), are more important. This form is not found in the Danish mounds where the transversely edged form was common, but a couple are found in the older dwelling-site of Maglemose, where Sarauw has given a summary of its extent and of the relations of age." It occurs already in cave finds and other dwelling-sites from the later palæolithic period or the reindeer epoch, but it is particularly frequent in the oldest neolithic period everywhere in Europe, Africa, and Asia, according to Sarauw.[1] „Sarauw characterises it as the oldest form of the arrow point, later succeeded by the transversely edged form. The one-edged arrow point has here somewhat deviating forms, but common to all is, however, the edge at one side, only formed by splitting off, while the other lateral side is entirely or partially finely chipped. In the finds here about always they have a special chipped tang for hafting.

Some forms of the *borers* are also characteristic of the older stone age. The abundance of partly unusually long and broad flakes and of good blocks are also characteristic.

Discoidal scrapers often occur of a more primitive form and smaller size, almost never found in the older kitchen middens. But they are common already in palæolithic times and are also found in Maglemose."

We must not forget that Maglemose is younger than the older kitchen middens, but both of them preglacial and palæolithic, anterior to the Magdalenian or reindeer time.

„The smaller finds in B generally give no support as to age, but only one, No. 20 from Kuli—Kulihaug, distinctly indicates the younger stone age." However, that is hardly right as the only questionable thing here is the rock axe with shafthole, what to me rather proves that rock axes with shafthole existed already before

[1] Palæolithic Chronology p. 45, where I have called them „unilaterally edged flint arrows," while K. Rygh calls them „eneggede" (one-edged).

the Ice Age, being an imitation in stone of the palæolithic horn axe with hole.

„According to Nummedal, the levels of the finds above the sea are on an average about 30 m., some a little less but mostly somewhat higher. At Kristiansund N. the maximum of the Tapes (Littorina) sinking is 21 m. The sites at Lesund (A. XII—XIV) are lying at about 50 m. above the sea.

In none of these dwelling-sites in Nordmore organic remains of meals are found. The oyster shells in A. 1 are from late times and one single shell in A. VII is later admixed. That the people were mussel-eaters cannot be doubted, the reason being as in Jæderen that the shells could not be preserved in or more below the surface in the moist marine climate. The position of the flints does not indicate a mound of shells.

One probable fireplace lies at Golma (A. X), but it is not yet investigated, and in A. I there has undoubtedly been a fireplace, disturbed by ploughing. On the whole, more or less of coal and remains of coal are only found in some sites. As yet the investigations have, however, been only preliminary.

The now collected flints (in 1910) are in all about 8,000, but not all are investigated. The flint is not native in Norway according to the geologists, but it appears quite unacceptable that all this flint is imported. The communications cannot in the older stone age have existed to such a degree. The flint lumps here only partly contain useful flint, they often are full of holes and sometimes contain greater parts of chalk. But finished implements must sometimes have been brought long ways as, for instance, even up to Tromsø's Amt, at least in the younger stone age. At Vespestad and Garnæs in Haus flint was missing. The people had nothing in exchange for the crude flint in Denmark. The crude flint must have been to find on the spot where it is chipped. It must have been brought from Denmark by the ice-streams."

„In the „Tilvækst (increase) af Oldsagsamlingen" in 1911 K. Rygh remarks that all these finds from flint places in outer Nordmøre in 1911 are collected by the assistant teacher (Adjunkt) A. Nummedal; they are partly new finds from formerly discovered findplaces, but the other 14 places are new ones. Of these new 14 places, 6 quite certainly belong to the older stone age and 5 with predominant probability, while the 3 others do not give certain points of fixture as to age. From Nordmøre in all about 60 flint places are now known, those places with a single or some few objects excluded."

Of not yet investigated finds from 1910 in the western parts of the sheriffship of **Romsdalen,** 3 finds with in all 4 tranchets are already mentioned at the very beginning of this survey of finds in 1910. In about 19 other places some flint objects were found in the same year as flake or discoidal scrapers, knives, arrow points, and lumps of flint (one weighing even 14,3 kilogrammes) and of rock 4 smaller axes, some grinding stones, and some fish-sinkers.

Rygh has already mentioned that some few finds along the coasts of Trondhjem's Stift had been made earlier before the rich finds in 1910:

In the islet of *Tautra*, somewhat south-west of Molde, were found: several flints, 10 scrapers of which 3 larger, 2 lance points or daggers, 1 unground thin-bladed *axe* of flint, and of rock 6 grinding stones, 1 hammer stone (?), 1 arrow point of quartz; of **slate** 1 lance point and 2 grinding stones; besides 1 fireplace.

In the island of *Otterø*, west of Molde, occurred: a collection of small flints; of rock 4 grinding stones and 3 small *axes* like the Vespestad type; of **slate** 4 arrow points, 1 lance point, and 1 knife, the last one being remarkable as the most southerly found one-edged knife of slate.

In the islet of *Bolsø*, a little east of Molde, at least in the last 50 years (written in 1902) an abundance of flint was found. From 1902—09 much flint was yearly found (one year more than 150), being mostly refuse. Of implements here are mentioned 1 lance point or dagger of flint and as probable several scrapers, flake knives, and arrow points. No tools of rock are mentioned. No bones were found. From this place there are in 1911 also found 1 fragment of a *ground* axe of flint, some flint scrapers, 3 small discoidal scrapers, 1 borer, 1 flake and 1 leaf-shaped arrow point of flint, and about 130 pieces of flint mostly refuse; in another place 1 larger lump of flint with several chipped faces and for the rest with a crust of chalk.

At *Bud* (or Bod) on the sea coast of the mainland, far north of Molde, there are only mentioned a large lump of flint and of **slate** 2 lance points and 2 arrow points, partly found in peatbogs.

