

dislocation sunk into the Archæan limestone and from its great resemblance to the Olenellus-sandstone of the Bothnian Gulf, especially the variety (*a*) (Bull. geol. Inst. Upsala, N:o I. Vol. I, page 68) the most natural thing was to suppose it to be Cambrian. It is not bituminous but contains round lumps of yellow or green clay of varying size.

3. Herr RUTGER SERNANDER discussed G. DE GEER's paper »On pleistocene changes of level in eastern North-America» (Proceed. of Boston Soc. Natural History, 1892).

In conjunction therewith Herr MUNTHE pointed out among other things the existing agreement between the opinion come to by N. S. SCHALER in 1874 and cited by DE GEER on the nature of the continental changes of level and his own, arrived at without knowledge of SCHALER's paper (MUNTHE: Bih. K. Vet. Akad. Handl., Bd. 18, 1892). Then a discussion arose between Hrr A. HAMBERG, MUNTHE and SERNANDER about the probable causes of glaciation.

4. Herr HENR. MUNTHE showed specimens of fossil oak, found in layer of peat under Litorina-deposits at Qvinnegårda in the parish of Hafdhem in the south of Gotland (cf. G. F. F. Bd. 15 (Stockholm 1893) page 124.)

Meeting on Feb. 27th, 1893.

1. Herr AXEL HAMBERG reported on observations made last summer of the glaciers in Spitzbergen and showed also numerous scioptic images (cf. also G. F. F. Bd. 15 (1893) page 73).

2. Herr JOH. GUNNAR ANDERSSON spoke on Barrande's theory of colonies with especial reference to J. JAHN's paper: »Beiträge zur Stratigraphie und Tektonik der mittelböhmischen Silurformation» (Jahrb. d. K. K. geol. Reichsanst., 1892, H. 2.).

Meeting on March 13th, 1893.

1. Herr CARL WIMAN read a paper on *Diplograptidæ* LAPW., published in this number of the Bulletin.

2. Herr HENR. MUNTHE spoke about the prospects of arriving at a more satisfactory determination of epochs in the Stoneage, seeking to illustrate the relationship existing between some of the discoveries in question and the changes of level in Scandinavia. Starting from the extent of elevation of the land at present reached in north Sweden, we get for a »Kjökkenmödding», found in the south of Gotland and consisting for the most part of fishbones, an age of about 10,000 years, which most probably falls in with the maximum sinking of the Litorina-time. — Very much older are on the other hand the flint imple-

ments, which SVEN NILSSON found *under* the peat-layer in the south of Skåne over which comes the so-called »Gäravallen» belonging to the Litorina-time, for this shows that people of the Stoneage were living here at the beginning of the Ancyclus-time; and the latter, judging from several circumstances, must have been of tolerably considerable length.

In connection with this MUNTHE gave an account of a vertical section taken at »Boserup skov» N. W. of Roskilde (Zealand) indicating, that the postglacial marine limit was probably reached after the people of the Stoneage had immigrated to the district. Most likely future research will reveal the existence of »Kjökkenmöddings» belonging to the Ancyclus-time at the bottom of the sea, for instance in the south part of Kattegat.

3. Herr HAMPUS VON POST lectured on »The formation of peat-mosses» with especial reference to the theories of A. BLYTT and his last work: »Om de fytogeografiske og fytopalæontologiske grunde forat antage klimavexlinger under kvartærtiden» (Christiania Vidensk. Selsk. Forhandl. for 1893, N:o 5).

The researches of VON POST were begun in the forties and continued during the fifties and sixties especially by means of the cultivation of peat-mosses in one district in Östergötland that is situated about 200—400 feet above the sea. On a smaller scale researches had been carried out in low-lying parts of Nerike, Södermanland, Westmanland and Upland, and in the years 1845—46 at a higher level up to 3 000—4 000 feet above the sea in Westmanland and Dalarna. Further information had since then been collected during travels in Småland, Östergötland and Wermland.

The results of these researches might be summed up in a few words as follows:

— Most peat-mosses have, to begin with, been lakebasins of greater or less depth, in which there have been deposited clay, mud and calcareous tufa, which formations according to the evidence offered by the diatoms can be looked upon as bottom-sediments of more or less muddy water, resembling that of many of our present lakes.

