

THE JOURNAL
OF THE
ROYAL DUBLIN SOCIETY.

THE JOURNAL
OF THE
ROYAL DUBLIN SOCIETY.

VOL. I.—1856—57.



DUBLIN:
HODGES, SMITH, & CO., 104, GRAFTON-STREET,
BOOKSELLERS TO THE ROYAL DUBLIN SOCIETY.

LONDON: SIMPKIN, MARSHALL, & CO. EDINBURGH: JOHN MENZIES.

1858.

make a glue for joining wood, which will not be affected by damp; to prevent the depredations of insects on wood. The heavy oak beams and rafters in the roof of the Royal Dublin Society are attacked to a considerable extent by insects, as the weevil, &c. As this cement is soluble to a considerable extent in volatile oils, as turpentine, naphtha, &c., an application of the solution of the cement in turpentine, &c., might be beneficial, and arrest the ravages of those insects. It may be highly deserving of inquiry whether the cement may not be applied to preserve surfaces of metal and wood exposed to the atmosphere, and to fresh water; also to protect anchors, chain-cables, &c., from the corroding agencies of sea water.

XXIV.—*Reminiscences of Arctic Ice-Travel in Search of Sir John Franklin and his Companions.* By CAPTAIN F. L. M'CLINTOCK, R. N., Hon. Member of the Royal Dublin Society, and of the Dublin University Zoological and Botanical Association. *With Geological Notes and Illustrations.* By the REV. SAMUEL HAUGHTON, M.A., Fellow of Trinity College, and Professor of Geology in the University of Dublin.

[Being the substance of two Papers, one read by the former on Jan. 25, and the other by the latter on May 27, 1856.]

FIRST EXPEDITION.

ON the 15th of May, 1849, the first of the sledging parties set out upon the Franklin Search, from the expedition under the command of Captain Sir James C. Ross, then wintering in Port Leopold, lat. 74° N., long. 90° W. Since that time nearly a hundred such parties have been dispatched from the various expeditions wintering in the Arctic Regions, and have travelled upwards of 40,000 miles in the same search; yet, when I look back upon this first pioneering journey, productive as it was of such inconsiderable results, my respect for it continues unabated, since we underwent as much privation and fatigue as in any equal period of my subsequent travel.

In the fitting out of our two sledges we availed ourselves of all the experience of former expeditions: each was drawn by six men; upon each were placed thirty days' rations and a tent; and provisions were forwarded by other parties upon our route. Sir James Ross led the party, and I had the good fortune to accompany him; we remained absent the unprecedented period of forty days, accomplishing a distance of 500

miles. Seven only out of our twelve men returned in comparative health; the other five having quite broken down under the fatigue.

Following the shores of North Somerset to its western extremity "Cape Bunny" (which we discovered to be an island), we found that a broad strait, leading southwards, intervened between us and Cape Walker. Hence, Sir James wisely determined to depart from his original intention of travelling to the westward, for the purpose of exploring this newly-found strait. Following the western shores of North Somerset, we endeavoured to traverse the whole of the unknown space intervening between it and the Magnetic Pole, in lat. 70° N., long. 97° W. Our failure was doubly unfortunate, 1st, because we were marching in the right direction, as the discoveries of Dr. Rae in 1854 have proved; and 2ndly, because a *magnetic* attraction in that quarter was most uncharitably attributed to our leader, who, it will be remembered, discovered the Magnetic Pole some eighteen years before.

It is not to be wondered at that the succeeding expeditions were shy of attempting anything in that unpopular direction; hence, it remains to this hour the only unexplored area of the easily accessible portion of the Arctic Regions. It may not be out of place, perhaps, to remark that it was within sight of the Magnetic Pole that some forty or fifty of Franklin's crews were seen by the Esquimaux in the spring of 1850, dragging a boat to the southward, and the remains of which boat have since been found within the estuary of the great Fish River. Yet our journey was far from being useless, as much valuable experience had been gained, and even the few "waist-coat pocket" specimens of fossils brought home by me to the Royal Dublin Society's Museum have proved sufficiently interesting to be deemed worthy of notice in the Society's Journal.

Port Leopold is, without exception, the most barren spot with which we are acquainted. During our stay of almost twelve months there, the only land-birds shot were two ptarmigan, a few snow buntings (*Emberiza nivalis*), a raven, and a solitary starving rusty grackle (*Quiscalus ferrugineus*). The neighbouring land averages a height of about 900 feet; lofty vertical cliffs, composed of impure earthy limestone and shaly mudstone, containing but few fossils, horizontally stratified, and alternating with occasional narrow seams of fibrous gypsum and Selenite, extend unbroken for miles along the coast. We were not sorry to leave this scene of desolation behind us for a time.

At Port Leopold the fine specimens of Selenite presented

to the Society were found; also abundance of natural casts of the fossil Gasteropod, described by Mr. Haughton as *Loxonema M'Clintocki*, Pl. V. Figs. 2 and 5. This fossil was found by me at North-east Cape, Port Leopold, at a height of 1100 feet above the sea; a coral which closely resembles, if it be not identical with, the variety of *Calamopora Gothlandica* described by Edwards and Haime as *Favosites Forbesi*; a species of solitary Cyathophyllum; a small-ribbed Rhynchonella; together with other fossils of a decidedly Upper Silurian type. The general appearance of the rocks is similar to the Dudley limestone, and would strike even an observer who was not a geologist. This resemblance to the Upper Silurian beds extends to the structure of the rocks on the large scale. Alternations of hard limestone and soft shale, so characteristic of the Upper Silurian beds of England and America, arranged in horizontal layers, give to the cliffs around Port Leopold the peculiar appearance which has been described by different Polar navigators as "buttress-like," "castellated;" this appearance is produced by the unequal weathering of the cliff, which causes the hard limestone to stand out in bands. Excellent sketches of this remarkable appearance, drawn by Lieutenant Beechy, are figured at page 35 of Parry's First Voyage, Hecla and Griper, 1819-20.

It is well known that the Falls of Niagara are due to a similar cause, existing in rocks of the Wenlock or Upper Silurian age.

Our arrangements for the journey were very simple: our tents covered a space of 6 feet by 9,—*just room* enough for seven persons to lie down in. Our tent furniture consisted of a waterproof floor-cloth, a blanket bag for each person, and a couple of furs, one to spread underneath, and the other over us. We travelled by night and slept by day, for the double reason of avoiding the intense noonday snow glare, and of travelling during the hours when it was too cold to sleep in our tent.

After passing Cape M'Clintock, the interior of the country alone retains its elevation, the coast, and for a few miles inland, being very low. On the 17th of June two gulls were seen, the first visitors of the season; they were, probably, the *Larus maritimus*. Two caterpillars were found crawling upon the snow (temperature, 21°).

In Garnier Bay, upon a little craggy limestone peninsula—in itself a remarkable object upon this flat coast—we halted to lunch; here we saw many beautiful fossil shells and corals exposed upon the surface.

In this place I found an abundance of beautiful fossils, in

excellent preservation, and which settle the question of the geological age of the limestone of North Somerset, from the fact of their including in their number specimens of *Atrypa reticularis*, *Porites pyriformis*, and *Cyathophyllum helianthoides*. From the conjunction of these fossils we are justified in considering the North Somerset limestone as Upper Silurian or Devonian. Among the most remarkable of the fossils found at this place were the following:—*Cromus Arcticus*, Pl. VI. Figs. 1, 2; *Cyathophyllum helianthoides*, Pl. VIII.; *Columnaria Sutherlandi* (Salter*); *Porites pyriformis* (Lonsdale), or *Heliolites porosa* of M. Edwards and J. Haime; *Atrypa reticularis*; *Atrypa phoca* (Salter); *Strophomena Donnetti?* (Salter); with several other undescribed Corals and Brachiopoda. Specimens of *Heliolites porosa* were also found by me in the limestone to the north-east of Cape Granite. In the shingle to the east of Cape Bunny, fragments of limestone containing this coral occur, associated with red and white carnelian, chalcedony, red fine sandstone, and the characteristic red gneiss of North Somerset.

This part of the coast is extremely low, many of the gravel or shingle ridges lying nearly a mile off shore; all of them appear to have been scooped up from the bottom by heavy ice pressure; they were half-moon-shaped, the convexity and highest part being to seaward.

Near Cape Rennell we passed a very remarkable rounded boulder of gneiss or granite; it was 6 yards in circumference, and stood near the beach, and some 15 or 20 yards above it; one or two masses of rounded gneiss, although very much smaller, had arrested our attention at Port Leopold, as then we knew of no such formation nearer than Cape Warrender, 130 miles to the north-east; subsequently, we found it to commence *in situ* at Cape Granite, nearly 100 miles to the south-west of Port Leopold.

The granite of Cape Warrender differs considerably from that of North Somerset; the former being a graphic granite, composed of gray quartz and white felspar, the quartz predominating; while the latter, or North Somerset granite, is composed of gray quartz, red felspar, and green chloritic mica, the latter in large flakes; both the granite and gneiss of North Somerset are remarkable for their soapy feel.

On the 23rd, several snow buntings, in flocks of about half a dozen, were seen; also an occasional ptarmigan; tracks of bears and foxes not uncommon; passed the mouth of Cunningham

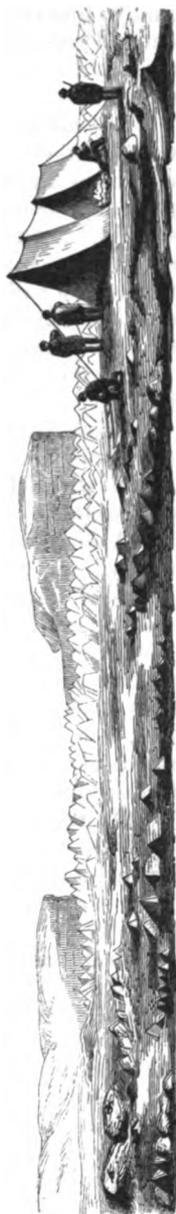
* Sutherland's "Journal of Captain Penny's Voyage to Wellington Channel," Pl. VI. Fig. 8.

Inlet. The capes guarding the entrance of this Inlet are bold, lofty, and of similar limestone formation, and presenting similar "*buttresses*" to those about Port Leopold. The shores of the Inlet (which is ten or twelve miles deep), and the adjacent coasts, are also high, with steep slopes to the water.

We drank her Majesty's health under the western extreme of this high range of hills, which we named "The Queen's Cape." We had arrived here very early on the morning of her Majesty's birth-day (24th of May), and finding a small pond of fresh water, the first we had seen of this season's thawing, we enjoyed a long drink, the more so as we were saved the delay and spirit of wine required for melting snow. The temperature of this water was $33\frac{1}{2}^{\circ}$, and that of the air 27° .

The summit of "The Queen's Cape" was now veiled in mist; but upon our return here, on the 15th June, we observed a remarkable rupture in its strata; which, when seen from the north, dip to the westward at an angle of 60° ; this inclination continues for about two hundred yards. On either side of this broken wedge-like mass, the dip is uniform, and less than 10° . Here, also, the *buttress-like* appearance of the cliffs is visible, but not strikingly so; it becomes more apparent as one travels eastward, and is nowhere to be met with in the west.