These 4 places are lying in the sheriffship of *Romsdalen,* and the two first ones in the parish of Akerø. The two earlier finds in the parish of *Aure* in *Nordmøre,* mentioned by Rygh, I have not found related.

In **southern Trondhjem's Amt** most southerly in the large island of *Hitteren* a cave, **Hestneshulen,** has been found.[1] „The cul-

[1] Th. Petersen in Det kgl. norske Videnskabsselskabs Skrifter 1910, no. 2.

tural stratum is on an average about 50 cm. thick, by a clayey layer mostly divided into 2 parts. The thinnest underlying layer may be from the neolithic stone age and the overlying one from the older part of the Iron Age. Bones of domestic animals are found in both layers as dog, tame ox, tame swine, sheep, and horse besides bones of several species of mammals, birds, and fish. Three species are not at present found in Hitteren as Alca impennis of which 3 bones were found, beaver, and elk. According to Collett, it is not improbable that one specimen of the great auk was shot at Vardo, Finmarken, in 1848, but the last certain specimens were killed in Iceland in 1844. Of molluscs 10 species occurred, mostly eatable and in both layers. Cyprina islandica was not found here, but at Buset (see hereafter) only one fragment, while many occurred in the kitchen midden of Stenkjær, perhaps, because it is used as bait and here the cave lay at some distance from the shore. Of objects only 36 occurred: of flint refuse 14 and 2 flint scrapers (one discoidal) besides 3 or 4 flat grinding stones that were ground concave, and 1 bone point, representing the stone age, while 1 iron knife, 1 iron piece, and 1 fragment of pottery, of a material strongly mixed with asbestos, indicate the older Iron Age. Also some bone points, 1 bone dagger, and 2 needles, etc. occurred. A large tine of stag's horn like a „Slagstok" was cut off by an implement of iron." In a later paper are mentioned „some hammer stones of flint and 15 smaller flints, 10—13 grinding stones, 5 awls of bones, 2 needles of bone, a piece of an antler, and a piece of stag's horn (perhaps a Slagstok)."

At least the domestic animals in the lower layer can only be neolithic. Alca impennis is found both in neolithic and palæolithic times. If the eatable molluscs are actually used also in the Iron Age, that is remarkable; they are at least found in both layers. In the 3 neolithic kitchen middens of Denmark from the first neolithic period an abundance of molluscs are found, probably originating from the returning palæolithic tranchet people.

„From *Agdenes* on the southern side of the entrance of the Trondhjemsfjord about 40 flints are formerly found, mostly refuse.

In the most southern part of **northern Trondhjem's Amt** in the peninsula of *Frosta* (or Frosten), projecting southward into the Trondhjemsfjord, the dwelling-site of **Buset**[1] was found, consisting of coal and a shell layer 15—25 cm. thick. Bones of 5 domestic animals at once indicate the postglacial period, probably the neolithic stone age, since 2 grinding stones, 1 small transverse axe of rock,

[1] O. Nordgaard and K. Rygh in Det kgl. norske Videnskabsselskabs Skrifter 1909 no. 9.

1 greenstone preparatory work for axe, and fragments of an infantile skull occurred here. 9 species of molluscs, common in the stone age, were partly in abundance, indicating a shell-eating people. No bones except of domestic animals occurred. Of interest may be that at present the oyster lives from the Kristianiafjord until near the 66th degree of north latitude (Tjøtta), but it is found fossil at the 68th degree (Grøtto)."

I have related these 2 postglacial and neolithic finds of Hestnes and Buset on account of their abundance of eatable molluscs. If they actually are neolithic though no ground flint implements are mentioned, it must be the returning ancient tranchet people that first inhabited Denmark and the Scandinavian peninsula after the glaciation and were partly driven northward by the later superior really neolithic race that never was a shell-eating people, as far as I know. But in the 3 neolithic kitchen middens of Denmark only actually neolithic ground implements were found.

„*Flatanger* in Namdalen, northern Trondhjem's Amt, belongs in the arctic stone age, but here were also found at *Bøleseter* some flint refuse, a couple of scrapers, and one fragment of a flint arrow point besides 12 small rock axes (6 entire) with transverse edge, ground in facets, and with polygonal section, and at *Bølestrand* comparatively much flint of which 6 small scrapers and some arrow points besides 2 greenstone axes of the same type, but not so small as at Bøleseter. But the principal contents are of slate, 100 or about 40 points and 40 or 25 knives. Near Bøleseter at *Uran* a workshop of flint is found more like Jæderen." It appears as if the two different cultures have here been in contact.

K. Rygh. Oversigt over (Trondhjems) Videnskabsselskabets Oldsagssamling. Tilvækst i 1911.

Oldtiden. Bind II, 1ste Hefte, 1912.

Many of these finds, occurring in places mentioned in 1910, are already there related as supplements from 1911. Two dwelling-sites (1 and 13), apparently from the neolithic postglacial period, are treated here on account of their contents of Alca impennis and many molluscs, while ground flint implements and tranchets are not mentioned. Formerly I have only found Alca impennis mentioned in preglacial finds as in Denmark 1 bone in Ertebölle Mound, at least 2 in Havnø, and at least 7 in Klinteso, and in Norway more than 60 bones in the Viste find in Jæderen. In the probably neoli-

thic find in the cave of Hestnes in Hitteren 3 bones occurred, as mentioned above.