— The most important part of the strata of the peat-mosses, that is the brown earth, in Swedish called »dy», has been formed by precipitation from brown water containing huminic substances quite analogous to the brown water of the present rivers and to the bogs with their vegetation of *Potamogeton*, *Myriophyllum*, *Nymphaea* etc. This brown water arises on land from the dissolving functions of vegetable matter, which is of an alkali nature from the first and dissolves huminic substances, which are heaped on the surface of the ground. By heavy rain finally these brown solutions are brought down to the

lakes, and the supply of huminic substances in the lakes depends on the quantity of surface soil in the environs of the lakes as does the shade (darker or paler) of brown colour of the water.

— If spring-water however is brought to these lakes, which usually contains salts of lime, ferric protoxide or alumine, the huminic salts, that are more or less hard to dissolve, are precipitated in them, and these very precipitations are the origin of those brown layers or the so-called »dy» or »dy-jord». In the precipitation small organisms floating in the water, such as algæ (diatoms etc.), fragments of molluscs, water-insects etc. and excrements of these and other animals are involved.

That the above process is the true one may be proved by putting some drops of a solution containing lime-, ferric protoxide- or aluminesalts to a quantity (one or two litres) of such brown water. The »dy» then always contains a greater or smaller amount of these bases even when they have been partly removed by later displacements and solutions.

That this is the case is proved for instance by spring-floods from existing peat-basins, which now are rich in lime-, now in ferric protoxide- and occasionally in alumine-salts. The most essential part of the brown peat-moss, the »dy», thus has its origin from land and no actual mouldering or formation of brown substance *under the water* takes place, as is usually maintained by most authors, who have written on this subject. If there is then no covering of soil on the landsurface, the water in the adjoining lake will remain clear, as is the case on great plains or in woodless districts.

Formations of »dy» and peat or re-formations of such layers therefore never occur in those places, where the woodvegetation is wanting.

When the »dy» is to be found in great quantities in the peat-layers, there must have been formerly plenty of brown water. If the brown water occurs in only small quantities, a little »dy»-material may nevertheless be found, but for the most part only remains of plants, only slightly coloured and only partially decomposed (in Sweden called »äfja»), or strictly speaking only peat-materials consisting of fragments of water-plants, mollusca, insect-larvæ etc.

One also can determine from the nature of the layers, if there has been leaves-wood (birch, alder, willow etc.) in those peat-basins or in the surroundings, for in these cases the vegetation on the shores consists of *Hypna* with very little *Sphagna*, or, generally speaking, such kinds of vegetation as form even now the leaves-wood-mosses. If on the other hand the brown water comes from the fir-wood, there appears hardly anything but *Sphagna*,

Eriophoron vaginatum, some kind of sedge etc. as is the case now-a-days, and beyond that finally the *Sphagnum-stratum* is formed, beginning with the borders, and thus the formation of the »dy» is continued in one or another deep cavity of the basin. Such lakes as these with deep brown water in the middle, only round the shores covered by the *Sphagnum*-vegetation, are still to be found in our country in great number and are generally called »Skogskärnar». The peasantry often declare them to be »bottomless» because even with very long stakes neither sand- nor clay-deposits at the bottom are reached.

In the middle of Sweden one finds above the »dy»-layer (with *Nymphaea* etc.) two well separated layers, one lower with stumps and stocks of *leaves-trees* and one upper consisting of *fir*. In the lower one, which is mingled with »dy», there is found *birch*, *alder* etc. and other plants of the leaves-tree-vegetation, *Hypnum*, and so on. It is probably this layer, that sometimes contains *oak*, but it is uncertain, if this layer of oak-wood in the middle of Sweden, where in former days the peat was very seldom used for the purpose of thatching, preceded, or was contemporary with the layer of birch-wood.

Hazel-nuts and acorn-cups were found though seldom at a great depth near the edges of the peat-mosses, but it might be supposed, these were brought hither by an accidental flood-erosion. On the other hand they seem never to be found at the bottom of the »dy»-layer.

