I.

DANISH KJÖKKENMÖDDINGS, THEIR FACTS AND INFERENCES. By ROBERT MUNRO, M.A., M.D., Kilmarnock.

Among the unrivalled collection of prehistoric remains now exhibited in the Royal Museum of Northern Antiquities at Copenhagen, there is one group which is of surpassing interest, on account of the thoroughness with which its varied contents have been forced to disclose the salient features in the social life of a bygone people, and that too at a period which must have been utterly beyond the pale of the most distant tradition. While a cursory glance at these remains greatly strengthens the belief that many more important phenomena of a similar character still remain to be discovered within the wide domain of prehistoric archæology, a more careful study of the way in which they have been handled by Danish savants supplies, not only a most interesting exposition of their methods of research, but also a convincing proof of the legitimacy of these methods as a means of extending our knowledge of the past phases of human civilisation. The prehistoric antiquities in this Museum are classified in eight rooms, according as they belong to the ages of Stone, Bronze, and Iron—a system of classification first propounded by M. Vedel Simonsen, and subsequently adopted by M. Thomsen, the real founder of the Museum, through whom, and the late venerable Professor Sven Nilsson, it soon became universally known. In the first, or outermost, of these rooms are located, in a series of glass cases, the objects to which I now invite attention. They consist of articles made of stone, bone, or horn, together with a few fragments of rude pottery, the whole of which, according to the present learned director of the Museum, Dr Worsaae, are the most ancient remains of human industry hitherto found in Denmark. These articles were collected from certain shell-mounds, long known to exist in various localities, and then supposed to have been ordinary raised beaches, because they were found scattered along the sea-coast, especially on the slopes and banks of the numerous fiords which now or formerly intersected the country. The discovery that

these supposed beaches were really artificial, and contained the remains of a prehistoric population and fauna, led the Royal Society of Sciences of Copenhagen to appoint a committee to make a special investigation of them. This committee, consisting of the late M. Forchhammer, Dr Worsäe, and Professor Steenstrup—three distinguished representatives of the respective sciences of geology, archæology and biology—was appointed as early as 1850, and continued its researches for many years afterwards. Scarcely had their examination commenced when it became apparent that these deposits were the culinary débris of villages of the Stone Age, the population of which fed largely on shellfish, chiefly the oyster, cockle, mussel, and periwinkle, and such animals as could be procured by hunting. Hence the origin of the name *Kjökkenmödding* (Kitchen midden) by which they are now generally known to science. Although, from the large number and careful arrangement of the objects in this collection,—a square portion of a natural section of the famous Kjökkenmödding at Meilgaard being here actually exhibited,—the best facilities are afforded for their study, I felt that a practical examination of one *in situ* could alone gratify my own curiosity. Upon representing my wishes to Dr Worsaae and M. Herbst, to whom I had already been indebted for much and varied information, they kindly instructed me how I could visit the celebrated shell-mound at Havelse, near Fredericksund. Accordingly, on the 6th July (1883), I visited this locality, and made several diggings in different parts of what now remains of the shell-heap. It was situated near the shore, on the land side slope of a narrow ridge which projected from the slightly elevated ground, and close to the embouchure of a small stream. Its whole area is now converted into arable land, so that its dimensions could only be estimated by the whitened appearance of the shells, which clearly marked out its site from the rest of the field. During my short visit I was fortunate in picking up several typical specimens of the flint implements so characteristic of these Kjökkenmöddings.

Although the Kjökkenmödding at Havelse is, as we have seen, now entirely demolished, it was formerly one of the most typical examples in the country, and proved extremely rich in organic and industrial remains. When first visited by Professor Steenstrup the shells were being removed

to serve as manure, but previous to that it appears to have been greatly undermined by workman in search of gravel for road metal, while during the subsequent researches of the committee of investigation it was traversed by numerous trenches. All these, however, were found, when visited by Sir John Lubbock in 1861, to have been completely filled in, so that a new trench had to be dug for his special benefit. Before the mound was interfered with, it formed, according to Engelhardt,[1] an irregular ring, several hundred yards in extent, with a breadth varying from 14 to 20 yards, and a depth of 39 inches, which, of course, tapered off to a few inches at the margin.

