

enormous thickness found with scarcely a trace of any beds heaped up by marine life at this period, either in the American or European areas, as may be seen by reference to the table, show conclusively that an additional force must have been at work. In some places, also, the sediments were heaped up so rapidly that during a depression of several thousand feet the rate seems only to have kept pace with the accumulations, and shoal conditions continued to prevail during the whole time." Probably glacial phenomena were restricted at this time to the higher lands in the higher latitudes, but there was nothing in the prevailing climatal conditions, certainly in later Pre-Cambrian times, to prevent the phenomena being then, as now, natural to certain elevations. The abundance of life in the Cambrian seas is sufficient evidence of this.

We have, therefore, to carry the mind into far earlier epochs ere we can expect to recognize evidences of very different conditions to those which now prevail. At present we know of no indications of life in the Peibidian, or last Pre-Cambrian epoch, but as most of the strata of that period are of volcanic origin, this is not to be much wondered at. Again there were but small marine areas in the regions now accessible to us for examination.

That glacial phenomena did prevail, therefore, at so early a period seems tolerably clear, and moreover, "That it was a cold epoch is evident from the fact that the Pre-Cambrian continents occupied very extensive areas in the higher latitudes, and that they were traversed by mountainous ranges, attaining in some cases to great heights. At no time since, unless in the Glacial Period, does there seem to have been so much land in the higher latitudes, and it is, therefore, reasonable to suppose that in the earlier stages, at least, of the epoch (Cambrian) the climate was one of extreme cold."<sup>1</sup>

The conclusions which I think are to be derived from the foregoing are that volcanic action has diminished probably even since Palæozoic times, and certainly since pre-Cambrian times; but that glacial phenomena have prevailed since at least later pre-Cambrian times in proportion as the geographical changes have been favourable or otherwise.

### III.—THE MAMMOTH IN SIBERIA.

By HENRY H. HOWORTH, F.S.A.

IN a previous<sup>2</sup> paper we have considered some of the legends which are current among the Nomades of Siberia about the Mammoth, and which were the outcome of the curious fact that whole carcasses of the animal have been discovered intact and with their soft parts and external shape preserved. This fact has not only been fruitful in romance among the inhabitants of the Tundras, and among those who are attracted by strange and unusual occurrences among more civilized people, but is in itself the key to a great deal of difficulty in understanding the later changes that have

<sup>1</sup> GEOL. MAG. 1876, p. 252.

<sup>2</sup> The previous part of this paper appeared in the GEOLOGICAL MAGAZINE for September, 1880, pp. 408-414.

occurred in the northern hemisphere. So interesting, and so valuable is it, that it is strange that not more has been written about it in English literature, and that most writers who have treated of the latest series of deposits have contented themselves with repeating over and over again the famous story of the Mammoth's carcass described by Adams, and have not gone further afield.

Before we consider some of the problems which are elucidated by the discovery of these carcasses, we have thought that it would not be ungrateful to the readers of the *GEOLOGICAL MAGAZINE* to collect together such notices as may be found of the various places where and occasions on which the soft parts of the great pachyderms have been discovered, especially laying under contribution Baer's famous paper, published in the *Memoirs of the St. Petersburg Academy*, which, however, was by no means a complete notice, and adding to it a more casual summary of the distribution of the bones as found separate from the soft parts in various localities in Siberia.

The existence of remains of Mammoths preserved with their flesh intact was known in Europe as early as the seventeenth century. Witsen, in his work, *Noord en Oost Tartarye*, edition 1694, p. 413, cites the finding of many Mammoths' teeth in Siberia, and mentions that numbers of people were engaged in searching for them. He also says that occasionally whole Mammoths were found, which were of a brownish colour, and emitted a great stench. Witsen was not alone. Isbrand Ides, who was sent as an envoy from Peter the Great to China in 1692—1695, met on his way through Siberia a man who was engaged every year in collecting fossil ivory, and who told him he had once seen the head of a Mammoth projecting from the frozen ground, which, with the help of some companions, he cut off. The inside of the head had decayed, but he secured the teeth, which he says were placed before his mouth like those of an elephant. He also took some bones out of its head, and cut off a foot of the girth of a man, of which he took a portion to Trugan (*i.e.* Turuchansk). The bones of the head were somewhat red, as if coloured with blood. Isbrand Ides knew these elephants were found imbedded in the frozen banks of the rivers, and he reports that the Russians ascribed them to the Noachian deluge, a view in which he concurred (Isbrand Ides' *Travels*, pp. 25, 26).