Oak, *birch* and *alder* appear, judging by the stumps most often found in the neighbourhood, to have grown only round the edges of the »dy»-lakes, where there was formerly firm ground, and not on the whole surface of the peat-moss. Trunks of oak and birch very often are found lying in such a way, that the thin ends face away from the edges, where only the stumps can be found, though they are now quite severed and indistinct. It is clear, that an important raising of the level of the water was the cause of destruction of the leaves-wood, confirmed by the fact, that these remains are covered by a quantity of »dy» of varying depth, sometimes as much as a foot or more.

On the top of this layer of leaves-wood and the one above it of »dy», the *Sphagnum*-vegetation appears to have shown itself more and more, and in it (but only on firm ground round the edges, 1—3 feet below the surface) fir-trunks are found with a diameter of 1½—2 feet, standing erect or nearly so and fairly equally distributed. They were never found in places, where the moss-layer is of greater depth, or where firm ground lies a long way below the surface. Thus the roots have not floated hither nor did they grow on the surface of the *Sphagnum*-strata.

Whether smaller stumps (for instance those only a few inches in diameter,

which even now may be found on the surface of the peat-bogs) occur in the moss-layers, can not be settled from lack of observations, but it is quite certain that no large fir-stumps are met with in the deeper Sphagnumlayer.

Very often one could find fir-stumps in several layers, or rather standing the one over the other in such a way, that the roots of the upper ones overlapped the lower ones, always surrounded by »dy»-peat and parts of Sphagnum. Stumps and trunks of leaves-trees always form a layer, lower and older.

The lecturer could at that time (1840—50) think of no other explanation of these circumstances than that they caused the level of the water to rise whereby the woodvegetation that had formed itself round the edges of the peat-basins, had from time to time been killed through inundation. Only on those peat-mosses, where firm ground was met at a depth of 3—5 feet, were stumps found distributed over the greater part of them.

The rising in the water's level in these peat-basins the lecturer considered at that time to proceed from the following reason (familiar to him as a farmer from his youth): the outflow from the sheet of water may from time to time get shallow or its bank fall in, so that the farmer after a few years has to drain it or take away a part of the bar formed at the mouth of it to prevent the water rising and overflowing the surrounding low-lying ground. Where the outflows are not deepened from time to time, the level of the water in small lakes and marshy ground will continue to rise, and thus it may, by natural causes swamp and kill the wood at the sides of the lakes etc.

The more abundant the rain is any year, the quicker such a rise.

Such a rise must have been still quicker directly after the glacial period, when the ground was not yet covered with vegetation, that could to any great extent prevent gravel and sand drifting down. The rise of water therefore has, at least as regards most of the peat-basins, probably been caused by the extension of the bar of the outflow and not by periods of abundant rain, although of course much rain during certain years or spaces of time has caused an occasional sudden rising. Exact observations and research on a small forest-lake (Bårsjön, near the Reijmyra glassworks in Östergötland) confirmed this. This lake, a few Swedish acres in area, is entirely surrounded by forestland. It had no visible outflow and the overflow of water spread instead over the low mossy forest ground. The surface of the water showed itself to be and to have been continually rising. The shores all round were covered with formations of peat-mosses, which at both ends of the lake were of greater width, but at the sides were covered by fir-wood right up to the steeply sloping

shore, from which the firs from time to time had fallen down into the water, with the tops downwards. Stumps of dead trees then forming a number of knolls lie along the water's edge, now quite overgrown by moss; but even far below the surface of the water such stumps can easily be found.

Similar lakes have been observed in several places in this country among others a typical one at the foot of the well-known »Hyckjeberg», near the Dalecarlia porphyry works, where standing on the hilltop, one can see an immense number of tree-trunks lying in the deep water below.

Not until after the arrival of man in Scandinavia does a diminution of water appear to have taken place in some parts of the country. This rests on traditions of boat-routes no longer practicable and tracts previously under water become dry, in cases where definite information of transformation is not forthcoming. This has however in many cases undoubtedly been caused by the draining of the outflows and is not a consequence of the existence of drier periods nor of local elevations of the surface of the ground. Where for instance boat-routes existed before or during the time of the Vikings, there is now dry ground consisting of fine cultivated fields (e. g. Upsala-plain). That man has done this, one must conclude from local evidence confirmed by tradition and history.