About half-way between Cunningham Inlet and Cape Bunny, sandstone begins to supersede the limestone; and we spent several hours in traversing sand-banks which lie off the mouth of a river in Transition Valley. Cape Bunny proved to be an islet, having a perpendicular cliff to seaward, 400 or 500 feet high. We, therefore, passed inside it, and round cliffs, of similar appearance, upon the N. W. extreme of North Somerset; these cliffs were named "Cape Pressure," from the accumulation of blocks of ice squeezed up against them; and they appeared to be of a coarse



sandy limestone, with ferruginous stains. After passing Cape Pressure the coast-line alters its direction from west to south, and the country almost immediately becomes limestone.

The accompanying sketch, which was made from a water-colour drawing by Lieutenant Browne, R. N., was taken by him from a rough outline drawn by me at the time. It represents our encampment at the mouth of Transition Valley, so called from the junction of sandstone and limestone which occurs at this point. A low sandy beach marks the termination of the valley, and is composed of small rounded fragments of quartzose sandstone, chalcedony, and limestone with *Heliolites*. Cape Bunny is represented on the right, and Cape Pressure on the left, with the frozen hummocky sea between them.

Near the river in Transition Valley ruins of a few summer huts of the Esquimaux were seen; i. e. the circles of stones which had been used to keep down the sides of their skin tents.

Also to the south of Cape Pressure we found ruins of a few winter and several summer abodes; portions of the bones of four whales lay about, and we dug up the side of a wooden sledge, measuring 5 feet long, 6 inches broad, and $1\frac{1}{4}$ inches thick; also another piece of fir, 3 feet long; besides several pieces of bone cut to answer for shoeing sledge runners, and pierced with holes. We constantly kept a sharp look-out for game, not much relishing our scanty supper of salt pork and lemonade, at a temperature often far below the freezing point.

On the night of the 28th May several of the men's feet were frost-bitten whilst we were making a very long march against a fresh gale, with the thermometer at 10° . We had now reached a rocky granite point, subsequently called Cape Granite. It was the first of this formation met with, which remained almost unaltered to the farthest point we reached. The mica it contained resembled blotches of dark green, often the size of a sixpence.

For the next ten or twelve miles we travelled in a south-west direction, passing several low stony points separating little bays: not a trace of vegetation nor of Esquimaux habitations. The tracks of foxes scouring the coast were numerous; and we passed the tracks of two bears, each attended by its cub; all were bound to the northward.

As land apparently continuous with Cape Walker could

be seen stretching away to the south, we began to fear lest it should unite with the coast-line we were upon, and that our supposed strait should turn out to be only a deep bay. All the country was now a primary formation: many of the rocks *in situ* being gneiss, traversed by vertical veins in a north and south direction. Granite blocks abound, which, as well as the gneiss, are of the coarsest description.

Our next encampment (on the 30th) was upon a low detached ridge, strewn with granite boulders, some of large size. James Bonnett now complained of spasmodic pains, loss of strength, giddiness, &c. He continued ailing, and unable to labour, for the remainder of our journey.

The ice here was very much broken up, as if from pressure from the north, and the difficulty of traversing it was often very great. In our progress through some hummocks of ice on our last march, we disturbed a brace of ptarmigan, which had been slumbering upon one of them, in greater security from the foxes than upon the land. I subsequently found that the hares practise this plan also, and even the lemmings (*Myodes Hudsonicus*), prefer to travel upon the ice along the coast to doing so upon the land.

On the 31st we found some water in crevices of rocks occupying a sheltered position and southern aspect. We, therefore, halted, and either carried away or sucked up every drop. One can hardly imagine how great a luxury a drink of water is to an Arctic traveller. Sir James Ross says, that no people drink so much, when they can obtain it, as the Esquimaux. At Wadworth Island the coast-line continues to be indented by numerous small bays. The adjacent land is of moderate elevation, seldom above 200 or 300 feet. It gradually rises further inland, and becomes gently rounded into little hills, strewn with granite boulder stones. Behind these, again, the land swells into larger and loftier hills, at a considerable distance from the coast; but the whole preserves the same unvarying character of gentle undulations and rounded hills. To the south, higher and bolder land appears; and to the south-west and west, distant lofty land is visible, resembling a chain of islands. The coast is everywhere fringed with grounded hummocks of ice of large size, and within these we usually find the ice tolerably smooth, so make it our highway.

On 1st June we discovered a commodious harbour, and it being the anniversary of Lord Howe's victory, we gave his name to it. Upon this march we had to cross a wide bay;

the sun was obscured; the hummocks of ice numerous and half buried in very soft snow; and as there was much glare it was only with great difficulty we could distinguish the level ice; often the men could not see my foot-prints, although I was walking only fifteen yards before them. They would sometimes try to come straight to me, instead of following the circuit I had taken, and would tumble over a hummock or into a bank of soft drift snow. Here we saw a seal, and the track of a reindeer and fawn, the first met with.

We made a desperate, but futile attempt, to pass close round Hummock Point, inside the broken-up ice, but so forcibly had it been pressed in, that it lay heaped up against the steep rugged rocks to the height of 50 or 60 feet. All the hollows and chasms were filled up with very soft snow, which made progress in any direction very dangerous. After two hours of hard labour, we fortunately succeeded in retracing our steps without accident, and, by getting far out on the ice, at length got round "Hummock Point." From it a dark, perpendicular, forbidding coast-line extends to the south for four or five miles. About twelve miles to the west is lofty land faced with cliffs. It appeared to be an island, and it has since been proved to be so by the sledge journey of Lieutenant Browne in 1851, and described by him as consisting of reddish granite.

The intervening strait is choked with heavy, crushed-up ice. As this iron-bound coast is separated from us by a very formidable barrier of hummocks, we encamped about a mile off shore upon the ice. Except in parts of Terra del Fuego, I have never seen so impregnable and forbidding a coast as that which here frowned upon us. It needed not its icy fringe of hummocks, resembling a continuous frozen breaker, to bar approach. The interior is broken up into a series of irregularly-shaped hills 500 or 600 feet high, and apparently devoid of vegetation.

On the 3rd of June a bear was seen approaching, and by lying down perfectly still, he mistook us, for seals I suppose, as he came up from the leeward with great eagerness at a rapid, noiseless pace, skilfully taking advantage of every intervening hummock to screen himself from our view. As ill luck would have it, only three out of seven barrels went off, and away went the bear with the agility of a cat, although the three bullets struck him within twenty-five yards, and blood flowed in a copious stream down his leg. We followed, momentarily ex-

pecting to see him fall, and I even wounded him again; but the blood froze upon his shaggy fur, and before he had gone a couple of miles the bleeding stopped. With Bruin in our larder, we could have greatly extended our journey. This was the second time we had attempted to increase our stock of provisions by shooting a bear. Bonnett continues full of pains and devoid of strength, and all the other men are greatly reduced in strength; although our sledge gets lighter, they seem to be less able to drag it. All this night we were confined to our tent by a violent gale, which threatened to blow it down, and literally whistled through it. At 8 in the evening we had our breakfast, sitting up in our blanket-bags round the tent, the kettle being at once the centre of our circle and of our hopes; spent the night in patching our clothes and boots, the latter having suffered so severely as to require an abundance of patches such as could only be applied with the utmost ingenuity. Temperature in the tent 31° , outside 24° . Our supper on the morning of the 4th was sumptuous indeed,—seven stewed ptarmigan amongst fourteen persons.

Next march we crossed the tracks of four reindeer, a bear, and fox. Having now passed the narrowest part of the strait, the pressure from the north does not seem to extend beyond, as here we find the ice smooth and unbroken. Another man is almost done up with blistered feet.

On the 5th of June we reached the furthest limit of our journey, and encamped upon the ice in a little bay. The land is moderately high, and consists of huge masses of granite and gneiss, barren and rugged. We crossed the track of a few reindeer on their route to the islands to the west; also of a bear marching to the northward, like all the others seen on this side of Cape Bunny. Two large gulls, supposed to be the *Larus argentatus*, flew past us northward. We stopped here for a day to rest the men; Sir James employed it in walking about ten or twelve miles further along the shore to the next prominent point in lat. $72^{\circ} 38'$, from which position the coast-line could be distinctly traced for forty-five or fifty miles further, the day being remarkably clear and the land high: it was manifest, therefore, that unless we could travel for three or four days more to the south, we should not be able to increase our geographical knowledge. Sir James saw several tracks of bears and some of reindeer, but no vestiges of Esquimaux; he described the whole country to be a primary formation, and much covered with snow for the time of year. During his absence I had completed several

sets of magnetic and astronomical observations; and the men had erected upon a conspicuous point a pile of huge stones nine feet in diameter and seven feet high, on the top of which was placed a copper cylinder containing a record. They also cut a hole through the ice, which was found to be eight feet thick, being two feet thicker than in Port Leopold.

The chain of islands on the opposite side of the strait terminated abruptly in the S.W. The one to the west of us was visited by Lieut. Browne in 1851, and found to be composed of dark green "granite of very fine close texture, and exceedingly hard and heavy."

We now commenced our return journey on the evening of the 6th June, in the teeth of a strong north-west wind, the noonday and midnight temperature being 18° and 12° respectively. We noticed the track of a lemming crossing the strait to the western land, and we saw a fox, the only one seen during our journey. I tried hard to secure him for supper, but he kept far beyond the range of a patent cartridge.

On the following march, after indescribable labour and fatigue, we rounded the much-dreaded "Hummock Point," and encamped upon the ice to the north of it. This harassing journey greatly knocked up our men; indeed, their strength had latterly been greatly impaired, inasmuch that they were utterly unable to lengthen their journeys beyond the outward-bound ones, although our sledges had become greatly lightened. The recent fall of snow not only augmented the difficulty of travel, but had almost obliterated our former track, by which it was desirable we should return through this rough, hummocky ice. Nor was this the only evil it occasioned; for, owing to the uniform dazzling whiteness of the surface, and the total absence of sun to throw any, even the faintest, shadow, it was necessary to strain our eyes in every direction, at the expense of much pain, and the risk of bringing on snow blindness.

The following extract is from my diary:—

"June 9th.—The men seem much weakened, and have the most ravenous appetites. I do not exaggerate when I say that they could devour at least three times their allowance without inconvenience; and I think double allowance, could it possibly be spared, would not by any means be too much for them." The season, moreover, was unusually cold and backward. "Not a drop of water could be found amongst the rocks where we procured a small supply on the 31st of May,

the recent severe weather having thoroughly frozen the water in all the pools. Saw during the night a glaucous gull, a snow bunting, and the track of a reindeer. At midnight, a fresh east wind; temperature, 17°."

But a change was at hand, nearer than we imagined:

"June 10th.—The first sandpipers (*Tringa Islandicus*) were seen, also several snow buntings, their cheerful notes reminding us of a more genial clime; another glaucous gull appeared. This day has been not only unusually, but really very warm; the weather calm and cloudy; the noon temperature 47°, and in the tent it rose to 64°!! To us it was excessively oppressive; small pools of water are now abundant all over the granite rocks; several small black spiders have been picked up."