„1. In the **Valseshule,** a little cave of mount Bremsneshatten in Avero, **Nordmøre,** a small dwelling-site was investigated. Both some antiquities and remains of domestic animals indicate the neolithic period. Here were found several fragments of 2 or 3 vessels (by the author called urns) of burnt clay, the material rather homogeneous but mixed with rather large pieces of quartz; 8 flints of which 1 scraper with convex chipped edge and at the other end chipped for hafting; 1 awl of a sheep's bone and a fragment of a ground bone implement; 1 tooth of elk with 2 deep incisions near the root (at Gullrum in Gotland of about 60 teeth of seal only one single had a groove at the root, and similar teeth of elk with groove occurred at Åloppe in Uppland); and 1 piece of **pumice.** Many remains of animal bones occurred of which besides some others tame dog, sheep, goat, ox, elk, and Alca impennis, and also a human tooth. Many mussel shells, most numerous Littorina and Patella vulgata, were found here."

Characteristic of the neolithic period are the many bones of domestic animals and the awl of a sheep's bone, but the other implements and the pottery fragments may also belong to the palæolithic period. The two finds in Sweden are preglacial and palæolithic. However, no certain implements of the older stone age as, for instance, the tranchet occur here. Implements of bone have formerly been exceedingly seldom in the stone age of Norway, but in the Viste find in Jæderen (1908) bone tools were found in this probably preglacial find. It struck me as exceedingly remarkable that in this cave, as in the 2 newly mentioned finds of the Hestnes cave in Hitteren and the dwelling-site at Buset in Frosta and also in the hereafter mentioned find of the rock-shelter in Skjørn (all 4 in Trondhjem's Stift), the neolithic period is distinctly marked by many bones of domestic animals, while no ground flint implements are found, but only many molluscs and implements that also belong to the older stone age, the preglacial palæolithic period. The people of these evidently neolithic and postglacial finds cannot have been the new neolithic race from Asia, but must have been the returning descendants of the tranchet people or the arctic stone age people. These two peoples probably were not at least very different originally. But on the other hand, the probably same people of the 3 neolithic kitchen middens in Denmark used neolithic ground flint implements. That the older stone age of the North was not preglacial but postglacial as generally accepted, that is impossible according to my views. The question must then be: has this people of Trondhjem's

Stift forgotten the grinding of flint, what seems unreasonable, or has it returned early in the neolithic period without having learnt this peculiar neolithic procedure (only the breeding of cattle) during their residence in southern countries throughout the glaciation? Driven away by the glaciation, the people of the North emigrated partly to Italy and partly to northern France and Belgium. As already mentioned in my „Palæolithic Chronology", the new neolithic race from Asia began to invade Europe already during the end of the Ice Age, but they were driven southward to Italy on account of the still lasting glaciation of Central Europe, and from Italy they also invaded southern France; however, the principal invasion probably occurred first after the cessation of the glaciation. The ancient palæolithic population must have been rather numerous all over Europe, but at that time they were brought together in the not glaciated regions. When the Ice Age had passed away, many of them returned to their old homes, and the succeeding more or less severe subjugation of the superior neolithic race must in many cases have forced them to emigrate to more distant regions, where the descendants of the ancient palæolithic people continued to live without being absorbed by the neolithic race as, for instance, in Britany and Wales where the celtic race might be their descendants, or in the Scandinavian peninsula. Certainly the same occurred also in the North, where the ancient people of the 3 neolithic kitchen middens of Denmark with their contents of ground flint implements might have been returned from Italy, for instance, in possession of a more distinct neolithic culture, while the postglacial inhabitants of the Scandinavian peninsula might have returned from northern France and Belgium in possession of a less developed knowledge of the new neolithic culture, using domestic animals but not grinding of flint. In Italy a full knowledge of the neolithic culture occurred earlier than in northern France. This reasoning may be right or wrong, but that at least must be certain that the neolithic inhabitants of the Scandinavian peninsula were another people than the new neolithic race, except in southern Sweden and some parts of the south-eastern Norway where only the burial custom of this race is found.

„2. A dwelling-site of **Dalehelleren** (rock-shelter) in Kirkelandet at Kristiansund N., **Nordmore,** was found. Many traces indicate a transition from the older to the younger stone age or an older epoch of the younger stone age. Some very small fragments of a vessel („urn") of burnt clay, not thicker than about half a cm.; 1 flake scraper of flint with convex edge and a narrower butt-end for hafting besides 2 other uncertain objects of flint and quartz; 10 small

discoidal scrapers besides some fragments; of flint arrow points 1 one-edged, 2 transversely edged, 3 heart-shaped (one quite entire), and another form; 2 flint borers and 2 others more badly chipped besides some fractured points; 1 flint implement fractured by fire; nearly 200 flint refuse, some stone balls, and 6 pieces of **pumice.**" This find may probably belong to the older stone age before the glaciation.

„13. A dwelling-site in a **rock-shelter of Dalen** in Skjørn, **southern Trondhjem's Amt,** was partly covered by down-fallen large stones. The cultural stratum, 0,50—0,80 m. thick, rested upon an underground of fine light-gray sand. About 9 square meters were investigated. Underneath a thin layer of dark mouldy soil a layer of shells occurred mixed with some single bones. At a depth of 20—40 cm. the bones became abundant, probably because covered by the shelly layer. According to Winge, the bones of higher and lower levels were not different in character; specially bones of domestic animals as ox, sheep, and goat were found as well in the lowest as in the highest layers. In 3 places beds of ashes and particularly pieces of coal occurred, but no remains of meals and no stony deposit were found. The tools of bone were scattered amongst the shells and animal bones.

The fauna here corresponded to that of the Valse-cave and the Hestnes-cave (mentioned above). Bones of domestic animals occurred in rather great abundance in all 3 finds. But here the dog was not found, present in the other 2 sites, but here rather numerous bones of Alca impennis (in all 6) occurred, while in the other 2 caves only one or a couple (3) were found. No unquestionable marks of cutting were to be seen, one bone appeared a little gnawed by mouse. The exceedingly great mass of shells here consisted almost exclusively of the 5 most common eatable molluscs as Ostrea edulis, Mytilus edulis, Cardium edule, Patella vulgata, and Littorina littorea besides 3 shells of Buccinum undatum and one shell of the 3 species, Cardium echinatum, Dentalium entalis, and Polytropa lapillus.