About one hundred and fifty of these shell-heaps are known in Denmark,[2] of which, up to 1869, over forty[3] had been examined by the committee specially appointed for their investigation. The final report of this committee[4] is still the principal source of information on the subject, although, within later years, one or two more have been discovered and partially investigated by the commissioners sent yearly from the Museum of Northern Antiquities to explore different parts of the country. The materials collected in this way have not, however, added any new information, nor in any way modified the results previously obtained. From the accompanying map on which the situation of the more important Kjökkenmöddings hitherto examined has been marked with blue crosses by Mr Kristian Bahnson, Attaché aux Musées Royaux d'Ethnographie et des Antiquities du Nord, it will be seen that they are mostly distributed along the shores of sheltered bays and inland fiords. Thus in Sealand all the examples are on the Isefiord, where we note no less than eleven, chiefly on its inland reaches. Fyen contains one or two in the neighbourhood of Svendburg, and one at the entrance to the Bay of Odense. On the small island of Samso there is one, while all the others are located in North Jutland—four being on the Limfiord, at considerable distances from each other, and nine on the beautiful Mariager fiord, grouped together about its middle third. The

[1] *Guide illustré du Musée des Antiquités du Nord*, p. 2.
[2] *Early Iron Age*, p. 2, Engelhardt.
[3] *Compte Rendu*, "International Cong. d'Anthro. et d'Arch," 4th Session, p. 135.
[4] *Undersögelser i Geologisk-Antiquarisk Retning.*

remaining three, Meilgaard, Fannerup, and Kaläevig, are situated within a peninsula formed by the sea and fiord of Randers, which embraces some of the finest wood and scenery in Jutland. In some instances the shell-heaps are found several miles inland, but in such cases there is good reason to believe that formerly the sea extended to these localities. The site of the one at Fannerup, now some ten miles from the sea, is on the border of a flat district, known even within historical times to have been an arm of the sea, which subsequently became a fresh water lake, but is now entirely dried up. Also the one at Gudumholm, near the entrance to the Limfiord, is presently separated from the sea by an extensive peat-moss which was formerly a bay or southern expansion of the now contracted fiord. On the other hand, none of the Kjökkenmöddings have been found along the coast of the open sea, a fact which is generally accounted for by the action of the waves in washing away the shore. On similar grounds, Sir John Lubbock thinks we are for ever deprived of all hope of finding prehistoric shell-mounds on the eastern and south-eastern shores of England, because the sea has so much encroached on the land that any such deposits, had they ever existed, would have been washed away long ere now.

As might be expected, the Kjökkenmöddings vary greatly in size and appearance. One of the largest and earliest explored is at Meilgaard, a veritable section of which is, as we have already observed, preserved in the Museum of Northern Antiquities. It is situated in a beautiful beech forest, called Aigholm Wood, between which and the sea are high dunes of drifting sand, through which the tops of the trees are sometimes seen protruding. Its distance from the sea—a little over two miles—may thus be partly accounted for by the accumulation of the sand on the sea-shore. The shell deposits occupy an oblong area measuring about 340 feet in length, 120 in breadth, and a maximum depth of 10 feet. Sir John Lubbock, who visited the district in 1863, and had an opportunity of examining a fresh section of the mound, writes thus :—

"In the middle, this Kjökkenmödding has a thickness of about 10 feet, from which, however, it slopes away in all directions; round the principal mound are several smaller ones of the same nature. Over the shells a thin layer of mould has formed itself, on which trees grow. A good section of such a

Kjökkenmödding can hardly fail to strike with astonishment any one who sees it for the first time, and it is difficult to convey in words an exact idea of the appearance which it presents. The whole thickness consists of shells, oysters being at Meilgaard by far the most numerous, with here and there a few bones, and still more rarely stone implements or fragments of pottery. Excepting just at the top and bottom, the mass is quite unmixed with sand and gravel; and, in fact, contains *nothing* but what has been in some way or other subservient to the use of man. The only exceptions which I could see were a few, very few, rough flint pebbles, which were probably dredged up with the oysters."—*Prehistoric Times*, p. 232.