This sudden heat was followed by a very dense fog; and had it not been for the guidance of our former tracks, we could not have ventured to cross the bays, as the directive force of the needle is here so weak that ordinary compasses are useless. On the 11th we saw the first pair of ducks (*Anas mollissima*) flying northwards; four or five gulls, one a *Lestris parasiticus*, and a few sandpipers also were seen. The "breaking up" of the winter had commenced at last; the snow was very soft; pools of water here and there upon the ice; the land nearly half-cleared of snow, and birds increasing in numbers. We saw in the snow the track of a fox, the spot where he had pounced upon a dormant ptarmigan, which he carried down amongst the broken ice, and there we found all that fell to our share—the feathers! In passing Cape Pressure, on the 13th, we found that already about forty silvery gulls (*Larus argentatus*) had established themselves upon the cliffs, but so high up that I could shoot only one. These breeding-places are always called by the seamen "gull rookeries." The first dovekie (*Uria grylle*) was seen this day. Water abundant upon the ice, and where the latter is unbroken it is fresh and good. We drink a great deal more of it than I think we have ever been in the habit of doing before. For the rest of our journey we were either walking through water on the ice, sometimes knee-deep, or labouring through very deep soft snow, with water underneath. This soon produced abundance of rheumatic pains; and several of the men having had their feet blistered and frost-bitten, already sufficiently painful, now suffered still more from their ice-cold nightly *pediluvium* of ten or twelve hours' duration. We soon had five men disabled, and two of these were obliged to be put upon the sledges. Here

upon the sandstone land we saw the *Saxifraga oppositifolia* in flower, and several caterpillars were picked up. Here I enjoyed "a scrub" at my hands and face, without soap or towel, the only attempt of the kind during forty days!!

June 15th.—Shot a pair of Phalaropes (*Phalaropus Hyperboreus*) and a glaucous gull; the latter measured 5 feet from tip to tip of expanded wings. Several flocks of ducks passed. Shot a king (*Anas spectabilis*) and an eider (*Anas mollissima*) duck.

On the 17th we observed the *Saxifraga oppositifolia* to be in flower upon the limestone soil.

June 18th.—The first Looms (*Uria troile*) appeared today, and Sir James caught a lemming, the only one seen during our stay of nearly twelve months in those regions. It was too precious to be eaten, like everything else that we got.

We observed very large flocks of ducks feeding upon the wet, mossy, flat lands lying along the eastern shores of Garnier Bay. They were very wild; so, only one of them and a red-throated diver (*Colymbus septentrionalis*) were shot. "The old tobacco quids are anxiously sought for by the men for smoking, as they have long since exhausted their stock of the weed." *Parhelia* are commonly seen, sometimes on both sides, but generally upon one side only of the sun.

"June 20th.—Passed Cape Rennell; enjoyed our third and last hot supper, the spoils of the chase. It consisted of a stew of three ducks, one diver, two dovebies, one skua gull, and one kittiwake gull (*Larus tridactylus*). Here the lowlands have been much cleared of snow, but the highland retains its wintry aspect. Fortunately, the ravines have not yet begun to pour forth their torrents of melted snow; even the small streams we occasionally meet with oblige us to make an extensive circuit upon the ice, which they overflow and rapidly decay."

We reached Port Leopold on the 23rd June. All the men required medical care and abundance of food. They prowled about the ship devouring every morsel they could pick up. In this feeling I fully participated, nor did I lose the sensation of *constant hunger* for nearly a fortnight. It seemed strange and incomprehensible how indifferent my messmates were to rich morsels of fat! I thought I never could get enough.

An idea may be formed of the sterile nature of this locality, —the most desolate known in the Arctic Regions,—by the

small quantity of game shot during our journey: eight ptarmigan, seven or eight eider ducks, a few gulls, a diver, and two little phalaropes, comprise the entire list^a.

Our opinion of the strait (Peel Strait^b) which we had discovered was, that any attempt to force a ship down it would not only fail, but lead to almost inevitable risk of destruction, in consequence of its being choked up with heavy ice. My subsequent experience has led me to modify this opinion. In 1849 we travelled down along the *leeward side* of the strait, where all the ice pressure was most apparent and striking; but in 1851 Lieut. Browne travelled down the *windward side*, and found the ice smooth, so much so as to show that water must have existed the previous autumn nearly all along the western shore. Moreover, it is now almost beyond a doubt, that Franklin's ships did pass down it in 1846.

The following lists contain an account of the principal specimens brought home from North Somerset on my return from the first expedition.

GARNIER BAY (LAT. 74° N.; LONG. 92° W.)

1. *Cyathophyllum helianthoides*, several specimens.
2. *Heliolites porosa*. Garnier Bay. Another specimen from near Cape Bunny.
3. Specimens of Carnelian, Gneiss, Chalcedony, &c., &c., from the shingle near Cape Bunny.
4. *Cromus Arcticus*, several specimens.
5. *Atrypa phoca* (Salter).
6. *Atrypa reticularis*.
7. Brachiopoda on slab (various).
8. *Cyathophyllum*.
9. *Columnaria Sutherlandi* (Salter). Several specimens.

PORT LEOPOLD (LAT. 73° 50' N.; LONG. 90° 15' W.)

1. Limestone containing numerous fossils of the Upper Silurian type: *Calamopora Gothlandica*, Goldf. *Rhynchonella cuneata*? Dalm. *Cyathophyllum*, sp.
2. Dark earthy limestone, containing multitudes of the *Loxonema McCintocki*, as casts—1100 feet above sea-level on North-east Cape.
3. Fine specimens of Selenite from shaly beds in cliff.
4. Fibrous gypsum from same.

^a The temperature during our journey was, max. 47°, min. zero, mean 23°.

^b Mr. Kennedy, in his sledge journey (1852), having been misled by appearances of land, supposed this to be a *sound*, and not a strait. Hence it is sometimes called "Peel Sound."

SECOND EXPEDITION.

The experience of our first journey was of great value to us in the second expedition. In 1851 we commenced our sledging operations a month earlier in the spring: we managed to provision our parties for forty instead of thirty days, and by adopting a system of fatigue parties, greatly extended our explorations; my own journey was prolonged, in time, to eighty days, and, in distance, to 900 miles.

This expedition wintered at Griffith's Island, in lat. $74\frac{1}{2}^{\circ}$ N. and $95\frac{1}{2}^{\circ}$ W.; and my journey had for its object the search of the southern shores of Melville Island, where Parry, in 1819, for the first time braved an Arctic winter, and which he describes as a favourite resort of reindeer and musk-ox. In short, we considered it as an Arctic paradise. Great was my joy, and unbounded was the enthusiasm of my men: not only did they expect to find our missing countrymen there, but also to enjoy an unlimited supply of venison steaks. Melville Island, however, was nearly 300 miles away, and to reach it difficulties had to be surmounted. In overcoming them my party proved themselves to be all that I could wish, and deserving of my highest commendations. The first check to our exuberant spirits came in the shape of *frost-bites*. The temperature suddenly fell to 40° below zero, the mercury froze, and a gale was blowing. To ascertain the extent of injury, it was necessary to examine the men's feet; ten out of thirty-five men were rendered unserviceable, and sent back to the ships. I shall never forget the anxious entreaties of some of these men to be allowed to continue the journey; when they found they could not conceal from me their wounds they shed tears like children, as they parted from us upon their dreary homeward march.—In the words of my pencil diary, written at the time, "it was with sincere regret I bade farewell to those poor fellows whom it had become necessary to send back; unconscious of the danger of neglecting their injured extremities, and despising the pain which labour occasioned, they still desired to go on; their sad countenances betrayed the bitter disappointment felt at being unable to proceed further upon our humane mission."

Whilst on the subject of extreme cold, I will insert here a few brief extracts from my diary.

"April 24th. Wind gradually freshening, frost-bites constantly playing about the men's faces. Scarcely was one cheek restored to circulation when the other would be caught.

Too cold to lunch, so we hastened on in the hope of getting shelter from the land, but in this we were disappointed. The weather became too severe to proceed, and Mr. S. having lost sensation in both his great toes (although he had been dragging at his sledge with his utmost strength without intermission), we were obliged to encamp at midnight, when only half way across the bay."

"It blew with unabated fury all day, coming down off the high land in violent squalls; dense clouds of snow-drift drove past, and the weather extremely cold and cheerless. Temp. 27° below zero.

"During the gale our little tent was very cold, and the steam of cooking, together with the moisture of our breath, condensed in considerable quantity on the inside, so that each flap caused a shower of fine snow to fall over us, penetrating and wetting our blanket-bags. We all felt delighted to be again on the march, after our twenty-three hours' detention in tents 8 ft. 8 in. long by 6 ft. 6 in. wide; in this space seven of us were packed." At these low temperatures (10° to 25° below zero) the fat of our salt pork becomes hard and brittle like suet; to drink out of a pannikin without leaving the skin of one's lip attached to it, requires considerable experience and caution; the small tin water-bottles carried by the men in their breasts were generally frozen after an hour or two."

We now saw several reindeer, and discovered that they do not migrate from the continent to the Parry group, as hitherto supposed, but permanently remain here. We can confidently affirm that neither reindeer nor musk-ox (*Ovibos moschatus*) cross Barrow Strait from the southward. When about six or seven miles east of Allison's Inlet, we found the low land to consist almost wholly of sandstone, there being only a few fragments of limestone intermixed. A bright red lichen (*Lecanora elegans*) was growing luxuriantly upon the sandstone blocks. Near this is a remarkably high bluff hill, apparently of limestone, presenting buttress-like projections near its summit, and is the only one we have met with since leaving Griffith's Island. All the lands explored westward of this position are sandstone.

When crossing from Bathurst to Byam Martin's Island, we were, for the first time, travelling out of sight of land, shaping our course by compass. Upon this plain of ice there was no object to steer for, and, to add to the difficulty of steering straight (the variation of the compass being nearly at its maximum), the north point of the needle pointed almost south,

and this variation changed very considerably with a very few miles' change of our position.

It was our custom to sleep by day and travel by night, for the sun is constantly above the horizon at this season, and the snow-glare during the day is more than human eyes can endure. One morning, as we were about to retire to rest, a bear approached our tents; he was, of course, saluted with a shower of musket-balls, and followed by all the men as he hobbled away, very briskly however, upon three legs. Not wishing to lose such a rich prize, I imprudently ran before, endeavouring to turn him; when, seeing all his other tormentors far in the rear, he *did turn*, but only to make a most determined rush at me; the broken leg seemed no longer an impediment; he had only twenty yards to go, and nearly did it in a couple of springs; in turning to run, the rough ice tripped me, but providentially the bear fell exhausted at the same moment, almost within his own length of me; before the men could come up, he was up again, endeavouring, as before, to effect his escape, but time to reload had been gained, and I soon terminated his sufferings. He was a huge old beast, and extremely thin.