The found antiquities indicate the stone age and the domestic animals the neolithic period, but some implements, particularly the fish-hooks, may perhaps indicate an early epoch of the neolithic period.

The found objects were: 1 transverse axe of **slate** with about quadratic section and finely ground, but with scars of the chipping; fragments of a fish-hook of bone and one larger with 7 incisions at the upper end (a similar is found at Viste); several pieces of bone; 2 pieces of flint and 2 balls of stone. A large collection of bones of mammals, birds, and fish as, for instance, Ursus arctus, Phoca

vitulina, Alces machlis, Ovis aries, and Bos taurus domesticus." The transverse axe of slate may not absolutely be regarded as „arctic" in this neolithic find.

43. „Finds from a dwelling-site at **Hammersvolden** in Beitstaden, **n. Trondhjem's Amt,** where in 1910 a mass of shell and some very eroded pieces of bone, but not one implement were found. But in 1911 there were found 1 very little axe or chisel of flint, *entirely ground* but with several unground scars of the chipping, 1 flake borer of flint with carefully chipped sides, 1 grinding stone, a smaller pebble, a smaller collection of animal bones not yet determined, and a collection of shells. The maximal thickness of the cultural stratum was 90 cm. Here was a partly destroyed rock-shelter. This mound is considered as belonging to the younger Scandinavian stone age." Here the relations are the same as in the formerly mentioned mounds from the neolithic stone age, except the entirely ground flint axe.

28. „In *Agdenes,* **s. Trondhjem's Amt,** 18 flints and 1 little piece of rock-crystal occurred, of which 1 probable **tranchet,** 1 one-edged arrow point, 1 or 2 flake scrapers, and 1 little discoidal scraper. At least 50 m. above the sea. Later 20 flints were found here, of which 6 small flake and 2 discoidal scrapers. Also formerly some flints are found here." This find appears to belong to the older stone age, specially the tranchet. „30. One chipped, but not ground axe of rock, considered a preparatory work for grinding, is also found in Agdenes."

In *Hitteren,* **s. Trondhjem's Amt,** several new flint places are mentioned (from nos 44—55), in which were found collections of flints (20, 30, 35, 40, and once even more than 100 and once about 250), arrow points, borers, flake or discoidal scrapers, flake knives, flake saws, flint blocks, and one lance point or dagger of flint. In 47 are mentioned 3 pieces of flint formed as **tranchets,** in 48 2 somewhat badly worked **tranchets,** and in 49 one axe of flint with transverse edge and chipped. Besides, in 53 at *Anderskog:* 1 flint **tranchet,** 1 perhaps **tranchet-chisel,** more than 20 flake scrapers, some probable scrapers, saws or knives, 8 discoidal scrapers and some broad flakes, at least 12 borers, 9 or 10 arrow points, 2 rudely chipped pieces of flint more like around-chipped axes, and about 900 other flints, mostly refuse of which several scorched. These flints are found by Nummedal at the bottom of a peatbog, probably a dwelling-site, more than 20 m. above the sea. In 55 at *Hernes* more than 100 flints, mostly refuse, occurred of which 2 flake scrapers, 3 arrow points, and 1 borer besides 1 one-edged arrow point

of sandstone with tang, 1 discoidal scraper probably of slate, and perhaps a scraper of rock. Much coal was also found here." All these finds indicate the older stone age.

„Of these 12 flint places 11 are investigated by Nummedal during short visits. Probably many other flint places may be found in these regions. Remarkable is the richness of flint also here. At least 5 of these places have delivered objects that certainly indicate that they have been inhabited in the older stone age of the North."

„New finds from flint places in **Nordmøre** (from nos 56—77), partly mentioned in 1910 as supplements, were 22, of which 14 were quite new places and of these 6 certainly and 5 most probably belong to the older stone age, while 3 furnish no certain points of fixture as to age, as above mentioned." In the other new finds were found about 28 arrow points, 22 borers, 36 flake scrapers, 9 discoidal scrapers, 25 knives, 3 saws, of **tranchets** 2 certain, 2 probable, 1 very like and 2 uncertain, 1 **tranchet-chisel,** 1 small transverse *axe,* and flint refuse of which are mentioned 30, 30, 80, 100, 150, 17 and 40. But no slate occurred here. But in no. 102 a transverse axe of hard, black **slate** of an arctic form is mentioned as found alone at Flaa in Nordmøre.

New flint places in **Romsdalen** (from no. 92—102) besides 2 or 3 larger finds (in 18, 19, and 20):

„18. At *Rakvaag* in the island of *Otterø*, the parish of Akerø west of Molde, a dwelling-site exists. From this place is also that in 1910 found collection of flints, of which some forms indicate the older period of the stone age as 1 **tranchet,** 5 flake scrapers, 1 knife, 1 borer, and 3 transversely edged arrow points. In 1911 in 2 investigatad places (A and B) and formerly found (C) occurred:

A. 1 lance point of **slate** at a depth of 80 cm., 3 flake and 1 discoidal scrapers of flint, 1 borer, and about 130 flint refuse besides some pieces of rock-crystal and quartz. At a depth of 50—60 cm. a layer of somewhat larger stones that were scorched and had coal lying both above and below.

B. 3 flint borers, 1 flake knife, 1 transversely edged, 1 one-edged, and 1 leaf-shaped arrow point of flint, about 280 flints, and some rock-crystals; at a depth of 40—60 cm. The soil was blackish, but no actual coal or fireplace were found.