Lawrence Lange, who went as an envoy to China in 1715, after speaking of the stories of the Mammoth (which he calls the Mamant or Behemoth) living under ground, goes on to say that what convinced him most that its bones were those of a beast which still existed was that several people worthy of credit had assured him they had seen the horns (*sic*), skulls and bodies of the animal with flesh and blood still remaining, adding that if it were thought necessary it would be easy without much difficulty to collect together a perfect skeleton (*Journal de Laurent Lange*, in *Nouveaux Memoires sur l'etat present de la Grande Russie ou Moscovie*, vol. ii. pp. 110, 111).

Müller, the author of the famous collections on Russian history, who wrote in the first half of the last century, in his *Memoir on the*

Manners and Customs of the Ostiaks, reports how he had been told by several people that they had seen these animals beyond the Beresowa in the caverns in the high mountains of those districts. They reported them as eight or ten feet in height, and about eighteen feet long, of a grey colour, with a long head, broad forehead, and having a horn on either side just below the eyes, which they could move about, and cross one over another as they pleased. It was said that when walking they could stretch themselves considerably, and could also shrink into a small space. Their legs in size were like those of the bear. After criticizing these stories, which clearly point to their relators having seen some Mammoth carcasses intact, he goes on to discuss the opinion of those who merely deemed the bones *lusus naturæ*. This he contests, on the ground that many times it had been noticed that the bones were bloody when the roots were broken, and that a cavity filled with clotted blood was often to be seen near the end (*id.* pp. 159, 160).

Laptef, who travelled along the northern coast of Siberia during the reign of the Empress Anne, 1739–1743, writes: "On the banks of several rivers on the Tundra, whole Mammoths with their tusks are dug out with thick hides on them. Their hair and bodies are however rotten, while the bones, except the tusks, are also decaying." He describes the heads of the animals as like those of a Horse, while their teeth were thick, flat, and not longer than three inches, a description which made Middendorf suppose he had seen the heads of the fossil Rhinoceros, which are like those of a Horse.

It is probable he confused the two animals, of which he had heard or seen specimens.

The next notice we have of the finding of one of these preserved animals refers to the *Rhinoceros tichorhinus*, and not the Mammoth. A head and foot of the Rhinoceros were taken to Pallas, when he was at Irkutsk in 1772. The complete animal had been found in the preceding December at Wiljui, about 64 versts below Yakutsk, and it had then begun to putrefy. The head and three feet were sent to Irkutsk, and the fourth foot to Yakutsk. One of the feet was destroyed by being dried too quickly; the other remains were described in a famous memoir by Pallas, and later by Brandt. They are still to be seen in the Zoological Museum at Petersburg. Pallas did not himself visit the site where the body was found, but was told by the person who had sent him the remains that the carcass was half buried in the sand a fathom from the water of the river, and four fathoms from a high steep bank. It was covered with a thick hide, over which were some scattered tufts of hair. The beast had clearly not been long where it was found, and had probably been detached from the bank in the spring floods of the years 1769 or 1770, and the sand in which it was found buried was probably a portion of the matrix which surrounded him in his grave. (Pallas, *de reliquiis animalium per Asiam borealem, etc.*, Nov. Comm. St. Peter. Acad. vol. xvii. p. 576).

In 1787, Sarytschef, who accompanied Billing in his well-known journey through Siberia, was sent in company with Dr. Merk and

others from Sredne Kolymsk to Yakutsk. At Alaseisk, a small station on the river Alaseya, about 100 versts down the river, and in its sandy banks, he was told there was the body of an animal of the size of an elephant. It was still whole and covered with its hide, and here and there had long hair on it. Sarytschef unfortunately did not visit the spot, which was a good deal out of his way.

About the same time, or even earlier, a Mammoth covered with hair was found at the mouth of the Lena, for when Adams' specimen was discovered, the Tungus told him that their fathers had told them that one of their number had seen a similar animal, and had then immediately died with all his family. The new discovery he deemed an evil omen, and fell ill.