I give an extract from my diary here, which explains the singular mode of his approach:—

“Shortly after pitching our tents, a bear was seen approaching. The guns were prepared, men called in, and perfect silence maintained in our little camp. The animal approached from the leeward, taking advantage of every hummock to cover his advance until within seventy yards; then, putting himself in a sitting posture, he pushed forward with his hind-legs, steadying his body with his fore-legs outstretched. In this manner he advanced for about ten yards farther, stopped a minute or two intently eyeing our encampment, and snuffing the air in evident doubt; then he commenced a retrograde movement by pushing himself backwards with his fore-legs as he had previously advanced with the hinder ones. As soon as he presented his shoulder, Mr. Bradford and I fired, breaking a leg and otherwise wounding him severely; but it was not until he had got 300 yards off, and had received six bullets, that we succeeded in killing him. All the fat and blubber amounted only to about 50 lbs. This, together with some choice bear-steaks, we took. His stomach contained portions of seal.”

A few days afterwards I shot another bear, but at the more prudent distance of a hundred yards. I chose the

moment to fire whilst he stood erect, as they sometimes do to reconnoitre. The bullet passed through his heart. The layer of blubber with which these animals are encased always afforded a most welcome increase to our stock of fuel. Several bears were seen about this time. The average depth of hard, impacted snow, overlying the ice, approximately measured, was two feet.

On the 6th of May we reached Byam Martin's Islands. The shore is a mixture of gravel and mud; the rock is sandstone. Some fragments of coal were found. On some of the very few patches of land bare of snow we saw some short grass, moss, and saxifrage. Two hares were seen, and shot. We encamped on a large muddy flat, the produce of the annual rush of water from a ravine. This island rises gradually to about 500 feet near its centre, but its shores are very low.

We encamped twice upon this island upon our return; and I shall here insert some of the observations made at that time:—

“Encamped near the south extreme (Cape Gillman), 15th June.—Found here a number of flat stones on a gravel ridge close to the beach, with several bones about them. Amongst these were the skull of a musk-ox, antler of a deer, and jaw of a bear. This was plainly the site of an Esquimaux encampment. The burrows of lemmings are extremely numerous. Saw many old tracks of deer and oxen; also one of a wolf. Picked up a few small pieces of coal and sandstone containing fossil shells.” The sandstone of Byam Martin's Island is of two kinds—one red, finely stratified, passing into purple slate, and very like the red sandstone of Cape Bunny, North Somerset, and some varieties of the red sandstone and slate found between Wolstenholme Sound and Whale Sound, West Greenland, lat. 77° north. The other sandstone of Byam Martin's Island is fine, pale-greenish, or rather grayish-yellow, and not distinguishable in hand specimens from the sandstone of Cape Hamilton, Baring Island. It contains numerous shells and casts of a terebratuliform Brachiopod, closely allied to the *Terebratula primipilaris* of Von Buch, found abundantly at Gerolstein in the Eifel. On the whole, Mr. Haughton inclines to the opinion that the sandstones, limestone, and coal of Byam Martin's Island, and the corresponding rocks of Melville Island, Baring Island, and Bathurst Island, are low down in the Carboniferous System, and that there is in these northern coal-fields no subdivision into red sandstone, limestone, and coal-measures,

such as prevail in the west of Europe. If the different points where coal was found be laid down on a map, we have in order, proceeding from the south-west: Cape Hamilton, Baring Island; Cape Dundas, Melville Island, south; Bridport Inlet and Skene Bay, Melville Island; Shomberg Point, Graham Moore Bay, Bathurst Island; a line joining all these points is the outcrop of the coal-beds of the south of Melville Island, and runs E.N.E. At all the localities above mentioned, and, indeed, in every place where coal was found, it was accompanied by the grayish-yellow and yellow sandstone already described, and by nodules of clay ironstone, passing into brown hematite, sometimes nodular and sometimes pisolitic in structure. "Several flocks of king-ducks and Brent geese flew past, and the first tern (*Sterna arctica*) of this season was seen. All the plants are putting out green shoots, but the *Saxifraga oppositifolia* is the only one in flower as yet. On the east point of the island is a very remarkable block of light-coloured sandstone, shaped like a sugarloaf. It is in a vertical position, and 11 feet high. Near this spot I found the ruins of five or six Esquimaux habitations, and about them a few bones, a portion of an antler, and a piece of decayed fir. From their position, I believe them to be the same ruins seen by Captain Sabine, and described in Sir E. Parry's First Voyage. From here the land recedes to the west of north, and the shore changes considerably; fine sand takes the place of mud, and the land is more barren and stony. This east point is strewn with large blocks of sandstone."

At length Melville Island was reached: a few ptarmigan and hares shot; fragments of coal found in the ravines and water-courses. Well do I recollect my first interview with a herd of musk-oxen, for such my telescope revealed to be a dozen black spots some two or three miles off upon a snow-covered plain. With deep anxiety I crept along the ground, vainly endeavouring to conceal my approach behind the few points of rocks or stones which appeared above the snow, and fearing lest the oxen should charge, or, worse still, run away. They did neither. When within long rifle-shot, I fired at the only one standing up; he gave a slight start, as if he felt something unusual, and in a minute or two reeled and fell lifeless. This proceeding did not in the least disturb the rest. I fired again at one of those lying down, and left them, to return with my men, and carry away the beef.

The "Winter Harbour" of Parry was reached, and the record I deposited there was found by M'Clure, just one year

after. As is well known, he had approached from Behring's Straits; so that this communication of mine to him was the first ever made through the North-West passage.

On the 22nd of May I shot another musk-ox; the herd consisted of eight animals. On seeing me suddenly appear within two hundred yards of them, they started off; but almost immediately wheeled about, and formed for defence in a semicircle, close together, with their heads down, their sharp, curved horns looking sufficiently formidable to deter any one except a hungry Arctic traveller. Approaching slowly, and cautiously crawling along the ground to within one hundred yards, I waited some minutes until their patience was exhausted, when one of them turned so as to present his shoulder. I fired;—those nearest him moved out of the way as he reeled and fell, but otherwise they continued undisturbed in the same defensive posture, until I had retired to a considerable distance; and then, without noticing their fallen companion, renewed their search for pasture, by scraping away the snow with their hoofs.

On approaching Cape Providence, we found the land, hitherto low, to consist of a fine range of hills, presenting boldly rounded outlines, with a narrow margin of low land intervening between their bases and the sea. Here are many well-sheltered and almost fertile spots, having southern aspects. This low land had lost much of its winter covering of snow, and was imprinted with innumerable tracks of deer and oxen of former seasons; it is probable that many of these foot-marks are even several years old. There were no fresh tracks either on the land or snow. Two ravens and five ptarmigan were seen.

We found here some drifted fragments of coal, of granite, and of gneiss, brought, probably, by the floating ice, and stranded; also one large boulder of dark stone (hornblende schist). On the muddy bank of a ravine I saw some recent *Venus?* shells, appearing as if washed down out of the soil; and a solitary piece of limestone, containing crinoidal stems, probably drifted hither from Griffith's Island.

From this Cape to Cape Dundas, the farthest point he reached, Parry has minutely described the coast. We found, I think, more game than he did; hares were the most abundant, and generally in flocks,—one of these numbered twenty-three. The traces of oxen and deer were also numerous. Only one wolf-track was seen; its impression measured 5 inches (nails included) in length, and 4 inches in breadth; the

average length of stride from toe to heel was 19 inches. The vegetation along the bases of the cliffs was more luxuriant than I had yet seen. In every position protected from the falling *debris*, moss and grass grew; and the grass was not in scanty tufts, as hitherto met with, but generally diffused as in pasture land of milder climates; it was short, and there was a good deal of moss growing through it. I could but seldom land along this steep coast. The hummocks pressed in against the shore were of every description of ice, from immense blue masses of rounded form, to crushed-up fragments of floe ice, varying in thickness,—the whole forced together, and raised by enormous pressure to an average height of twenty-five feet. This icy barrier is frozen to the shore, and is the "ice-belt" of Dr. Kane. Against it the sea ice abuts, rising and falling with the tide, and in many places leaving an impassable trench of sludge and water. Crossing this tide-crack and ice-belt is a matter of danger as well as difficulty, owing to the many deep fissures covered with soft snow.

Most of the ice about Cape Dundas has been drifting in from the extensive ice-covered sea to the westward, and is quite distinct from any hitherto met with in the confined area of Barrow's Strait. I can only compare it to long waves suddenly frozen, and studded over by hemispherical mounds of ice. I believe it to be very old field ice, its surface having become deeply channelled by repeated summer thawings; hence the blue rounded eminences, which are often sufficiently lofty to intercept one's view of the horizon^a. Having left Cape Dundas behind us, we commenced our discovery of new land. Abundance of coal was found amongst the *debris* at the base of the cliffs. We found the shore to trend gradually round to the north and north-east, leading us into the Liddon's Gulf of Parry. A long line of coast could be seen stretching away from the north shore of Liddon's Gulf, till lost in the western horizon. The extent of new coast-line discovered upon this occasion amounted to 160 miles. On the 28th we experienced the highest temperature, 52° at noon; in the tent it rose to 74°, so I was obliged to sleep outside. Much of this heat was owing to reflection, I think, for the lightest wind felt cool. Several caterpillars appeared, also two silvery gulls, a fox, and some snow-buntings. This land has a north-western aspect, and there is but little vegetation; it is of moderate elevation,

^a This ice is spoken of by Sir R. M'Clure as "the tremendous Polar park;" and by the Esquimaux of Cape Bathurst it is called "the land of the white bear."

sloping gently down to the sea. These slopes are generally barren clay. Burrows of lemmings are extremely numerous; traces of oxen and deer are rare; ptarmigan occasionally seen,—the female has now acquired nearly half her summer plumage.

We often derived assistance from our tent "floorcloth," set as a sail upon the sledge—the tent-poles serving as mast and yard. In this manner we travelled into Liddon's Gulf, in a very thick fog, before a fresh, fair wind, with the addition of a large kite, which not only gave us a friendly pull, but served to guide us whenever the land was obscured from view. Heard the strange hunting-cry of the fox, which puzzled the men very much, and was by them supposed to proceed either from a wild goose, a hawk, or a seagull; indeed, it might easily be mistaken for any of these birds, and had I not subsequently seen the fox, and ascertained the fact for myself, could hardly have believed it. The fox is a good ventriloquist; it is difficult to judge from what direction or from what distance the sound proceeds. Having frequently heard it, I suppose this is their natural cry, although Captain Lyons states that they *imitate* the wild goose.

In Liddon's Gulf I saw and wounded a wolf; he was changing his coat, the face and shoulders being dark brown, whilst all the rest remained of a yellowish-white. He was a lean, gaunt, jaded-looking brute, with disproportionately long legs; the wound caused him to vomit the contents of his stomach, which consisted entirely of portions of young seal.