C. 6 unquestionable **tranchets** of flint not carefully worked, 1 **around-chipped flint axe,** 3 flake scrapers, and about 90 flints.

All these finds may belong to one dwelling-site extended over a large region in a hilly slope. Already last year it was, at any rate partly, considered to belong to the older stone age. Remarkable

is the position of the slate point (80 cm. deep) that must have come in the soil prior to most of the flints and before the stone-laid fireplace was made."

To me, however, it seems more likely that the cause is a removal during the Ice Age. The find is lying in the slope of a hill where it is hardly possible that the people lived, and besides the find is scattered over a large region.

„19. Finds from a dwelling-site at *Hegdalsvik* also in *Otterø:* of flint 1 flake and 1 discoidal borer, 7 flake scrapers besides some uncertain, of arrow points 1 transversely edged, 1 one-edged, and 1 triangular, and more than 450 flints chiefly refuse; besides, a couple of rock-crystal and some white quartz; also a fragment of 1 arrow point of **slate** and 13 pieces of **pumice.** These finds occurred in the same place where in 1910 (Tilvækst nos. 69, 70, and 71) were found 2 small **tranchets** (already mentioned), some scrapers, and not so few flints. In 1911 this find, lying in a slope, was only investigated in undisturbed places where the turf was not already removed. The flints were lying rather close together, some in the turf 10—12 cm. deep and others in the underlying gravel until 30 cm. deep. It was mostly refuse, more than 450. No certain signs of a dwelling-site were discovered. Some objects were also found on the plateau of the hilltop. The flints occurred scattered over a larger area. The spoon-shaped scrapers, mentioned in 1910, are found in other places of this farm at a various distance from this find place. This large find place must partly belong to the older stone age, but the place must also have been used in the later part of the stone age."

As far as I can see, all implements belong to the older stone age before the Ice Age; the spoon-shaped scrapers may be postglacial, but they occurred in other places. To be particularly noted is that some are actually found on the plateau of the hilltop and in the slope always scattered with interstices between them and partly at a great distance, all indicating a removal, while no certain signs of a dwelling-site were discovered.

„20. At southern *Hegdal*, the neighbouring farm, were found 1 borer, 1—2 flake scrapers, some flint discs of which one was a small **tranchet,** 1 fragment of a grinding stone, and 1 stone ball.

92—101. In 10 other places in outer Romsdalen in the parish of *Akerø*, mostly in Otterø, there were found about 18 flake scrapers, 6 discoidal scrapers, 9 borers, 6 arrow points, 3 saws, 6 knives, and of **tranchets** 4 certain, 4 uncertain, 1 perhaps uncertain, and 1 like a tranchet. All these of flint. The number of flints found in several

of these places are: about 40, 55, 11, about 50, 100, 180, and 10. Only one single piece of **slate**, a little ground, was found in 92. Besides, in 80 is mention 1 transverse axe of stone like Rygh 15, found in Vestnes south of the Moldefjord."

All these finds appear to be preglacial from the older stone age.

K. Rygh: Flintpladsene paa Trondelagens Kyst.

Oldtiden Bind II, 1ste Hefte, 1912.

„One of the most important events of the Norwegian archæology of late is the discovery of the numerous flint places along the coast of Trondhjem's Stift south of the Trondhjemsfjord, indicating such an ancient and considerable population.

Until the end of 1909 only 12 flint places were known in these regions: 2 in Agdenes south of the entrance of the Trondhjemsfjord, 2 in Aure the most northern parish of Nordmore, and 8 in Romsdalen. Some of these finds were from the inner districts of the fjords, one from the Valsøfjord innermost in Aure and 3 from Nesjelandet innermost in the middle basin of the Romsdalsfjord (near Veblungsnes); the others belonged to the proper coast districts.

In 1910 and 1911 Nummedal made a rich harvest of flint places (workshops). In the first months of 1912, 9 partly very rich places at Tornes on the outer part of the Frænenfjord (north of Molde) in Romsdalen were discovered by *Kringstad*, and in the parish of Bratvær on the western side of the large island of Smølen in Nordmore 4 places were found by *Soleim*.

We know at present more than 100 flint places in these regions besides some finds of quite few pieces; but probably many new finds may be found.

The flints are most often found underneath an overlying layer of peaty or heathery turf of the thickness of 30—40 cm., sometimes also a little deeper. The flints are lying upon an underground of gravel or „aur," partly also in the turf. Sometimes they are lying very close but, however, never to that degree that there may be spoken of actual heaps. Farther down in the underground they appear not to occur as a rule, at least not in abundance. Some exceptions, however, occur; in some places a mighty layer of peaty turf may lie above them or a thick layer of top-soil where cultivation has occurred.

There is a great mass of flint refuse, but also some quartzite (only in one place in a somewhat greater abundance), not seldom

rock-crystals sometimes with traces of working, and sometimes small lumps of **pumice** with marks of being used for grinding or polishing. Only in one place from the younger part of the stone age a fragment of an earthenware vessel („urn") is found. Implements of bone or meal-remains of bone or shell are quite wanting." These remarks must probably refer to the open flint places, as in some finds of caves or rock-shelters there are mentioned several fragments of pottery, implements of bone, remains of animal bones and eatable molluscs.

„We cannot, however, conclude that these places, at least for a great part, have not also been actual dwelling-sites. As in Jæderen, we must start from the point that bones and shells have not been able to resist the erosion in the moist maritime climate when lying in the open air. Coal is not a certain sign of a dwelling-site, it may result from later forest fires, but not so where whole heaps of coal in some places occurred. Besides, in several finds scorched flints or stones are found, but actual fireplaces only occurred in some few places (Golma and Rakvaag).