Organic Remains.—In course of the elaborate explorations conducted by the learned committee, the following animals were identified as having their remains more or less represented:—

1. *Shellfish.*—Oyster, cockle, and mussel (most common), *Venus palustra*, *V. aurea*, *Trigonella plana*, *Nassa reticulata*, and *Littorina littorea* (most common of their kind), *Littorina obtusata*, *Buccinum undatum*, *Helix strigella*, *H. nemoralis*, and *Carocolla lapicida*.

2. *Fish.*—Herring, cod (*Gadus callarias* and *æglefinus*), eel, and flounder or dab.

3. *Birds.*—Eagle, cormorant, mew, wild duck and goose (most common), swan (*Cygnus olor et musicus*), capercailzie (*Tetrao urogallus*), and great auk (*Alca impennis*).

4. *Mammalia.*—Stag, roedeer, and wild boar (most common), urus (*Bos primigenius*), dog, fox, wolf, marten (*Mustela martes et foina*), hedgehog, otter, seal, porpoise, water-rat, mouse, beaver, wild cat, lynx, and bear (*Ursus arctos*).

5. *Vegetable Remains.*—Except ashes and charcoal, the latter of which on being analysed was found to belong mostly to a species of pine, and the charred remains of some kind of sea plant, no other products of the vegetable kingdom were found in any of the Kjökkenmöddings.

From the above list it will be observed that, except in the solitary instance of the dog, the ordinary domestic animals, as the common barn fowl, domestic ox, horse, sheep, goat, and domestic hog, are unrepresented. In addition, we have also to note the absence of the mammoth and all the other extinct or emigrated mammalia of the Palæolithic period, including the reindeer, bison, moosedeer (*Cervus alces*), musk ox, and hare.

It was remarked that these shells were full grown, and belonged to edible species which are not usually found living under the same natural conditions; moreover, they were not water-worn nor mixed up with sand. Hence their combination in the shell-heaps, independent of any other evidence, could only be accounted for on the supposition that they were transported thither by human agency. This inference was amply justified by the other organic remains and industrial implements with which they were associated. The remains of fish, especially their vertebral bones, and of birds, were very abundant in all the Kjökkenmöddings. Among the latter several species of ducks and geese were most numerous. Of special interest among the birds are the great auk and capercailzie, both of which are no longer inhabitants of the country, nor indeed even casual visitors to it. The former now, I believe, entirely extinct in Europe, though found both in Jutland and Sealand, was upon the whole rare; but the latter appears to have been frequently met with, not only in the débris of the Kjökkenmöddings, but also in the peat-mosses.

Among the many valuable observations made by Professor Steenstrup upon the organic débris, perhaps the most interesting are those suggested by the condition and character of the osseous remains. Thus all the long bones, and such as contained marrow, belonging to the stag, roe, and pig, three species whose remains immensely preponderated over all others, were systematically broken and split up, supposed to be to facilitate the extraction of the marrow. That they were so treated by the hand of man was convincingly proved by the frequent detection of the conchoidal indentations left on the spot where the blow had been struck. Moreover, as a striking contrast to the bones of the ruminants, it was observed that the long bones of birds, the shafts of which alone were found in the Kjökkenmöddings, were not at all broken, a phenomenon which he attributed to the fact that these bones in birds do not contain marrow. Again, all the bones, whether broken or not, were characterised by having their cartilaginous heads and other cartilaginous and spongy portions, more or less gnawed by some kind of carnivorous animal, whose teeth-marks in many instances were still visible, so that there remained only the harder and non-nutritious portions. Professor