In 1805, when Tilesius was on his way to Kamstkatka with Krusenstern's expedition, he was told by Patapof, who was carrying provisions from Okhotsk, that he had a short time before seen a Mammoth with a hairy skin, on the shore of the Polar Sea, and as evidence he sent Tilesius a bunch of its hair, which he in turn sent on to Blumenbach. Adams speaks of another similar find two years before his own discovery on the banks of the Lena a long way from the sea.

We now arrive at the famous Mammoth with which the name of Adams is so associated. Adams was a botanist, who was at Yakutsk in 1806, when he heard that a Mammoth with its flesh, skin, and hair intact, had been found on a peninsula at the mouth of the Lena. On going there he learnt that a Tungus chief named Ossip Schumakhof, in a journey to the borders of the peninsula of Tamut in 1799, saw a hummock or lumpy hill. In 1801 this had melted away partially and disclosed the side of a large animal with a tusk projecting out. The following summer proved a very cold one and the animal melted very little. In 1803, the ice between it and the cliff melted, and it subsided on to a bank of sand lower down. In March, 1804, Schumakhof returned to the Mammoth, detached its tusks, and bartered them for goods of the value of 50 roubles. The Tungus drew a picture of the animal, which Adams said was very incorrect. It had pointed ears, very small eyes, feet like a Horse, and a line of bristles along the back, and looked like a cross between a Pig and an Elephant. The merchant Boltunof, who saw the carcass in 1803, before it had decayed, mentions that it had a long snout between its tusks (*i.e.* a trunk). Adams did not see it till 1806. In the meantime the dogs of the Yakuts and the wild animals had eaten its flesh, and Adams found little more than the skeleton, of which one of the fore-limbs was lost. The bones were still united by thin ligaments, the skin on the head was dried up, and a bunch of hair remained on one ear. In the left eye he thought he could distinguish the pupil.

The skin of the side on which the animal had lain was still covered with thick hair. Adams secured a portion of this hide, which was so heavy that ten men with difficulty dragged it on to the bank. He also collected a pood of long hair, which lay scattered about the ground round about. These remains are still in the Zoological

Museum at Saint Petersburg. When Adams found the remains, they were about 100 paces from the steep bank from which they had slid down. This bank was from 35 to 40 fathoms high, and the Tunguses reported that they lay at first under seven fathoms from the surface. Adams reported that the remains were found imbedded in a stratum of clear ice.

The delta of the Lena has undergone considerable alterations, but the site of the discovery may still be made out. It is on an island marked as a peninsula in Wrangell's map, but which is now an island, as appears from the staff survey map of the Russian government issued in 1855. It lies in the Polar Sea opposite the little station of Kumak Surka on the Lena. Its northern point is called Myss Bykofskoi, and its southern one Myss Mostach (the Manstai of Adams).

During Schrenck's journey across the Samoyede steppe in 1837, he heard of the discovery of two skeletons of pachyderms in the great peninsula of Karakhaiskaya which separates the Kara Sea from the Gulf of Obi. One of them was found on the left bank of the river Yerumbei or Yerubei, four or five years before Schrenck passed that way. It was described to him as being as big as a walrus, but without tusks. Schrenck suggests that it was the skeleton of a rhinoceros, but it may be that the tusks had been previously broken off and carried away. It had apparently lain exposed a considerable time, and the bones were of a brown colour. Another skeleton not quite so perfect had been found ten years before on the same peninsula, and was well known to the Samoyedes (Baer, *Bull. Sc. St. Peters. Acad.* vol. x. *op. cit.* 278-279).

In 1840, an entomologist named Motschulsky was at Tobolsk, where he was told by the Samoyedes that the spring of the previous year had been very wet. This had washed away a portion of the bank of the river Tas, a tributary of the Yenissei, and exposed the body of a frozen Mammoth. They had seen its head and one of its tusks, the latter of which they had detached and sold at Obdorsk. They reported that from the jaws of the animal there projected a tongue as long as that of a one year old reindeer, by which they no doubt meant the trunk of the animal. Some difficulty has arisen about the exact locality of this Mammoth, as no such river as the Tas falls into the Yenissei, and Baer suggests that the Samoyedes may call the wide outlet of the latter river by that name. At all events, a merchant of Berezof, named Trofimof, undertook to bring the remains to Obdorsk, which he did, and they were found by him not far from the Yenissei, about 70 versts from its outfall into the sea near a cliff. This skeleton was removed to Moscow, and still remains in the museum there. Portions of hair and of the flesh still remained on it, upon which Professor Glebof has written.