In most cases, but not always the places were lying sheltered from the severest winds either in a slope or behind a knoll or ridge, perhaps indicating that the working place also was the dwelling-site. But Rygh considers it rather certain that several of the now known flint places were not at the same time dwelling-sites that must have been lying somewhat in the neighbourhood. This is chiefly the case where rather great masses of flint refuse were found almost without finished implements or with only some very small ones, which were easily lost during the working. A greater supply of crude flint may explain this." But an actual removal by the ice may perhaps explain these relations.

„The implements, settling the time of these finds, are chiefly the axe forms, the tranchets and the on both faces chipped transverse axes, by K. Rygh called „Kjerneokser"[1] (Kjerne-core or nucleus); next, some forms of flake knives, flake scrapers, borers, and arrow points; besides, several forms of flake blocks. Also the occurrence of many good and large flakes can be included as settling the time. Particularly the first of these forms are conclusive with the older stone age.

The numerous flint places indicate a numerous population in the older stone age, most essentially corresponding to the period of the south-Scandinavian mounds. Already a couple of formerly known

[1] K. Rygh's „Kjerneøks" is in Sweden called „den rundtom slagna yxa", translated by me as the around-chipped axe. It is a transverse axe that probably, at least often, is called by the French le pic.

find places, at Aasvaag and Flovik on Næsjestranden in Romsdalen, contained some axe forms that must undoubtedly be determined as tranchets. But in the finds of the last years there is a predominant number that must quite certainly be referred to the same time; some finds are not sufficiently characteristic and a small number is certainly to be referred to the younger stone age. Of the 12 places in Hitteren 4 certainly and 3 probably belong to the older stone age. Of the 9 finds at Tornes in Romsdalen certainly all belong to the older stone age; besides, in Romsdalen at least 5 others and probably 4 finds in Ottero also belong to the same period, to which also the above 2 finds on Næsjestranden must be added. Of the finds in Nordmøre 36 with full certainty and half a score others with probability are to refer to the older stone age; besides, 4 tranchets are here found single. From all these districts of the coast at present at least 60—75 finds belong to the older stone age, according as we reckon with the less certain or not. In southern Norway we had only single finds from this period (except Viste), and formerly only the tranchets on Næsjestranden so far north; but now it is evident that a rather numerous population lived here in the older stone age.

Nummedal has maintained that these finds date from the Ancylus time, since one-edged arrow points occurred not in the Danish kitchen middens, but in Maglemose only in some specimens; but Rygh does not agree with him." Since this opinion is founded upon the false supposition of Sarauw that Maglemose is more ancient than the Danish mounds, while it is actually younger, so I need not relate the arguments of Rygh. He mentions that only 2 tranchets occurred in Maglemose; but 20 in Christies Minde near Kristiansund N.

„In the remaining part of Trondhjem's Stift north of the Trondhjemsfjord and in the inner districts around the Trondhjemsfjord there is only known one pure flint place, Uran in Flatanger, Namdalen. But in Flatanger and in Bjørnør, somewhat southerly, slate objects are most prominent, belonging to the arctic stone age.

Rygh maintains here, as formerly, that all this crude flint is not imported, but brought from the south by floating ice according to the geological hypothesis."

That the crude flint here is not imported, is certain, and it is as certain that it is not brought by floating ice from Denmark or the bottom of Skagerak; this last hypothesis is *à la mode,* but hardly possible. In these coast regions the crude flint was native as in Denmark, lifted up from the sea bottom during the general upheaval in Middle Tertiary; but the chalk is now destroyed, chiefly during the glaciation, though even at present deminutive particles of chalk are

found in the depressions of some flints. If my hypothesis is right that the older stone age of the North was preglacial, then the supposed transportation by floating ice in Miocene or Pliocene is impossible, and the crude flint along the coasts of Norway must be native from Lindesnæs at least to about the 67th degree of latitude, since Nummedal in this year 1912 found a flint place of quite the same character in the islet of Rødo in northern Helgeland, Nordland's Amt.

In a Kristiania newspaper of $^{11}/_{10}$ 1912 is related „that Nummedal has in 1912 found 20—30 new flint places of which some on the coast of Romsdalen; but also a whole series of flint places were found in the island of Vikten in the most northern part of Trondhjem's Stift, far to the north of the already known places in southern Flatanger in Namdalen. And one flint place of quite the same character as the formerly known ones was found even in the islet of Rødo in northern Helgeland (in Tromso's Stift), some Norwegian miles to the north of the polar circle. In this newspaper it is related that upon the whole about 150 flint places are at present found on the coast of Trondhjem's Stift." K. Rygh mentions „considerably more than 100 flint places" before the last 20—30 were discovered. These interesting new finds even so far north are not yet published, but it may be done before this treatise is printed. At any rate, it appears that the south-Scandinavian culture has been in direct contact with the arctic culture already in the most southern part of Tromso's Stift, before the beginning Ice Age drove the arctic people southward. If the south-Scandinavian people lived so far north in the preglacial period, it is a further argument in favour of the preglacial existence of the arctic people.

A. W. Brøgger: Studier over Norges Stenalder.

1. Øxer uden Skafthul fra yngre Stenalder i det sydøstlige Norge. 1906.

When the first invasion of man into Europe, according to my deviating views, actually took place from the East from Asia, then it would appear highly curious that Denmark and the Scandinavian peninsula were absolutely uninhabited in the palæolithic period, while nearly all the rest of Europe had an extensive and numerous population in this period. These relations, explained in my last treatise „Palæolithic Chronology," easily and artlessly explain many of the great archæological perplexities, formerly badly or not at all accounted for. It is, however, but the dwelling-sites, almost always removed more or less from their original preglacial sites, that are

able to give more or less reliable hints or assurances, while the many single finds of various axes in the North cannot be relied upon.