On 1st June I reached Bushnan Cove, and, taking four men with me, entered the ravine at its head; spreading ourselves across, we walked up it, and soon found the encampment of Sir Edward Parry when here on the 11th June, 1820. The very accurate account published by him at once guided us to his record, his ammunition, and the remains of his broken cart. The crevices between the stones piled over the record were filled with ice, and its tin case was eaten through with rust. The powder had been destroyed by wet. We erected a cairn at the spot, and placed within it a record; then, gathering a few relics of our predecessors, we returned with the remains of the cart to our encampment; an excellent fire had been made with willow-stems, which soon thawed the ice out of Parry's record tin; the record was carefully removed, but little more than the date was distinguishable. Had it been in a better state of preservation, I would have restored it to its lonely position. Some tin canteens were found; they were

bright on the outside, but wet had lodged within, and rust had eaten small holes through all of them. In his Account Sir E. Parry mentions a "sumptuous meal of ptarmigan," which his party enjoyed at this place; their bones lay strewed about the encampment; they were not decayed, but merely bleached by their thirty-one years' exposure; I found them as elastic and tough as if Parry's people had picked them only a few weeks before, thus affording a most striking instance of the conservative properties of the climate.

The hill-tops and sides along the south shore of Liddon's Gulf, and as far as Cape Dundas, are generally bare, composed of frozen mud, arising from the disintegration of shale, the annual dissolving snows washing them down and giving them a rounded form. The southern slopes generally support vegetation. Fragments of coal are very frequently met with, and at the mouth of a ravine on the south shore of Liddon's Gulf, I saw plenty, of very good quality; it contained a considerable quantity of pyrites or *bisulphuret* of iron.

Leaving Liddon's Gulf, we proceeded to cross the land for Winter Harbour; our first encampment was upon a mossy bank; it looked so soft, so refreshing, and to us so beautiful, after our long residence upon the ice, that the men at once named it "Mount Pleasant." Several caterpillars were seen. In breaking the horns of a musk-ox skull, we found that they were solid for more than two-thirds from the tips. The frequent calling of ptarmigan during our stay reminded us of the novelty of our position.

The land was low, gently undulated, and almost entirely covered with a few inches of snow. We saw a few reindeer in our land transit, and shot one young buck who approached us with more curiosity than prudence; his horns were only twelve inches long, and still covered by the skin; he was nearly white, but this winter coating fell out on being handled.

On the 5th June we reached Winter Harbour, still buried in the snows of winter, and my men drily remarked that it deserved its name. Our noisy approach disturbed a hare from under the lee of the huge sandstone rock which bears Parry's inscription; she came towards us, and sat quietly within twenty yards for some time, watching us, then retired to her home beneath it. This rock is 22 feet long, 10 feet high, and 7 or 8 feet broad. The inscription cut upon its southern face in 1820 appeared quite fresh: scarcely any of the minute black lichen which abundantly covers the rock had grown up to the letters. The bright red lichen is nearly as plentiful, but appears to be of slower growth, not having grown into any of the letters.

I stopped here a day to rest the men, and made up for the delay by shooting a musk-cow, one of a herd of thirteen. Some deer were seen, and two flocks of ducks, the earliest of the season.

On digging the snow off the site of Parry's observatory, sundry small fragments of English coal, wood, broken glass and crockery, nails, and a domino were found.

We lived on very friendly terms with our neighbour the hare. She regarded us with confidence, hopped about our tent all day, and *almost* allowed the men—who were most anxious to carry her back to the ship as a pet from Winter Harbour—to touch her. Her fearlessness is the most convincing proof that our missing countryman had not been there.

My medical skill was put to the test here, and found wanting: John Salmon complained of violent pain in his chest, and difficulty in breathing. It was agreed by the men that his complaint was "wind in the stomach," and they recommended peppermint drops. I was provided with medicines, and instructions for their uses, well adapted to ordinary occasions; but this complaint was not in my Medical Directory, neither were the peppermint drops in my *Materia Medica*. Supposing that something he had eaten disagreed with him, I acceded to the proposal of the party, and ordered half a gallon of warm salt-water to be administered, which, acting as an emetic, afforded some relief. At this time we were subsisting upon musk-ox beef, which we consumed in enormous quantities, with a little biscuit only, not having even pepper or salt; subsequently, when we had plenty of both, Salmon had a second attack; but this time he did not call in my aid; he told me he cured himself in half an hour, by swallowing a large draught of pepper and salt. Having burned the last of Parry's cart, we with difficulty gathered enough of willow to cook two meals, and started upon our homeward journey.

June 8th.—Found some ponds on the land under Bounty Cape, and enjoyed the first drink for the year 1851, without the aid of kettle and spirit-lamp.

Some silvery gulls, brent geese, dotterels, sand-pipers, ducks, and ptarmigan were seen.

Whilst encamped here, the cackling of the geese, screaming of gulls, and whistling of phalaropes, frequently awoke us, our ears being unaccustomed to any other sound than the cheerless rustling of snow-drift. Sorrel was more abundant than usual; its leaves of last year were withered and tasteless. Several very large seals were basking on the ice. Upon Dealy

Island I found a vast deal of gneiss and granite in small fragments, of every variety of colour, mixed with the loose sandstone soil. The island is 180 feet high, and 5 miles in circumference.

The thaw had now commenced; pools of water appeared upon the ice; and for the rest of our journey we were almost constantly wading through them. Following the shore to Point Griffith, some few ruins of Esquimaux habitations were seen; they consisted of circles of stones almost buried in the soil, and covered with moss. About them I usually found decayed bones of deer, seals, and oxen. After what we saw of the ptarmigan bones at Parry's encampment, I am inclined to assign a very remote period for the time when these ruins were tenanted. Patches of moss of unusual luxuriance generally indicated the position of these ruins and bones. On the 11th we experienced great difficulty in making progress, owing to the bursting out of water from the ravines. The temperature this afternoon was, in the shade 37° , in the sun 50° ; in the tent 65° . The day was unusually fine, and water being abundant, we enjoyed a partial scrub with soap, the first for nearly two months. The ptarmigan have commenced to lay their eggs: the hen is in perfect summer plumage, but the cock bird has only just begun to change a few feathers about his head.

On 13th June, near Point Griffith, saw some bones of a small whale, twenty-five feet above the sea; the jaw-bones were six or seven feet long. Wading through pools of water, at a temperature of 33° , and fourteen inches deep, was here more frequent than agreeable. It was here that I separated from the sledge *Resolute*, under the command of Mr. Bradford, on the 11th May, in order that he might explore the east coast, whilst I searched the south shore of Melville Island; he had been my excellent companion for twenty-five days of anxious outward journeying. After his departure I could only give vent to my reflections by inscribing them in my diary, and at once wrote down this passage:—"When our isolated position is considered, how completely we were exposed to all the vicissitudes of a rigorous climate, and dependent upon our own efforts, and the accidental condition of the ice for advance or retreat, had not hope come to the rescue our farewell would indeed have been a painful one." That Bradford felt something of this sort is evident from this passage in his diary:—"We shook hands and wished each other success. I must admit that when the *Perseverance* (M'Clintock's sledge) was lost sight of in the distance,

I began to have some little feeling of the loneliness of our position, almost as if the last link connecting us with the living world had been severed. That these feelings were participated in by the men of the two parties, was evidenced by the manner in which they cheered and shook hands with each other." Before taking leave of Melville Island, I will take this opportunity of remarking, that at the very time when I was upon the summit of Cape Dundas, and anxiously scanning with my telescope the distant cliffs of Banks' land, a party from M'Clure's ship, the Investigator (then wintering in Prince of Wales's strait), was actually exploring them!

Putting on our wet clothes, we started in the evening to cross the strait between Melville and Byam Martin Islands. From the hill the floe looked most promising, level, and free from hummocks; but we soon found that it was covered with deep, soft snow, which filled up all inequalities, and occasioned us five hours of excessive labour to advance four miles. Frequently, the sledge sank so deep in this wet, adhesive snow, that we had to dig it out. There was much delicious fresh water on the ice, which quickly filled up our foot-marks when we reached down to it, but we frequently sank fifteen or sixteen inches without doing so.

On the 15th we reached Byam Martin Island, and on the 17th commenced to traverse the strait between it and Bathurst Island. Here the travelling was still more difficult; for the first nine hours and a quarter we could only advance four miles. The whole distance across is only twenty-nine miles, yet it occupied us for four days, literally working for our lives. Bradford had passed here eight days before; having sprained his leg, he was obliged to be carried on his sledge. We were now upon that part of Bathurst Island which forms the western limit of Graham Moore Bay, and is called Cape Schomberg. I was now able to travel along the shore, where the ice being more cracked, the melted snow had run off, yet such extracts as the following from my diary show that difficulties of another kind greatly hindered our progress.

"June 21st.—For the last three hours our journey was very fatiguing, as we had to cross pools of water, crusted over with a mixture of ice and recently fallen snow, an inch and a half thick, yet not strong enough to bear. The men had to break the ice before the sledge, which cut their boots and hurt their feet." Again, on the 23rd.—"Started under sail, a pleasant breeze blowing. Three hours of very severe labour were spent in reaching the Point—a distance of two miles. A great part

of this time was spent in digging the sledge out of the deep, soft, clogging snow." Occasionally we had to unload the sledge, and carry everything forward to better ice. On a low, sandy point, a few miles east of Cape Schomberg, were a great many large blocks of sandstone strewed about, some of them in strange positions. One large block, more than a ton in weight, stood upon another, as if placed there. They had no appearance of being rolled or water-worn; but might have been transported hither upon ice before the land had reached its present elevation above the sea. A few reindeer, hares, and seals, and many brent geese and ducks, were seen.

Point Scoresby is low, but remarkable for the huge masses of sandstone rock which protrude through the loose stones and gravel. All this land round Graham Moore's Bay is nearly bare of vegetation, and the bluff hills on the low shore have much similarity of form, about 400 feet high, and abrupt to seaward, and gradually sloping away towards the interior.

In Peddie Bay we noticed a good deal of moss on the southern slopes of the land; no animals, and but few birds, were seen. I saw here the fragments of a deer, the bones having been broken up into small portions, probably by wolves. Here we found many small pieces of coal, a great many bivalve and spiral shells, thrown up on the beach; also a piece of drift-wood, apparently a portion of the root of a fir-tree;—it was twenty feet above the sea. Near Cape Cockburn, where the shore has a western aspect, it is quite barren, and the soil loose and sandy. Our encampment was on a bank of very fine white sand. Here Bradford's party were obliged to throw away all their treasured relics of musk-ox and reindeer horns, &c.

When near Cape Cockburn, I saw the bones of a large whale, about 300 yards from the beach, and probably twenty-five feet above the sea. One of the jaw-bones measured 18 feet 8 inches; therefore the length of the animal must have been between 55 and 60 feet. Near this place were the ribs of some smaller animal, probably a narwhal.

The low land between Cape Cockburn and Allison's Inlet was almost cleared of snow, and was well covered with moss, interspersed with tufts of short grass; a few reindeer and ducks were seen. Upon Cape Capel were the ruins of ten winter habitations of Esquimaux. There were many bones of whales, including three crown bones; also bones of bears, seals, &c.,—some of them having been cut with a sharp instrument. Along this shore, as far as Allison's Inlet, Esquimaux ruins are numerous,—all of them moss-covered, and

many scarcely recognisable. The general form of the winter huts is an oval, with an extended opening at one end; their size being about 7 feet by 10. They had been roofed by the bones of whales, and these covered over with flat stones and earth.