In 1843, Middendorf found the remains of a Mammoth near the river Taimyr, only 50 versts from the Polar Sea, in about 75° N.L. He describes the animal as but half grown. Its flesh had nearly decayed away, and the bones were soaked through from the great moisture of the clay in which they lay. They still retained their

form however, and it was clear the flesh had decayed away on the spot, from there being found there two inches thick of a dark brown mud, which surrounded the bones, which had a strong ammoniacal smell, and was clearly a decayed animal substance. The banks of the river were about six fathoms high, and consisted of coarse sand containing boulders of various kinds of stone from the size of a nut to that of a man's head. Some of these boulders were taken home by Middendorf and were classed by Keyserling as granite, white felspar, gneiss containing garnets, black mica slate, and a peculiar breccia formed of pieces of anthracite welded together by white carbonate of lime. Half-way up the cliff in the otherwise unstratified sand, was a layer an inch thick of fine-grained peat mixed with coarser sand. Higher up, and five to seven feet below the surface, lay the remains of the Mammoth in a layer of sand mixed with clay. The boulders did not apparently reach so high. The animal lay on its left side (Baer, *op. cit.* 285).

A Mammoth was found some time between 1840 and 1850 in the circle of Yakutsk. It was mentioned in a notice by Herr Schtschukin, who had lived long in Yakutsk, and was afterwards in correspondence with the place. It was probably the same animal of which a foot is preserved at Irkutsk, and was mentioned by Schrenck. It was well preserved when found, and the animal had a mane of long hair reaching from the neck to the tail. Like most of the others it was found in the bank of the river, which had been undermined by floods. The Archbishop of Yaroslaf reported that the animal had been found by a missionary named Khitrof, who reported that it had a shaggy mane, and that its head was covered with hair; remains of its food between its teeth consisted of twigs of trees (Bull. St. Pet. Acad. vol. x. pp. 118, 362). It seems this Mammoth was found on the banks of the Kolyma (*id.* 362).

Baer was told by the doctor, Alexander Golubef, who had practised long in Yakutsk, that about 1860 or 1862 the Yakuts had found a huge beast covered with skin on the banks of the Wiljui, where it falls into the Lena, which they reported to the Yakutsk merchant, Ivan Platonovitch Kolessof.

A Yurak, who was looking for his reindeer on the Tundra, near the bay of Tas, noticed projecting from the ground a horn (so they call the Mammoths' tusks found in Siberia). In order to secure this he scraped away as much as he could of the earth, and disclosed the head of a great beast. Having drawn or broken off the tooth, he detached also a portion of the hide as evidence, which he gave to the village elder of Dudinsk, Athanasius Koschkarof, who passed it on to the overseer, Sotnikof, who showed it to Ivan Maksimof, an engineer on one of the steamers on the Yenissei, who again communicated the important news to M. Stephen Gulayef, and he to the Russian naturalist, K. E. von Baer. The news was communicated in a letter from Karl Maximovitch to Stephen Gulayef, dated Barnaul, 30th November, 1865 (Bull. St. Pet. Acad. x. 230-234).

On the receipt of this news, the Imperial Academy nominated



a Commission, consisting of the well-known names of Brandt, Heltersen, Schrenck, and Baer (*id.* 239), and it was determined to send an expedition to recover, if possible, the skeleton and other remains of the Mammoth, and to take a plaster cast of his shape. This expedition was put under the command of F. Schmidt, who was ordered to set out in February, 1866. When he arrived in Siberia, he found that the carcase he was in search of had decayed. Kaschkaref had visited the place in the spring of 1865, and found some bones and a piece of decayed hide only (*id.* 513). The place where the remains were found was on the Yambu, a small lake from which springs the river Gyda (*id.* 521), about 100 versts to the north-west of Maksimof Myss. The tundra about there is quite naked, alder bushes and grass grow apparently near the rivers. Schmidt describes the land of the Yuraks as a veritable mine of Mammoths' remains, and affirms his belief that the specimen in the Moscow Museum came from there, from the Simovie Krestowskaya close to the Polar Sea. Schmidt heard of another skeleton of a Mammoth with hair still remaining on its head, which lay on the Awamskian tundra, and exposed to the air (*id.* 516). He eventually secured a number of the bones, and a quantity of the hair of the former specimen (*id.* xi. 80-90).