No dolmens or giants' chambers are as yet found in Norway, while 3 cists are newly discovered by Prof. Gustafson in Smaalenene, east of the Kristianiafjord, and some time ago 2 cists were found in the Svelvik moraine on the Drammensfjord not 50 m. from the coast and 20 m. above the sea level, lying about 100 m. from each other. An assignable find of 6 small cists in a gravel pit in Ramnæs, northern Jarlsberg, also on the west side of the Kristianiafjord, is dubious as only related by the owner. These few cists from a late neolithic epoch seem to indicate that the new superior neolithic race first very late arrived to the south-eastern Norway, while Norway for a long time had been inhabited in postglacial times by the returning ancient palæolithic people of the North that had been driven away by the Ice Age. This ancient people used their ancient burial custom. After having referred to the burial custom in the Ertebölle mound and at Gullrum in Gotland (by me considered preplacial), Brøgger says that the grave form of the Norwegian stone age ought to be regarded as a survival of the oldest burial custom, to deposit the corpse underneath the flat soil without further care and probably near the dwelling-site. It is, then, a preglacial custom still used by the returning same people also in the first postglacial times. Accordingly, Gustafson's supposition that the simple kind of graves, mentioned from Holstein by Miss Mestorf, was also in use in Jæderen (Holeheia), cannot be right, since this grave form seems to have been a very late neolithic custom. Besides, Wibling's supposed numerous graves in Ulfö in Småland, Sweden, were not graves, but only removed preglacial dwelling-sites, as mentioned previously. I have mentioned these relations to prove that the first postglacial population actually was the returning palæolithic race and not a quite new people.

In this treatise only the following axe types from dwelling-sites are proved to be actually palæolithic and preglacial, viz., the tranchet, the around-chipped axe as it is called in Sweden, by Müller in Denmak „the flint axe from the older stone age," and by K. Rygh in Norway „Kjerneoksen,"[1] the Nostvet axe, the Vespestad axe and the Westland type, and the butt-necked round axe (the „Trindøx"). Corresponding to the Swedish around-chipped axe is Müller's Danish flint axe from the older stone age, in „Palæolithic Chronology" by me called „les pics." In „Affaldsdynger" Müller says that this flint axe is still more uncertain in form and, as a rule, still more badly

[1] K. Rygh spells it Kjerneøks, but øks (axe) is also spelt ox in the Norwegian language.

chipped than the tranchet. It is chipped from the entire natural flint nucleus and it is not a chipped disc as the tranchet. This oblong, broad-edged, and big flint blade is of uncertain shape so a correct division is impossible. The people were satisfied with very bad, in every respect inferior implements. In the Ertebølle mound Müller, however, divides these axes in: 1. with narrow lateral margins, 2. with one or two broad lateral margins, and 3. with straight edge and having a certain likeness of the tranchet. This third form consists only of 16 specimens out of in all 415 in the Ertebølle mound, certainly being the oldest mound. It appears, then, not improbable that this flint axe is older than the tranchet, however, used for a long time. K. Rygh describes his „Kjerneøks" as a transverse axe, so it appears quite right that the French called this axe le pic; it must be the oldest used axe form. In the older Danish mounds were found:

in Ertebølle	374	tranchets	and	415	flint	axes.
- Aamølle	83	„	„	9	„	„
- Havnø	36	„	„	7	„	„
- Faareveile	26	„	„	10	„	„
- Klinteso	167	„	„	37	„	„

while in the 3 younger mounds from the postglacial younger stone age none of these flint axes was found and only 1 single tranchet in two of these mounds, one in the Orum Aa mound at the very bottom and one in the Aalborg mound from an uncertain spot.

The probably last axe type from the preglacial older stone age is the butt-necked round axe of rock, „den butnakkede Trindøx," characterised by a quite new working method, the so-called prick-cutting or prick-hewing, which is markedly different from the more ancient chipping.

Brogger says that the rock axes of the North are commonly made by crushing followed by grinding, but the Nøstvet axe is made by chipping, an imitation of the flint technique. This „Tilstødning" or „Afknusning" as called in Norway (in Denmark „Afstødning" and in Sweden „Bultning") belongs also to the older stone age and is now called „Prikhugning" (prick-hewing or prick-cutting as I have translated it). „The butt-necked round axe type, becoming rounded as it was turned round during the prick-cutting, is extended over the west-European coast regions from France and England until the North, but it is also found in southern countries as India, Egypt, Asia minor, Greece up to Hungary, and in the Mediterranean regions from the north-western Africa down to Togaland, being particularly prominent where flint was scarce. The result of this must, then, be

that the butt-necked axe type had a world-wide extension and must have appeared autochthonously in many various regions. This prick-cutting is used in later types of rock axes."

„Brogger's so-called axes of the Scandinavian types are in the North generally considered to begin with the point-necked axe type that inaugurates the younger stone age. He says that it may be accepted that this type is partly evolved from the butt-necked type and partly evolved under a distinct influence of the Danish-Swedish point-necked axe of flint, but this evolution is hardly independent in Norway. In Central Europe, however, not few rock-axes of point-necked type occur, reminding in many traits of the Norwegian type." According to my views one might here ask: is the point-necked type of rock axes already used in Scandinavia before the Ice Age and then introduced to Central Europe by the retreating Scandinavian people, or is this type evolved in Central Europe during the glaciation and brought to Scandinavia by this ancient people when they returned to their old homes after the close of the glaciation? In Upplands stenålder Gunnar Ekholm says „that about 260 round axes of rock („Trindyxan") occurred in Uppland, of which the oldest form is the axe with almost circular diameter and butt-necked, however, not found in the dwelling-sites of Uppland; younger is the axe with round and broad-oval diameter and pointed neck, of which one is found at Kvarsebo, Bråviken, in Östergötland in the upper (younger) stratum; and youngest is the axe with compressed elliptic diameter, the sides (margins) often ground flat, and broad-necked. These 2 last types occur in Uppland side by side in the beginning period of the giants's chambers." I have only[1] found this one indication of the presence of this second point-necked form in a probably preglacial dwelling-site, at Kvarsebo, Bråviken; if this is right, then the point-necked axe of rock may have been brought from Scandinavia to Central Europe, but it is at least very dubious. The only thing I can say with some probability is that the butt-necked round axe may already in late preglacial times have had the neck (butt-end) formed in another shape, more or less accidentally perhaps. Brøgger has 2 sections of this point-necked rock axe: one short elliptic, nearly circular (fig. 1 and 2) and the other long elliptic with a roundish, somewhat compressed section (fig. 3—6). It may, however, appear more reasonable to consider the point-necked rock axe of Central Europe as late glacial or early postglacial and afterwards brought to the North.