In those places where man has had no motives for interfering, our lakes and peat-basins still have a level that is rising or at least not decreasing, judging by recent observations and evidence. In general it may be observed that here too the actual peat-mosses are drier than they were long ago; but in our country this probably depends rather upon the diminution in the extent of the woods and other influences of the spread of cultivation, than on any other more general cause, as for instance the changes of the climate.

(Further particulars on the origin of the peat- und »dy»-strata and that of the humus are best found in the two following treatises by the lecturer:

1. »Studier öfver nutidens koprogena bildningar», in K. Vet.-Akad. Handlingar, Bd. 4, Stockholm 1861.

2. »Undersökning af gyttja, dy, torf och mylla samt deras hufvudbeståndsdelar», in Öfvers. af K. Vet.-Akad. Handl., årg. 19, Stockholm 1860.)

In connection with the lecture just delivered Herr J. G. ANDERSSON referred to the alternation of peat and calcareous tufa, mentioned by BLYTT and SERNANDER, and considered by them very good evidence of drier and moister periods.

Herr VON POST and MUNTHE were of opinion, that those alternations probably need not necessarily prove similar changes of climate, but thought,

they might be explained by local circumstances. MUNTHE referred to the alternation of peat and calcareous tufa at Mølner in the parish of Klinte in Gotland, described by WESTERBERG (in *Geol. Fören. Förhandl.*, Bd. 9, Stockholm 1887). It might be, that the highest *Litorina*-wall situated here, has dammed up the spring-water and by this damming may have indirectly caused the formation of the upper part of the calcareous tufa-layer, that lies above the peat.

Meeting on April 3rd, 1893.

1. Herr OTTO NORDENSKJÖLD lectured on Melaphyrs in Dalecarlia and exhibited numerous specimens (cf. an essay in this number of the Bulletin: »Ueber basische Ergussgesteine aus dem Elfdalener Porphyrgebiet»).

2. Herr NORDENSKJÖLD furthermore reported on the existence of diamonds in meteorites and spoke also on MOISSAU's synthesis of the same mineral.

3. Herr CARL WIMAN discussed TÖRNQVIST's paper »Observations on the structure of some Diprionidæ» (*Lunds Universitets årsskrift*, XXIX).

4. Herr JOH. GUNNAR ANDERSSON reviewed HENRI LASNE: *Sur les terrains phosphatés des environs de Doullens etc.* (*Bull. Soc. géolog. de France*, T. XX, 1892).

5. Herr RUTGER SERNANDER read a paper on »The climate and vegetation of the Litorina-period», (published later in *G. F. F.*, Bd. 15, 1893, pag. 345).

In discussion that followed Herr MUNTHE mentioned among other things that he claimed priority of discovery both in regard to the dip of the highest coast-line of the Ancylus-sea in Gotland, and to the localities of peat etc. under Ancylus-gravel at Tomtemyr in the parish of Tofta in the same island. Information on these subjects given to SERNANDER had not been intended for publication by him.

Meeting on April 17th, 1893.

1. Herr HENR. MUNTHE spoke about his »biological and chemical examination of specimens from the bottom of the Baltic sea and Kattegat», collected during the Swedish hydrographical expedition in the year 1877. A paper on this subject will appear in one of the publications of the Royal Academy of Sciences (Stockholm).

2. Herr JOH. GUNNAR ANDERSSON reviewed F. A. MATTHEW's paper on »The diffusion and sequence of the Cambrian Faunas» (*Trans. Roy. Soc., Canada*, Sec. IV, 1892).

Meeting on May 15th, 1893.

1. Herr JOH. GUNNAR ANDERSSON spoke about an undersilurian conglomerate block from Öland (An account of his researches will be inserted in the next number of the Bulletin).

2. Herr AXEL HAMBERG showed Manganite, Vanadinite and Barite from Böhlet in Westgothland. There Manganite was wrongly considered as Pyrolusite.

Commenting on this communication Herr VON POST said, he had used for many years manganesian minerals from Böhlet for practical purposes and had found only Manganite.

3. Herr G. HELLSING showed a block of ball-granite, found by him at Balungsstrand in the parish of Enviken in Dalecarlia.

Meeting on Sept. 18th, 1893.

1. Officers were appointed for the term; namely,

OTTO NORDENSKJÖLD, Secretary.