In the summer of 1867 another Mammoth, with its flesh and hide intact, was found about 100 versts from the Polar Sea, between the rivers Indigirka and Alaseya, and on a small river called Kovschetshaja, whose mouth is about 50 or 60 versts from that of the Alaseya. It was found by a Tungus named Foka, who spent the summer there in search of Mammoth bones. Its flesh, it was reported, had been eaten by wild animals. This discovery was very important, from the place where it was made, which was about the same meridian as New Siberia; it was one and a half day's journey north of the limit of trees, and about five days' journey from the Polar Sea. Schrenck says that the Mammoth's body referred to by Sarytschef as having been found in 1787 was found on the Alaseya; while Kosmin, a companion of Wrangell, who made a journey in 1821 along the Polar Sea from the Kolyma to the Indigirka, passed the River Uschiwaja, called Pila by the Jukagirs, which is about half-way between those two rivers, found a collection of Mammoths' bones which had been washed out of the banks by the undermining of the river (Bull. St. Pet. Acad. vol. xvi. p. 153).

A Yakut, who was sent by the Baron Von Maydell to find the remains of this Mammoth, found only a leg, with one end sticking in the ground, but without flesh or hide, covered with skin only on the hoof; he also found a piece of the hide with hair still on it the size of half a horse's skin.

Meanwhile news arrived at Nishni Kolymsk of the discovery of another Mammoth's body. Of this but the skeleton remained; it lay some fathoms from the right bank of the River Kolyma, 200 versts above Nishni Kolymsk, out on the open ground (*id.* 155 and 156).

Maydell noted the spot where the first of the three Mammoths had

been discovered, but when he went he found only a number of Mammoths' bones. On his way to it he heard of a third find. A Yakut told him that on a stream not far from the Kovschetschaja, where a former Mammoth had been found, he had seen the leg of a great beast, with flesh and hide upon it, sticking out of the ground. This was in the summer of 1870. This he had detached by moving it backwards and forwards. The site of this find was on the tundra between the Indigirka and the Alaseya, which is very prolific in Mammoths' remains, so that a number of men are annually engaged in searching for ivory there. It is watered by a number of small rivers, the most eastern of which is the Kovschetschaja, where the second of the above-named Mammoths was found. Forty versts west of this was another river named the Schandran, where the third Mammoth was found. Maydell visited both places. In the first he found a number of bones, and a piece of the hide four arshins long and one and a half broad, covered in places with yellowish short hair, and longer hair of a brown-red colour. He then went on to the second site, where he recovered the leg which had been detached the year before by the Yakut. It was broken off at the knee, and, according to Maydell, seemed to have been detached long before, as the exposed parts of the bones seemed weathered, and of a brown colour. There was no flesh remaining, but the hide was intact, and ended in a rounded foot with a horny sole. He succeeded in finding another similar limb, and a mass of earth mixed with Mammoth hair, but nothing more; the rest of the animal had been dispersed either by being dragged away by wild animals, or by being broken and washed away by the water or otherwise.

This completes our view of the distribution of the remains of Mammoths in Siberia which still retain their soft parts, and it will be noted that they have occurred in various and widely separated meridians, from the eastern water-shed of the Obi to the peninsula of the Chukchi, and they have been found naturally where the climate is the most severe, and where the tundra is the most bare of vegetation. The list of places where bones and other remains of these pachyderms have occurred is such an extensive one, that I shall not attempt to give a complete index to it, but only collect a series of localities to prove how wide-spread the remains are.

When the Russian envoys went to Japan from Petropauloski, in Kamskatka, one of them, named Kusholof, brought home some tusks and fragments of Mammoths' bones which he had found in the latter peninsula (Tilesius, *op. cit.* 423). Wrangell found a tusk in a small brook near the River Aniuj (*op. cit.* 307), and he says both Mammoth and Rhinoceros remains are found in the Little Aniuj. Several Mammoth bones and pieces of Whalebone were found on the tundra west of the Baranicha (*op. cit.* 286). These bones, he says, are found in hills surrounding the lakes near the Baranof rocks (*id.* 283), and he records a Mammoth's jawbone from the Great Aniuj. He says that between the Kolyma and the Indigirka there is a long perpendicular ice-cliff, which never thaws, and in which the ice is mixed with a little black earth and clay, and where the



waves have washed away the earth, Mammoths' bones not unfrequently appear, and he again adds that the whole of the coast from the Aleseya to the Indigirka is rich in Mammoth bones. While near the Baranicha, between a low hill and the sea, the ground might be said to consist entirely of Mammoth and Buffalo bones. He noticed a large heap of jawbones that had been thrown aside by a previous party. In regard to the Bear Islands, he says: The soil of the first Bear Island consists only of sand and ice, with such quantities of Mammoth bones that they seem to form the chief substance of the island. Among the bones are also found the skulls and horns of an animal resembling the Buffalo (*i.e.* of the Bison).