Steenstrup was so much struck with the uniformity with which the identical portions of the same bones always turned up in the different excavations, that he had no hesitation in ascribing the absence of the softer parts to the agency of dogs, whose presence in greater numbers than any other carnivora had already been established by the relatively much larger proportion in which their remains were represented. That the disappearance of the soft and juicy portions of the bones was not due to any casual visitors to the refuse heaps was inferred from the fact that the bones, through the entire mass of Kjökkenmöddings, were similarly treated. These animals must therefore have been constant companions of the people during all their feasts, and hence the inference that they were a breed of domestic dogs. Professor Steenstrup further strengthened this important deduction by proving experimentally that when dogs have free access to the bones of mammals and birds, the portions left by them are precisely those found in the Kjökkenmöddings.[1]

But the most unequivocal evidence that the Kjökkenmöddings were of human origin, and the abode of a primitive people, was the large assortment of worked objects collected from their débris. These are extemely simple, and the only materials used in their manufacture were stone, bone, or horn. Flint being abundantly found in Denmark, was mostly used for such cutting instruments as were required, hence worked flints are not only frequently met with, but are greatly in excess of all other relics. They consist of roughly chipped hatchets, flakes or knives, scrapers, coarse nuclei, and some angularly chipped flints called "*flint kunder*," which have sometimes gone under the name of slingstones. The so-called hatchets are generally of small size, seldom exceeding 4 or 5 inches in length, often triangularly shaped, and sufficiently peculiar in

[1] For diagram of skeletons showing the missing portions supposed to be eaten by dogs, and the bones broken by man for their marrow, see plates vii. and viii. *Compte Rendu de Congress inter. d'Anthrop. et d'Arch. Prehist.* 4th Section. One of the diagrams on plate viii. is copied from Flouren's work *Sur le developpement des Os et des Dents,* and shows how closely the portions of the bones left by the dogs correspond with those that become first ossified in the young animal. Also compare article by Steenstrup on "Comparaisons entre les ossements des cavernes de la Belgique et les ossements des Kjökkenmöddings du Danemark, du Groenland, et de la Laponie." *Ibid.*, 6th Session, p. 199, plates lxxvi., lxxvii., and lxxviii.

type to be at once recognised. Similar implements have not been found elsewhere in Denmark except in one or two places near the sea-shore, hence called "coast finds," as on the island of Magleo and at Korsor, where a large number of them was collected. According to Oscar Montellius, weapons similar to the Kjökkenmödding hatchets have also been found in the province of Scänii, in the extreme south of Sweden.[1] Flint flakes are extremely common, some of which are well made, and display a thorough knowledge of the art of flaking. Many of these were 5 or 6 inches long, and showed three or four facets, others appeared to have been used as scrapers. A few hammer stones and slingstones (*flint kunder*) were everywhere met with, though not in such quantities as the flakes. Polished stone celts were so extremely rare that they can scarcely be said to belong to the Kjökkenmöddings. Two of these were found in the Kjökkenmödding at Sölager on the occasion of the visit to it of the members of the Prehistoric Congress, and two previously. According to Professor Steenstrup, they were made of a kind of *diorite*, and similar in form to analogous objects from the polished Stone Period. At Havelse a scraper was found (No. 12,020 in the Museum), which there can be no doubt had been manufactured out of a broken portion of a polished stone celt. Among other articles in the collection I noticed a polished celt, a worked dagger, and portion of a human jaw; but these, I learned afterwards, were found on the surface of a shallow Kjökkenmödding at Havnö on the Mariagerfiord.

The Kjökkenmödding at Meilgaard rewarded the explorers with a most interesting and varied collection of objects, among which, in addition to the usual types of flint implements, were the following:—

1. *Combs.*—Three small combs made of bone, with short handles and long teeth. One is 4 inches long, including the handle, which terminates in a flattened knob, and when perfect contained eight teeth. The others are about $2\frac{1}{2}$ inches in length, and have only four teeth. One of them, instead of having a rounded handle, ends in a triangularly shaped projection, the tip of which is perforated by a small hole as if for suspension. These are not unlike the long-handled combs found in the north of Scotland, among the Eskimos and elsewhere, and supposed to have been used for the weaving of cloth.