{ OTTO HELLBOM, Reporter.

{ JOH. GUNNAR ANDERSSON, Reporter.

Meeting on Oct. 2nd, 1893.

1. Herr HENR. MUNTHE reviewed R. SIEGER: »Niveauperänderungen an Skandinavischen Seen und Küsten» (Verhandl. d. IX. d. Geographentages in Wien, 1891).

2. Herr GUST. FLINK communicated some notes on *the Occurrence of Minerals in Iceland*, made on two visits to the island (1883 and 1893). In the former year in rather more than 3 months he travelled round almost the whole of the island; in the latter, on the other hand, he stayed in the east part of the island, where the most important occurrences of minerals are to be found. The lecture began with a topographical and geological survey of the island.

Iceland consists, for the most part, of a basalt plateau, which rises to about 1000 metres above the sea-level, and is tertiary in age. The basalt beds, that as a rule have maintained their horizontal situation, but in many places show a very considerable dip alternate with strata of tuffs which here and there contain carbonized trunks of trees, so-called »Surtur brand». Acid eruptive rocks, Liparites for instance, occur in the form of massive rocks and bosses, but play a very subordinate part in the Icelandic mountain-system. A considerable part of the island consists however of younger formations, such as the Palagonite-tuff and more recent lavas, and with these formations the present volcanic activity is connected.

In respect to mineralogy Iceland is rather a uniform territory, since besides the rock-forming minerals scarcely any thing beyond Zeolites and Calcite is to be found there. As to the formation of the Iceland spar various opinions have been held. The lecturer tried to prove, partly from his own observations, that the doubly refracting spar (as also the Zeolites) must have formerly in amygdaloidal cavities been crystallized out of water-solutions (it may be under high pressure and at high temperature) derived from the dissolving of the components of the percolated basaltic rocks. The famous Iceland spar mine at Helgustadir has since 1871 been in the hands of the Icelandic government. No breakage of spar to speak of has taken place there since that time. Probably rich stores exist still of this uncommon mineral in depths of mine.

Zeolites occur in such excellent specimens nowhere but in Iceland, and the chief locality is in the neighbourhood of Theigarhorn farm near the Berufjord on the east coast of the island. Here are to be found principally: Stilbite, Epistilbite, Desmine and Skolecite. Stilbite and Desmine are the commonest. Some time ago Epistilbite was considered a very rare mineral, since it was scarcely found anywhere else than at Theigarhorn, and even there rather sparsely. But on his first journey in Iceland the lecturer found near the church of Berufjord at a distance of 30 kilometres from Theigarhorn a new locality, which since then has yielded considerable quantities of Epistilbite. Skolecite has most likely not been found anywhere else in Iceland than at Theigarhorn. But there the mineral is not exactly scarce. Most magnificent samples of this mineral may be dug out from the mouldered basalt rocks. But the mineral is so brittle, that it cannot be packed up and carried in the usual manner, and therefore very few specimens are to be seen in mineralogical collections. The three minerals Skolecite, Mesolite and Natrolite, formerly all called Mesotype being very nearly allied to each other, do not probably occur anywhere together. At Theigarhorn only one of these three minerals, namely the Skolecite, has been found. At Faskrudsford, north of Berufjord, the lecturer on his second journey was the first to find Mesolite in abundant quantities, but no Skolecite.

Among the rhombohedral Zeolites: Chabazite (Phakolite), Levyne and Gmelinite, the first mentioned is most frequent in Iceland, and it occurs almost everywhere, but always in inconsiderable quantities. The variety Phakolite was found by the lecturer in 1883 at Thorodstadir in Nordland, and in 1893 near the Faskrudsford. In this fjord, which until that year probably no Mineralogist had visited, one finds also the Levyne, the Epistilbite and the Analcime, the latter mineral in extremely fine druses. Levyne is not found largely in Iceland. Certainly it has been found there but only at Vidimyri near the Skagafjord

(in 1883), and now (1893) near the Faskrudsford. Of Epistilbite but one specimen was found in the last-named place. The Gmelinite occurred rather abundantly in a much transformed basaltbed close by the trading-station Eskifjord. The crystals were small and compactly agglomerated and had the light flesh-colour, that is so usual in this mineral.