It is impossible to form an accurate idea as to when these abodes were tenanted; from whence their inhabitants came; whether they perished here, or whether they migrated, and why. From various circumstances, including the fresh appearance of Parry's traces at Bushnan Cove, I am led to believe that, of all those which have come under my observation during this journey, none have been inhabited within two hundred years.

I saw here two reindeer, a fox, some ducks (king, eider, and long-tailed), and a small bird of the bunting species. It was of an uniform dusky brown colour, with a yellowish bill; it had a shorter tail than the snow bunting, and was altogether a smaller and more plump bird. I think it was a female Lapland finch (*Plectrophanes nivalis*). They are common in South Greenland, but have not been obtained in Barrow's Strait.

Here we rejoined Mr. Bradford and his party; he was still obliged to travel on his sledge, which accounts for our having overtaken them. A day was spent in resting the men, and in patching our clothes and boots. All of us had swollen feet and ankles, in consequence of having walked for ten or twelve hours every night through ice-cold water, for such a lengthened period. It is not to be wondered at that we were all a *little stiff* at starting.

On the 29th of June we commenced crossing the ice to Cornwallis Island. We found it very much flooded, generally knee-deep, and sometimes we were wading up to our waists, the sledges floating after us; to meet with a dry spot was quite a treat. The streamlets from the land had carried down a vast deal of mud upon the ice, which, from its dark colour, attracted the solar heat, and greatly hastened the thawing of the ice. In many places it was "*honeycombed*"—i. e. holes had thawed through it; hence it was sometimes rather a nervous matter to lead the way across these dark, slushy pools, uncertain whether one might not *disappear* through the ice at every step! Added to this, there was generally tough half-inch ice on the pools, obliging us to lift our feet high above it at every step in order to break it down.

On the 1st July the first dovekie was seen; they seldom go farther westward. During our sleep a bear passed within

fifteen yards of the tent. Fortunately for him, he was not of an inquisitive or a troublesome disposition, as my rifle was always ready by my side, and I had cut a very convenient "window" through the end of the tent. The western shore of Cornwallis Island is almost devoid of vegetation; here and there rude masses of the limestone rock protrude through the loose frost-rent fragments which generally cover its surface. On the 4th of July we reached our ships, reduced in flesh, but not in strength or spirit, and deeply sensible of our obligations to that sustaining Power which had shielded us from harm, and supported us through innumerable difficulties. During our absence of eighty days the temperature varied from 52° above zero to 40° below; average temperature 15°, and range 92°. 4 musk oxen were shot, and 46 seen; 1 reindeer shot, and 34 seen; 2 bears shot, and 10 seen; 1 wolf seen, and wounded; 1 snowy owl seen, and shot; many hares, ptarmigan, brent geese, and ducks were seen, and a few of each shot. Much more might have been killed, but I never wantonly destroyed life; their presence often served to relieve that oppressive feeling which the desolation and unbroken stillness of the solitudes are wont to occasion.

During the stay of the ships at Griffith's Island, abundant opportunity was afforded of collecting geological specimens from this and the neighbouring localities. The following brief descriptions will suffice to show the value and interest of the collections brought home from this place:—

GRIFFITH'S ISLAND (LAT. 74° 35' N.; LONG. 95° 30' W.)

1. Beautiful specimens of the *Cromus Arcticus*. Pl. VI. Fig. 5.
2. *Orthoceras Griffithi*. Pl. V. Fig. 1.
3. An *Orthoceras* with lateral siphuncle, and simple circular outline of septa.
4. *Loxonema Rossi*. Pl. V. Figs. 6, 8, 9, 10, 11.
5. Numerous specimens of crinoidal limestone.
6. *Strophomena Donnetti* (Salter). Sutherland's Voyage; Pl. V. Figs. 11, 12.
7. *Atrypa phoca* (Salter). Pl. V. Figs. 3, 4, 7; and a ribbed *Atrypa*, not identified with European species, and undescribed.
8. An undescribed bryozoan Zoophyte. Pl. VII. Fig. 6.
9. *Calophyllum Phragmoceras* (Salter). Sutherland; Pl. VI. Fig. 4.
10. *Syringopora geniculata*.
11. An undescribed species of *Macrocheilus*.

BEECHY ISLAND (LAT. 74° 40' N.; LONG. 92° W.)

1. *Orthoceras* (species).
2. Great multitudes of *Atrypa phoca*, forming, in fact, a dark-coloured earthy *Atrypa* limestone.
3. With these were associated many species of *Loxonema*, sometimes so abundant as to form a pale pink and whitish *Loxonema* limestone.
4. A species of ribbed *Atrypa*.
5. Crinoidal limestone in abundance.

6. *Syringopora reticulata*.
7. *Calophyllum phragmoceras* (Salter). Sutherland; Pl. VI. Fig. 4.
8. *Cyathophyllum cœpitosum*.
9. *Cyathophyllum articulatum* (Edwardes and Haime).
10. *Favosites Gothlandica*?
11. *Favosites alveolaris*?
12. *Faristella Franklini* (Salter). Sutherland; Pl. VI. Fig. 3.
13. *Clytiophyllum Salteri*. Sutherland. Pl. VI. Fig. 7.
14. *Cyathophyllum* (species).
15. *Loxonema*, described by Mr. Salter in Sutherland's "Voyage to Wellington Channel;" Pl. V. Fig. 19.

This is a fine slab of limestone, almost altogether composed of the remains of *Loxonema Salteri*, No. I., and *Atrypa phoca*. It appears to have been quietly deposited at the bottom of a deep submarine depression, swarming with Pyramidellidæ and deep-water Brachiopoda. The physical conditions indicated by the fossils are also rendered probable by the rock itself, which consists of fine gray limestone, subcrystalline, and intimately blended with the finest and most delicate description of mud, such as could only be found where the water was deep, and all currents far removed.

**CORNWALLIS ISLAND, ASSISTANCE BAY (LAT. 74° 40' N. ;
LONG. 94° W.)**

1. *Orthoceras Ommaneyi* (Salter). Sutherland; Pl. V. Figs. 16, 17.
2. *Pentamerus conchidium* (Dalman). Sutherland; Pl. V. Figs. 9, 10.
3. Pentamerus limestone.
4. *Cromus Arcticus*.
5. *Cardiola Salteri*. Pl. VII. Fig. 5.
6. *Syringopora geniculata*.

CAPE YORK, LANCASTER SOUND (LAT. 73° 50' N. ; LONG. 87° W.)

A specimen of the same fossil coral which I have named, doubtfully, from Beechy Island, as *Favosites* or *Calamopora Gothlandica*; it is not impossible, however, that it is not a *Calamopora* at all, but a species of *Chætetes*.

**POSSESSION BAY, SOUTH ENTRANCE INTO LANCASTER SOUND
(LAT. 73° 30' N. ; LONG. 77° 20' W.)**

Specimens of brown earthy limestone, with a fetid smell when struck with a hammer; resembles closely the limestone of Cape York, Lancaster Sound.

Coal, sandstone, clay ironstone, and brown hematite, were found along a line stretching, as already mentioned, E. N. E. from Baring Island, through the south of Melville Island, Byam Martin's Island, and the whole of Bathurst Island. Carboniferous limestone, with characteristic fossils, was found along the north coast of Bathurst Island, and at Hillock Point, Melville Island.

HILLOCK POINT, MELVILLE ISLAND (LAT. 76° N.;
LONG. $111^{\circ} 45'$ W.)

Productus sulcatus. Pl. VII. Figs. 1, 2, 3, 4, 7.
Spirifer Arcticus.

BATHURST ISLAND, NORTH COAST, CAPE LADY FRANKLIN?
(LAT. $76^{\circ} 40'$ N.; LONG. $98^{\circ} 45'$ W.)

Spirifer Arcticus. Pl. IX. Fig. 1.
Lithostroton basaltiforme.

BALLAST BEACH, BARING ISLAND (LAT. $74^{\circ} 30'$ N.; LONG. 121° W.)

1. Wood fossilized by brown hematite; structure quite distinct.
2. Cone of the spruce fir, fossilized by brown hematite.

**PRINCESS ROYAL ISLANDS, PRINCE OF WALES'S STRAIT,
BARING ISLAND** (LAT. $72^{\circ} 45'$ N.; LONG. $117^{\circ} 30'$ W.)

1. Nodules of clay ironstone, converted partially into brown hematite.
2. Native copper in large masses, procured from the Esquimaux in Prince of Wales's Strait.
3. Brown hematite, pisolitic.
4. Grayish-yellow sandstone, same as Cape Hamilton and Byam Martin's Island.
5. *Terebratula aspera* (Schlotheim).

CAPE HAMILTON, BARING ISLAND (LAT. $74^{\circ} 15'$ N.;
LONG. $117^{\circ} 30'$ W.)

1. Grayish-yellow sandstone, like that found *in situ* in Byam Martin's Island.
2. *Coal*.—The coal found in the Arctic regions, excepting that brought from Disco Island, West Greenland, which is of tertiary origin, presents everywhere the same characters, which are somewhat remarkable. It is of a brownish colour and lignaceous texture, in fine layers of brown coal and jet-black glossy coal interstratified in delicate bands not thicker than paper. It has a woody ring under the hammer, recalling the peculiar clink of some of the valuable gas coals of Scotland. It burns with a dense smoke and brilliant flame, and would make an excellent gas coal; and, in fact, it resembles in many respects some varieties of the coal which has acquired such celebrity in the Scotch and Prussian law courts, under the title of the Torbane Hill mineral.

CAPE DUNDAS, MELVILLE ISLAND (LAT. $74^{\circ} 30'$ N.;
LONG. $113^{\circ} 45'$ W.)

Fine specimens of coal.

CAPE SIR JAMES ROSS, MELVILLE ISLAND (LAT. $74^{\circ} 45'$ N.;
LONG. $114^{\circ} 30'$ W.)

Sandstone passing into blue quartzite.

CAPE PROVIDENCE, MELVILLE ISLAND (LAT. 74° 20' N. ;
LONG. 112° 30' W.)

A specimen of crinoidal limestone, apparently similar to that occurring in Griffith's Island, from which, however, it could not have been brought by the present drift of the floating ice, as the set of the currents is constant from the west. If brought to its present position by ice, it must have been under circumstances differing considerably from those now prevailing in Barrow's Strait.

Yellowish-gray sandstone.

Clay ironstone passing into pisolitic hematite.

WINTER HARBOUR, MELVILLE ISLAND (LAT. 74° 35' N. ;
LONG. 110° 45' W.)

Fine yellow and gray sandstone.

BRIDPORT INLET, MELVILLE ISLAND (LAT. 75° N. ;
LONG. 109° W.)

Coal, with impressions of Sphenopteria.

Ferruginous spotted white sandstone.

Clay ironstone, passing into brown hematite.

SKENE BAY, MELVILLE ISLAND (LAT. 75° N. ; LONG. 108° W.)