[1] *La Swéde Préhistorique*, p. 8.

2. *Staghorn Implements.*—Stout portions of stag's horn, some of which were perforated with a round hole as if for a handle, appeared to have been used as hammers or hatchets.

3. *Bone Implements.*—These are pointed objects, mostly of a rude character, which might have been used as needles, pins, bodkins, &c.

4. *Pottery.*—Pottery appears to have been upon the whole a scarce production, although a few rude fragments, made by mixing rough sand and gravel with the paste, were among the articles collected at Meilgaard.

Finally, indications of hearths, consisting of round stones of granite or sandstone showing marks of fire, and associated with ashes and charcoal, were occasionally encountered not only in several places, but at various depths in the débris.

In none of the Kjökkenmöddings examined were the slightest traces of broze or iron found.

Such is a brief summary of the facts derived from the collective investigation of the Danish Kjökkenmöddings. But, in the hands of Danish archæologists, who had already constructed a veritable science from the archaic fragments of their country, and who were now as proficient in interpreting antiquities as they were formerly dilligent in collecting them, it was not likely that these novel materials would lie dormant without an effort being made to render them subservient to the further elucidation of the new science of prehistoric archæology. The manner in which this has been done involves a discussion of such questions as when, why, and how, the inhabitants of the Kjökkenmöddings lived? and hence it could scarcely be expected that perfect unanimity would characterise the opinions of a committee who had often to invoke the aid of an extensive and minute knowledge of the collateral sciences of biology and geology.

First of all, it had to be decided whether these people were simple nomads, who visited the fishing and hunting grounds only at certain seasons? or whether they were a permanently settled population in the country? The latter alternative was answered in the affirmative on the following grounds:—

1. The presence in the refuse heaps of the bones of migratory birds. Thus, the wild swan (*Cygnus musicus*), whose remains were very common, visits Denmark only in the winter time, from November till March,

hence the Kjökkenmöddings could not have been mere summer quarters.

2. The mammalia remains indicate that the animals were killed in various stages of development, and since these stages always correspond with different but definite seasons, it was inferred that the people must have occupied the country during the whole year. Thus the shedding and reproduction of stag's antlers are as invariable as the seasons. Again, the characters of the teeth of young animals, especially those of the pig, and other phenomena in the development of animals, indicate equally fixed periods of the year. From the consideration of these and similar anatomical and zoological phenomena, Professor Steenstrup (than whom there could not be a more competent authority) concluded that the people of the Kjökkenmöddings were permanent dwellers in the localities where the shell-heaps are now found.

As to the antiquity of the Kjökkenmöddings, besides the negative evidence afforded by the entire absence of any of the metals, and the great prevalence of flint implements, which clearly prove that they were not later than the Stone Age, further evidence has been adduced from a variety of considerations which is supposed not only to strengthen their claim to this antiquity, but even to fix their development, in point of time, to a more limited range in the early Stone Period. But the effort to assign their development to a particular portion of the Stone Age has hitherto failed to produce unanimity of opinion among the Danish antiquaries. The opinion formulated by Dr Steenstrup was, that the Kjökkenmöddings were contemporaneous with the dolmens, giant chambers, and other megalithic monuments of the country, and that all these remains might have been due to the same individuals. In opposition to this view, the eminent antiquary, Dr Worsaae, contends that the Kjökkenmöddings, on the one hand, and the dolmens, with their highly polished and skilfully wrought implements, on the other, were the products of two distinct epochs, the former being the most ancient remains of the Stone Age in Scandinavia; whereas the latter represented its final and most cultured stage, which even overlapped into the succeeding Age of Bronze.