The lecture was illustrated by a numerous and fine collection of specimens.

Meeting on Oct. 16th, 1893.

1. Herr CARL WIMAN read a paper on *Monograptus*, displaying several preparations and figures. (The essential part of his paper is reproduced in »Ueber Monograptus GEINITZ», published in this number of the Bulletin).

2. Herr JOH. GUNNAR ANDERSSON reviewed E. KALKOWSKY: »Ueber Geröll-Thonschiefer glacialen Ursprungs im Kulm des Frankenwaldes» (Zeits. d. deuts. geolog. Gesells., Bd. XLV, 1893).

3. Herr OTTO NORDENSKJÖLD discussed J. SEDERHOLM's paper »Om bärggrunden i södra Finland» (Fennia, 8, 1893).

Meeting on Oct. 30th, 1893.

1. Herr HENR. MUNTHE spoke about the so-called »Undre grålera». (vid. report of following meeting).

2. Herr JOH. GUNNAR ANDERSSON spoke »Ueber Blöcke aus dem jüngeren Untersilur auf der Insel Öland vorkommend», published in Öfvers. K. Vetenskaps-Akademiens Förhandl. Stockholm 1893, N:o 8.

Meeting on Nov. 18th, 1893.

1. Herr HENR. MUNTHE gave some further communications on the lower grey clay. (The major part of his remarks is given in his paper: »Über die sogenannte 'Undre grålera' und einige darin gefundene Fossilien», in this number of the Bulletin).

2. Herr CARL WIMAN spoke about the inner structure of *Climacograptus*.

3. Herr OTTO NORDENSKJÖLD discussed F. ZIRKEL: Lehrbuch der Petrographie, Theil I., with reference especially to the different nomenclatures of this author and Rosenbusch. Then a lengthy account of the present classification of the eruptive rocks in England, Germany and France in the course of which the lecturer gave his own opinions on this point (cf NORDENSKJÖLD: Ueber archaische Ergussgesteine aus Småland, in this number of the Bulletin).

Meeting on Dec. 9th, 1893.

1. Herr JOH. GUNNAR ANDERSSON gave an interesting lecture on geographical and scientific explorations in Greenland, from its first discovery by Eric Röde down to the epoch-making ice-expeditions of recent years.

2. Herr C. WIMAN showed some Silurian blocks from the Gulf of Bothnia.

In J. J. SEDERHOLM's paper »Om bärggrunden i södra Finland», Fennia, 8. 1893. N:o 3. p. 114, there occurs a statement that a probably upper silurian encrinite limestone has been discovered in Åland. A specimen of the block in question, which was kindly placed at the disposal of the lecturer, belonged to one of the encrinite limestone blocks mentioned in the descriptions of the map-plates of the Geological Survey of Finland¹, and proved to have an unmistakeable resemblance to the limestone blocks with *Leptæna Schmidtii* TQT found in Öland². It contained no other fossils except fragments of encrinites.

From Rosenbergs in the parish Finström in Åland the lecturer had brought with him a rather large limestone block containing several fossils, which however afforded no information as to the age of the block. This was also the case with the rather numerous occurring ostracods, that Herr J. GUNNAR ANDERSSON has kindly examined.

In spite of the negative results given by the fossils these blocks may with tolerable certainty be considered to have the same age as the *Leptæna Schmidtii*-limestones in Öland, that is the same age as the Lyckholmer and Borckholmer beds in the East Baltic silurian district.

It seems from this very probable that the so-called Baltic limestone does not reach higher than up to these strata.

The suspicion might arise that blocks in Öland too of that age come from the Bothnian Gulf, but that would be extremely unlikely, considering that only three discoveries in all have been made within the North-Baltic district, whereas these blocks within a certain district in Oland are so numerous that unlimited quantities of them could be collected.

¹ Map-plate Finström p. 38, BENJ. FROSTERUS. Map-plate Mariehamn p. 51. BENJ. FROSTERUS and J. J. SEDERHOLM.

² J. GUNNAR ANDERSSON: Ueber Blöcke aus dem jüngeren Untersilur auf der Insel Öland vorkommend. Öfersigt af Kongl. Vet. Akad. Förh. 1893. N:o 8.