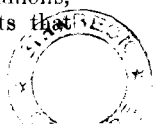
The people on the Indigirka are employed in trapping foxes and collecting Mammoth bones. Near the mouth of the Ušchewaya the banks are often undermined, and Mammoths' bones exposed, of which the Yukagiri obtain a large supply annually. This part of the coast is generally rich, he says, in Mammoths' bones.

Further west Erdmann tells us that in the lower valley of the Lena, at the place where the Vilui disembogues into that river, between the rocky hills which confine the course of the Yana, and at the Icy sea on both sides of the mouth of the river, are found the teeth and bones of Mammoths, Rhinoceroses, and other quadrupeds, and even whole carcases (*op. cit.* vol. ii. p. 378).

But the most famous deposits of all of the Mammoth bones are found in the Liachof archipelago, so called from a merchant named Liachof, who in the year 1770 began to collect fossil ivory there, and so enriched himself that he got the exclusive privilege of digging for the ivory there, a privilege which he transmitted to his descendants. These famous islands are situated off the promontory known as Sviatoi noass, between the mouths of the Yana and the Indigirka, and about 74° N.L.

According to the report of Samukof, who was there frequently, the soil of the first of these islands is almost composed of fossil bones, and near it is a mud bank which exposes fresh ones with every storm. This made him conclude that a large deposit lay under the sea there.

In one of these islands is a lake with high banks, which split open in the summer, when the sun melts the ice, and disclose heaps of tusks, Mammoths' bones, and bones of Rhinoceroses and Buffaloes (doubtless Musk Oxen are meant). The ivory is often as fresh and white as that from Africa. In other parts of the island bones and tusks are to be seen projecting from the ground. Liachof was engaged for many years in digging ivory there, and built huts and a magazine for his people who lived there in the summer. North of the Liachof Islands are those known as New Siberia. These consist of the islands known as Kotelnoi, Fadeyefskoi, and a third more to the east. They were partially discovered by Liachof's people, who, however, kept the matter secret. Another speculator obtained a special privilege of digging there. Later, Count Rumanzof, Herr Hedenstrom, with a number of companions, among whom was Samukof, went there. Hedenstrom reports that



in the most eastern of these islands he had found ten Mammoths' tusks standing out of the ground in the space of a verst. Hedenstrom and Samukof report these islands, especially Kotelnoi, as abounding in heads of Sheep, Cattle, and Horses. The place has unfortunately not been visited by a naturalist, so that it is impossible to say whether these Sheeps' heads belong to the Siberian Mountain Sheep, *Ovis nivicola*, or to the Musk Ox, and whether the so-called Horses' skulls may not be those of Rhinoceroses. There are also large heaps of wood lying so thickly that the Russians call them wood hills. So plentiful are the Elephant remains, that in 1821 an ivory merchant from Irkutsk collected 20,000 pounds of elephant ivory from the islands of New Siberia. Samukof himself, in 1805, collected 250 poods, or 10,000 pounds, of this ivory, and the trade goes on regularly (Baer, *op. cit.* pp. 253, 254).

The same report as to the abundance of these remains comes from other parts of the northern coast of Siberia.

The branches of the two rivers Aniu, tributaries of the Kolyma, are, according to Maljuschkin, rich in fossil bones. The bones of the carcase, other than the tusks, when they still retain a quantity of fatty matter, are used for fuel or for other domestic purposes. The supply of fossil ivory drawn from northern Siberia during the last two centuries must have been enormous, and still gives no signs of waning. From 1825 to 1831 there was never, according to Middendorf, less than 1500 poods of fossil ivory sold at Yakutsk; one year it reached 2000 poods. From 80 to 100 at Turukhansk, and 75 to 100 at Obdorsk. The number of individual Mammoths deposited may be guessed from the fact that many of these northern tusks are small, and weigh only about three poods, or 150 pounds each.