[1] Also in the palæolithic finds at Vespestad, Bømmelo, Norway and at Viste in Jæderen some point-necked rock axes are found, as mentioned there.

Gustafson has with some probability objected against any preglacial occupancy of the North, because the evolution of the axe types is so intimately succeeding each other so that there can be no room for a between-lying Ice Age. But as explained in „Palæolithic Chronology," the Ice Age was but one and very brief, lasting only about 1,000 years or perhaps even less, the Ice Age being the period between the older and the younger kitchen middens of Denmark and corresponding, on the whole, to the reindeer epoch. The butt-necked round axe of rock occurred in the last part of the preglacial times. During the Ice Age Central Europe had probably but a scanty population, and in Italy and France the ancient people of the North had rather little use for rock implements; the Magdalenian period was yet palæolithic. In fact, there hardly was an actual break of continuity in the evolution of the Scandinavian people, as they were only removed to southern countries and after the glaciation again returned to their old homes; it was not a quite new race that took possession of the Scandinavian peninsula in the beginning neolithic period. Of course, an evolution occurred during their exile. I cannot accept this objection, but it may be true that the postglacial period of the North actually began with the point-necked axe type, if not one or more of the succeeding axe types were already in use about the same times.

„The succession of axes of Scandinavian types are at present considered in Norway to be:

1. The point-necked axe type. Of flint only 6, of which but one in Smaalenene is quite unground, while of rock in all 63, usually ground only at the edge and but a little upwards. The section is regularly elliptic in two variations of a short or long ellipse.

2. The broad-necked axe type. Of flint only 4 of a more badly working, one quite unground from Jarlsberg and one a preparatory work from Lister. Of rock 69, ground only at the edge except one ground all over as the material did not allow prick-cutting. The section is a somewhat compresed ellipse.

Tkese two types are probably contemporary.

3. The thin-necked axe type. First here the flint begins to be more common. Of flint 130, only 15 unground. Of rock 99, more often ground all over. The section is quadratic.

4. The thick-necked axe type. This type is more numerous than the preceding three ones. Of flint 169, seldom quite unground. Of rock 93, often ground only at the edge and often all over.

The evolution of the axes of rock without shafthole ends here.

5. The broad-edged axe type. In Norway found only wrought from flint, 119.

Accordingly, all types in Norway are also found in Sweden and Denmark. The types 4 and 5 and axes with shafthole have a larger extent, reaching farther into the heart of the country than the first three types, indicating a division at type 3."

According to the figures of the paper, all these axes seem to have the edge in the centre of the blade.

Some of these axes might have been preglacial, but it is not possible to determine the real age of single found axes. What has not yet been done, is to investigate the flint and specially the rock axes of southern Europe in the Magdalenian epoch, while the North was covered by Ice and the former people of the North lived in southern Europe. There an evolution must have occurred and in the postglacial epoch it was this same ancient palæolithic people who returned to their former homes of the North, more or less acquainted with the neolithic culture specially stock-keeping, but mostly still using palæolithic implements. As already mentioned, we find in western Norway some actually postglacial finds in caves and rock-shelters with remains of domesticated animals, while all the implements are, in fact, palæolithic and the flints not ground and polished. The first returning ancient people of the postglacial Danish Mounds used only ground flint implements, and might have come from Italy, where the neolithic race from Asia settled down already at the close of the glaciation. But in the first postglacial times the Scandinavian peninsula was only inhabited by the returning preglacial and palæolithic people, the tranchet people and probably also the people of the arctic culture; this returning people might have come from northern France and Belgium, since they only knew the neolithic stock-keeping, but not the grinding and polishing of the flint implements. Here the new neolithic race first arrived some time after the close of the glaciation. To investigate the evolution of the Scandinavian axe forms without a full knowledge of their evolution in southern Europe during the Ice Age, will not do. That would be a highly appreciative task for a young archæologist, but not before the preglacial palæolithic period of the North is actually acknowledged; it must not be forgotten that in the Scandinavian peninsula the ancient palæolithic implements were in use even in the first postglacial period.

In my archæological treatises I have tried to correct some of my former geological mistakes. In „Deviating Views on The Glacial Period“ p. 4 I have made a great mistake, which I first saw too late. James Geikie is quite right, there runs no current from Norway to Iceland. The old Norsemen, emigrating to Iceland, did not throw their „høisædestotter“ into the sea when they left Norway, but first after their arrival near the coast of Iceland to see where the drift-wood used to land.

However, after the Ice Age seeds were brought to Iceland from Norway by birds and storms. Besides, the glaciation lasted only 1,000 years or less, and it may be a question if not seeds in the soil underneath the glaciers still preserved their capacity to germ after the close of the glacial period. Hiss in his glaciation of the Alps mentions that he found the temperature of the soil underneath the present glaciers to be about + 4° C. If the story of the corn-seeds of the Egyptian mummies being yet in our days able to germ, is right or wrong, I have never been able to testify.