Bituminous coal, with finely divided laminæ, associated with brown crystalline limestone, with cherty beds, and gray-yellowish sandstone, passing into brownish red sandstone.

HOOPER ISLAND, LIDDON'S GULF, MELVILLE ISLAND
(LAT. 75° 5' N. ; LONG. 112° W.)

Nodules of clay ironstone, very pure and heavy, associated with ferruginous fine sandstone and coal of the usual description.

BYAM MARTIN'S ISLAND (LAT. 75° 10' N. ; LONG. 104° 15' W.)

Yellowish-gray sandstone, *in situ*, containing a ribbed *Atrypa*, allied to the *A. primipilaris* of V. Buch, and the *A. fallax* of the Carboniferous rocks of Ireland.

Reddish limestone, with broken fragments of shells, of the same description of Brachiopod as the last.

Coal of the usual description.

Fine-grained red sandstone, passing into red slate.

Scoriaceous hornblendic trap (boulders).

GRAHAM MOORE'S BAY, BATHURST ISLAND (LAT. 75° 30' ;
LONG. 102° W.)

Coal of the usual quality.

At Cape Lady Franklin, and at many other localities along the north shore of Bathurst Island, carboniferous fossils in limestone, clay ironstone balls passing into brown hematite,

cherty limestone, and earthy fossiliferous limestone, with the same species of *Atrypa* as at Byam Martin's Island, were found in abundance by Sherard Osborn, Esq., Commander of H.M.S. Pioneer, who has made the following curious note to his Journal (*vide Arctic Expeditions, 1854-55, p. 254*):—
 “The above collection was delivered over to Captain Sir Edward Belcher, C. B., by Commander Richards, at 2 P.M., on 7th Nov., 1853.”

It is to be hoped that they may soon be made available for the elucidation of the geology of this most interesting portion of the Arctic discoveries.

A question of very considerable geological interest is raised by the occurrence together of corals, in the same locality, of Silurian and Carboniferous forms.

I entertain no doubt of their being *in situ*, and occurring in the same beds, for the following reasons:—

1st. The Syringopores of Griffith's Island were found at an elevation of 400 feet above the sea, and, therefore, could not be brought by drifting ice.

2nd. The specimens were apparently of the same texture and composition as the native rock, whenever the latter was visible from under the snow.

3rd. I do not believe in the lapse of a long interval of time between the Silurian and Carboniferous deposits,—in fact, in a Devonian period.

4th. The same blending of corals has been found in Ireland, the Bas Boulonnais, and in Devonshire, where Silurian and Carboniferous forms are of common occurrence in the same localities.

5th. In the Carboniferous beds proper of Melville Island, and Bathurst Island, there were not found, so far as I am aware, any corals of the same character as those at Griffith's Island, Cornwallis Island, and Beechey Island, which could give a supply to be drifted to the latter localities in a Pleistocene sea. It is plain, from the height at which the corals were found, that, if they were brought to their present localities by ice, it must have been during the period known as Post-tertiary, as the present conditions of drift-ice in Barrow's Straits do not permit us to suppose them to have been placed where we now find them by existing causes.

THIRD EXPEDITION.

In the summer of 1852 I was again at Melville Island, not tracing its shores with a sledge, but in command of H. M. screw-steamer *Intrepid*, and under the orders of Capt. Kellett, C. B., of the *Resolute*, which ship has since become so well known from her having lately been presented, fully equipped for Arctic service, to the Queen, by the President and people of the United States.

We found Sir Robert M'Clure's record at Winter Harbour just six months after he had deposited it there. Having secured our ships near Dealy Island, Bridport Inlet, early in September, we commenced preparations for carrying out depôts of provisions, in furtherance of our intended spring explorations, as soon as enough of snow should have fallen to enable our sledges to travel. But as I was to cross Melville Island to the north, I set out at once, with two light, strong carts, each drawn by eight men, and heavily laden. Our first mishap was breaking through the ice, whereby considerable loss of provisions and delay were occasioned. My good rifle sank to rise no more. We succeeded in depositing our depôt at Port Nias (about fifty miles only from our ships), after six weeks of intense labour; half of this time we worked with carts, and then, when snow had fallen, we used sledges.

The interior of the country was gained by ascending a ravine; we then traversed a stony, barren plain, intersected by numerous deep ravines with precipitous sides. The general level of this central plateau was about 600 feet above the sea. For the first eighteen days we did not see a living creature. After the middle of October we saw several reindeer migrating westward, where we subsequently discovered their favourite feeding-grounds. When travelling through the ravines our progress was occasionally almost prevented by the ice-cliffs, or glaciers, attached to their sides, and protruding nearly across. They are formed by the drifting snows of winter collecting in the angles or sheltered portions of the ravines, sometimes wholly filling them up; but the summer torrent cuts its way through, forming in most instances a contracted passage, sometimes a tunnel, beneath the snow. This compressed snow, thus saturated with water, the return of severe weather converts into an opaque, crystalline substance, nearly as hard as ice. One of these miniature glaciers was forty feet high; the water had worn away its base, leaving comfortable caverns beneath, that one might bivouac in, with

beautiful rows of huge icicles, like a crystal fringe, several feet in depth, across the entrance. Some days afterwards, when travelling before a violent gale, with snow-drift so dense as to limit our vision to about twenty yards, we were suddenly stopped by a large ravine, with precipitous sides, across our path. We attempted to travel along the glacier attached to its north side, but one or two deep, ominous-looking cracks cautioned us off. On examining this ravine I found the glacier, as usual, occupying an angle, where it extended right across in an immense arch. The tunnel beneath was 240 feet long, 70 or 80 feet wide; its height at each end was 60 feet, and at half-way through, where it was lowest, it measured 40 feet. The interior of this icy tunnel was opaque bluish-white, with glazed surface, exactly resembling real old china. The under surface of the roof was rippled in the form of miniature waves. Icicles of every possible size were disposed in clusters from fissures in the roof, or in rows along the sides; these were of the purest and most transparent ice, their lustrous appearance forming a most beautiful contrast. It was, indeed, an enchanting scene; but the fissures in the roof, and immense blocks of ice which lay as they had fallen from it, reminded me that it was not a desirable place to loiter in. These fissures explained the cracks our carts had passed over! The bed of the ravine beneath the arch was an unobstructed dry river course. Here we were weather-bound by the gale for a day. Temperature at zero, and in the tent at + 10°. The men agreed in voting noses to be a nuisance in this country, especially prominent ones, as they are usually the first part frost-bitten. Whiskers and moustaches were also condemned, not only as being useless, but most inconvenient—the former catching all the snowdrift, and one's breath condensing on the latter, forms an icicle not easily removed.

It would occupy too much space even to enumerate the difficulties of this cart journey; the carts were ill adapted, the diameter of the wheels being only three feet; they frequently stuck fast in the snow, and had to be dug out, carried forward, and reloaded. Sometimes we had to lower them over very steep banks; at other times to advance by *standing pulls* with the drag-ropes shifted to the upper rims of the wheels; when this expedient failed, we had to "dig out." The men were ready at expedients, no matter what the difficulty was, and their perseverance and ingenuity entitled them to great praise. In crossing rocky ground, when one wheel or the other was almost constantly brought up, the man whose duty it was to guide the cart by the pole in front, was tossed about from

side to side like a shuttlecock : he had to cling to it to prevent being knocked over, and to exert great patience, skill, and temper ; in going down hill it was a post of *real danger*. In every difficulty we found our nautical education a most valuable acquisition ; and for downright hard tugging, no men could have endured such fatigue, unless, like seamen, they had been inured from boyhood to dragging at ropes.

We did better with our sledges, with which, in October, we carried out the second half of our depôt.

When half-way across the Island, on the 11th, I wrote the following notes in my diary :—

“ The land which I walked over to-day is much cut up by ravines ; one of them is about 200 feet deep, and in it are steep cliffs at intervals not exceeding one or two miles. These ravines receive the drainage of extensive hollows, containing sand-banks, and a few hillocks resembling islets, which rise to the general level of the country.

“ Water appears to have been the principal agent in breaking up this country. In a few localities I saw a great deal of clay-ironstone ; small pieces of coal are sometimes found, but in the interior here it is very rare. Passed some reindeer tracks, and heard the dismal howling of three or four wolves, which proceeded from the most rugged part of the country, where the passes were few and narrow, and the chances of stealing upon their prey, of course, proportionally increased. Having no gun, and being out of sight of my party, I kept a *sharp look-out*, and soon saw a wolf attentively watching me from his lurking-place amongst the rocks. He approached by a circuitous route, concealing his approach as long as possible, and then appeared before me and trotted up boldly within easy gunshot, when I prevented any nearer approach by waving a handkerchief, and running towards him, pelting stones, &c. He was evidently ignorant of the respect due to man, and therefore I was glad his companions were not with him. About the same time three wolves were seen by my party.”

On the 14th this incident of a fox occurs :—

“ For the last mile I noticed a fox-track very frequently crossing and recrossing the direction in which we were proceeding. It led to one of our former encampments, where several scraps of canvass, pieces of rope-yarn, and empty preserved-meat tins had been scratched up from beneath the snow. This animal must have either scented the old encampment, or the cart-track leading to it, both of which were so perfectly covered with snow that every trace was obliterated.”

Again, on the 15th:—" At noon the temperature was 18° below zero, and there was just wind enough to make frost-bites of frequent occurrence. Travelled down a ravine leading to the north shore, but found it became contracted and filled with soft snow. At length we reached a part where the east side was so steep as to threaten an avalanche of stones, and the west side was faced with a glacier approaching the perpendicular, so that there was no turning aside out of it.

" Just here, too, its bed of large boulder stones was clear of snow, and, at a short distance beyond, the glacier threw itself completely across the ravine. On examination I found a low, crooked tunnel (the continuation of the water-course) beneath it, sixty or seventy yards long. This we succeeded in making a practicable passage for everything except the cart, and that we pulled up by the drag-ropes right over the glacier. Proceeded without further obstruction, and encamped at 5½ o'clock. At 7 o'clock the temperature had fallen to 28° below zero, but as night advanced it became much colder; the stars were beautifully bright, and the weather perfectly clear and calm. The cold was such that we could not sleep."

Upon the north shore, fifteen miles east of Port Nias, I found a large piece of drift timber: it was the greater portion of a fir-tree, the upper part having been broken off. It was well above high-water mark, but not embedded in the sand, perfectly straight, destitute of bark and branches, decayed upon the outside, but quite sound within. Its length was 29 feet; circumference at 2 feet above the roots, 7 feet; and at 24 feet above the roots, 4 feet 4 inches. Near this tree, but much higher up on the beach, was a granite block of dark colour and irregular form; its diameter was about 6 feet. Saw a few pieces of gneiss, which were generally of a reddish colour; upon the shingle ridges above the beach, small pieces of clay-ironstone were in greater abundance, and mixed with the gravel.