West of the Lena the Mammoth occurs also in great quantities. Middendorf found its remains on the Taimyr peninsula. Gmelin found those of a Rhinoceros on the new Tunguska.

Pallas and others have reported Mammoths' remains as found in the valleys of the Yenissei, the Angara, the Chalaiya, the Irtysh, the Tom, the Tobol, the Ob, the Alei, in the country of the Barabinski, the banks of the Volga, and the Ural, etc. They are, in fact, found distributed all over Siberia from the Ural Mountains to the Pacific. They are not, however, distributed equally over Siberia, but, as Wrangell says, form immense local accumulations, which become both richer and more extensive the further one advances to the north, being found in the greatest abundance in the islands of the Leachof archipelago, more sparingly on the main land, and but rarely in Southern Siberia (Wrangell, 185, note).

The presence of the remains of these vast animals in such abundance in a country so sterile, and so given up to the hardest conditions of climate, etc., where there is now in winter the barest sustenance for the raven and the snowy owl, and they alone, has ever been a subject of marvel and surprise, has given rise to many theories and many opinions. These are well worth sifting more closely than they have hitherto been, for they involve answers to

riddles nearer home than Siberia. We will postpone a survey of them to another communication.

The following Errata refer to the previous article by me in the GEOL. MAG. Sept. 1880, p. 408.

Page 409 line 25 for Nurnan read Russian.  
 „ „ „ 46 „ p. 387 „ vol. ii. p. 387.  
 „ 411 „ 11 „ Dudmo „ Dudins.  
 „ „ „ 42 „ Kiachtu „ Kiachta.  
 „ „ „ 46 „ Tutungian read Tai-tun-gian.  
 „ 412 „ 2 „ Bun zoo gan rom read Bun-zoo-gan-mu.  
 „ „ „ 24 „ Observaciones read Observatio.  
 „ 413, last line, for days read months.

#### IV.—ON THE CARBONIFEROUS POLYZOA.<sup>1</sup>

By G. R. VINE, Esq.

AS so much remains to be done before the Palæozoic Polyzoa can be properly classified—more particularly the Carboniferous species—it seems to me that the wisest course to adopt is to go carefully over the work of other authors, reviewing their labours generally, and giving, in as condensed a form as possible, the results of their varied efforts.

David Ure,<sup>2</sup> the son of a working weaver in Glasgow, is the first, so far as I am aware, who drew attention by figures to British Carboniferous Polyzoa; and Martin<sup>3</sup> gives some good figures of Zoophyta, but species of these belong to both the Corals and Polyzoa. Thirty-five years after the publication of Ure's work, Dr. Fleming<sup>4</sup> named some of the species figured, and the Zoophyta he called *Cellepora Uriei* and *Retepora elongata*. The first of these, according to Mr. Robert Etheridge, Jun.,<sup>5</sup> is *Chaetetes tumidus*, Phillips, and the other is a *Fenestella*.

In 1826, the work of August Goldfuss<sup>6</sup> was published. In this a system of nomenclature was adopted, and many figures of Polyzoa and Corals given, which to a large extent assisted investigators and helped them to identify species found in this country. The generic terms used by Goldfuss were accepted by authors who followed him, but as no distinction was made by the earlier investigator in separating true Polyzoa from true Corals, those who worked from his types and descriptions fell into his error, and mingled, for a time, Corals and Polyzoa together whenever they had fresh forms to describe.

The chief of the generic terms used by Goldfuss were:—

1. *Gorgonia*, Linnæus, 1745.
2. *Cellepora*, Gmelin, 1788?
3. *Retepora*, Lamarck, 1816.
4. *Ceriopora*, Goldfuss, 1826.

The type of Linnæus' *Gorgonia* was altogether different from the

<sup>1</sup> British Association—Section C. (Geology).—Report of the Committee, consisting of Prof. P. M. Duncan and Mr. G. R. Vine, appointed for the purpose of reporting on the Carboniferous Polyzoa. Drawn up by Mr. Vine, Secretary.

<sup>2</sup> History of Rutherglen and East Kilbride, 1793.

<sup>3</sup> Petrefactions of Derbyshire, 1809, *Petrefacta Derbiensis*.

<sup>4</sup> History of British Animals, 1828.

<sup>5</sup> Ann. Mag. Nat. Hist. 1874.

<sup>6</sup> *Petrefacta Germaniæ*.