This season is always particularly gloomy; all our summer visitors have left us, with the exception of the sun, and he is on the eve of disappearing. Winter gales are of frequent occurrence, and winter temperatures occasionally take us by surprise. Of other *disagreeabilities* a few more brief extracts will afford some idea. " 23rd. Latterly our fur-blankets and sleeping bags have been rapidly getting more and more filled with frost; the latter are quite wet, whenever we are warm enough to thaw them, so that when we sleep warm we are of necessity moist also. Nor have we been able to prevent them getting

into this state. The utmost care has been taken to keep out the snow-drift and to brush our clothes before coming into the tent. The presence of this water is chiefly caused by the condensation of vapour from our warm meals, and from our breath, which falls in minute frozen particles. The quantity of moisture from one's breath is surprising; the very small aperture we usually leave open at the mouth of our bags, to breathe through, is coated with ice by the morning.

“Continued our march down the ravine through very soft snow; its sides rise to 200 or 300 feet above us; the southern side is the most precipitous, and the northern one is in many places faced with glaciers. An artistic admirer of nature might have a very delightful and instructive ramble here amongst these scenes, which are sufficiently wild and grand to raise one's admiration to enthusiasm, and, provided the latter would only keep his fingers warm, his portfolio might very soon become rich.”

On the 25th of October we set off for the ship at 7 o'clock; it was bright starlight, yet the sledges were as neatly packed, and our banners displayed with as much pride, as if we were about to march into the Great Exhibition in broad daylight. At noon we reached the *Intrepid*, in perfect health, and with half a day's provisions remaining. On weighing our buffalo blanket and coverlet, we found they had increased from 66 lbs. to 145 lbs.; and each of the sleeping bags from 6½ lbs. to 10 lbs.: the increase being due to the snow-drift and moisture they had taken up in eighteen days.

On the 4th of April, 1853, seventy-seven out of the eighty-eight individuals composing the crews of the *Resolute* and *Intrepid*, renewed the sledge-search for our missing countrymen. This time I was accompanied by Monsieur Emile de Bray, Enseigne de Vaisseau, in the French Navy, who came in command of a supply sledge. This officer had been attached to the expedition in order to obtain a knowledge of Arctic exploration.

We crossed the land as before, nothing of interest happening, except four and a half days' detention by a most violent north-wester, the temperature varying from 10° to 30° below zero. In our tent it was generally several degrees below zero. At Point Nias we completed provisions to fifty-three days, and after passing Cape Fisher, the extreme point seen by Parry in 1820, our own discoveries commenced. Oxen and reindeer were seen here. Following the tread of the coast-line to the north-west, we reached Cape Scott, in

76½° N., and 115° W.; from thence it inclined to the south-west, to Cape Russell. Having completed this N. W. side of Melville Island, Monsieur de Bray left with me all the provisions he could spare, and returned to the ship. I then proceeded to explore the off-lying land, now known as Prince Patrick's Island.

On the 20th of April I shot one of three musk-bulls, which scorned to notice my near approach, although they had galloped off on the first appearance of our party. The two survivors stood resolutely facing us, and when our men came up to carry off the meat, we were obliged to pelt them with stones to get them to move away from the spot,—holding our guns, cocked, in the left hand, whilst we repeatedly hit them with stones and lumps of earth. Having once commenced their retreat, they galloped with surprising speed up the hills for nearly two miles. On the 21st, when near Hillock Point, and about a mile off shore, we crossed four separate tracks of lemmings travelling in for the land; it would seem that these little creatures had come across the ice, from some land to the east, a distance of thirty miles.

On the 22nd the first ptarmigan was seen: and, on the 20th, at Grassy Cape, we saw a herd of eighteen reindeer; seventeen of these had no antlers, and the eighteenth had but one. Monsieur de Bray succeeded in shooting a small doe. Until the 29th, when we saw, near Cape Scott, three musk oxen, and a brace of ptarmigan, no living creatures were seen after rounding Cape Scott; the frequent tracks of foxes indicated that those little creatures were travelling northward from Cape Russell.

Cape Scott, and all the land within twenty miles of it, is low; it is tolerably well sprinkled with stunted moss, but hardly any grass. Thirty miles further to the south-west it rises abruptly into lofty hills, with bold, handsome outlines, and is intersected by numerous deep ravines. It is very beautiful dark land, not much covered with snow. Found grass, saxifrages, and ranunculi, but hardly any moss. Near Cape de Bray I saw several lumps of gneiss; one very large mass had the rounded form of a boulder; it was forty or fifty feet above the sea, was about six feet in diameter, and contained numerous coarse garnets. On 1st May, tracks of foxes and ptarmigan were numerous; saw two wolf-tracks coming from the south-west.

The first snow-buntings (*Emberiza nivalis*) were seen. We fortified ourselves with a hot musk-ox beef breakfast, instead of the usual cold bacon one, after which we washed our faces!

The "scrub" was refreshing, and would have been delightful but for the blisters and frost-bites which had been hitherto almost hidden by a coating of filth! These *favours* of the climate have been fairly earned by constant exposure to sharp winds, intense cold, and an unsetting sun. One man's nose is so raw and sore that he has to wear a cover, ingeniously made by M. de Bray out of sticking-plaster, lined with lint.

At Cape de Bray the hills rise directly from the beach, throwing their broad shadow far out upon the ice. I walked over some of them; they are almost quite barren, their surfaces being composed of slaty sandstone and clay. Upon their slopes I found a hard, dark stone very abundant, more resembling clay ironstone than any other. These hills are about 300 or 350 feet high, but those in the interior rise several hundred feet higher. As we approached Blackley Haven, we found the land much lower and more fertile. Passed the track of nine reindeer, coming from Prince Patrick's Land. The evening of the 3rd May was beautiful and clear, the morning mists having passed away. Crossed the mouth of this most magnificent haven, which I named after a much esteemed friend. The distant land across its head is mountainous, and is so cut up by numberless ravines, and dark, steep gorges, that it resembles a vast assemblage of peaked hills. On the south side there is a very remarkable perpendicular cliff, 930 feet high; it is the highest land anywhere bordering the coast, and is very conspicuous at forty-five miles' distance. Blackley Haven and the neighbouring land form by far the most beautiful Arctic scenery I have ever beheld. The visible extreme of Melville Island, to the south, is a bold, terraced cliff, 750 feet high, and distant twenty-five miles. To the west Eglinton Island is seen; it is much lower, and is just now so much distorted by refraction as to appear like a group of islands. After midnight, when we halted to lunch, the temperature was 18° below zero! an extraordinary temperature even here for a May morning. All this march we observed strong and remarkable refraction, throwing up some portions of Eglinton Island, and exhibiting inverted images, without affecting certain *intermediate portions* of the same land. Along the tops of bare ridges near Ibbett Bay the ptarmigan have been scratching for food. Off every ravine there is a low projection of muddy *debris*, and on their south-west extremes, where ice-pressure has been greatest, these projections attain their highest elevation, of twenty or twenty-five feet; the cause is evident, for large blocks of ice still remain embedded in them. After crossing Ibbett

Bay I left the sledge and party to explore that deep indentation, and went on with two men and six days' provisions, and examined the coast-line nearly as far as Cape Russell. All the coast-line from here to Cape Russell, with the exception of the low shore around Purchase Bay, is a noble range of cliffs, 600 or 700 feet high, broken at intervals by wide ravines. Stratification is distinctly observable, dipping slightly to the south-west, at Terrace Cape. Five reindeer, in crossing from Eglinton Island, passed within 200 yards of us, when, by a lucky shot, I brought down a fine buck. We passed numerous tracks of reindeer, all of them crossing from Eglinton Island to Terrace Cape. On the 9th I rejoined my party, near Ibbett Bay, and we commenced our return to Cape de Bray. Before leaving the ranges of cliffs about Terrace Cape, I may here remark, that they are composed of sandstone rock; the greater part is hard and dark, but with layers of the common, pale-reddish yellow colour occasionally appearing. In Ibbett Bay two reindeer and six oxen had been seen, and one of the latter shot; it proved to be in excellent condition. A raven, and a bird supposed to be an owl, were also seen. The temperature is usually about 10°, and, although still rather cold at nights, the weather delightful for travelling; but the snow has become soft, so that dragging even a light sledge is by no means light work. Tufts of moss and the tops of stones are gradually reappearing through the snow, and, as the season advances, the animals seem to increase in numbers. I picked up two caterpillars to-day, the first insects seen. Three or four ptarmigan are usually seen every March, also an occasional snow-bunting. Fox tracks are very numerous, traversing both land and ice in all directions, but the majority are crossing to the northward, probably following up the ptarmigan. Lemmings are abundant: these wonderful little creatures, which constitute the chief support of foxes, ravens, wolves, owls, and even every species of gull, are as active tourists as the larger animals, and traverse these wide straits in all directions. Many reindeer have crossed from the north-west (Prince Patrick's and Eglinton Islands), and have gone into the interior. Some of them seem to have hesitated about crossing our outward trail, going along it for some distance, and then clearing it at a bound. Hare tracks are pretty common along the shore and upon the sides of steep hills, so I suppose they have come down from the hill-tops and rocky eminences amongst the cliffs, which afford them a secure retreat; they sometimes make burrows under the snow, but we have never found these

extending into the earth, like those of the fox and lemming. No traces of the musk-ox upon the ice or along the shore; if they migrate at all, it is only from the interior to some favourite slopes upon the coast. A few tracks of wolves coming from the south have been seen, but no trace whatever of the polar bear.

After returning to Cape de Bray, we took up the provisions that the officer after whom it is called had left for us, and crossed the strait to Point Wilkie; reached it on the 14th May. This traverse was the more difficult from the great load upon our sledge, and the unfavourable state of the ice and snow. The freshly fallen snow was soft and deep, and beneath it the older snow lay in furrows across our route, hardened and polished by the winter gales and drifts, so that it resembled marble.

On landing, I found the beach low, composed of mud, with the foot-prints of animals frozen in it. A few hundred yards from the beach there are steep hills, about 150 feet in height, and upon the sides of these, in reddish-coloured limestone, casts of fossil shells abound. Inland of these, the ordinary pale carboniferous sandstone and cherty limestone reappeared. The fossils are all small, and of only a few varieties, some being ammonites, but the greater part bivalves. They differed from any I had met with before, and the rock was almost brick-red; picked up what appeared to be fossil bone (*Ichthyosaurus?*), only part of it appearing out of the fragment of the rock.

Point Wilkie appears to be an isolated patch of liassic age, resting upon carboniferous sandstones and limestones, with bands of chert, of the same age as the limestones and sandstones of Melville Island. The eastern shore of Intrepid Inlet is composed of this formation; while the western, rising into hills and terraces, is of the underlying Carboniferous epoch. At the western side of Intrepid Inlet I found upon the ice a considerable quantity of white asbestos, but did not ascertain from whence it had been brought.

There was plenty of moss, but hardly a blade of grass. I saw a herd of eleven reindeer here, and shot three of them. On my suddenly appearing near them; they ran off with great speed; but, after reconnoitering me from a hill, trotted briskly back, halting for a few seconds now and then. In this way they approached within about seventy yards, when I shot two of them. Subsequently they allowed me to approach within long rifle-shot, when I brought down a third buck. Whether they were prompted by curiosity to approach me, or by the desire of repelling an intruder, I cannot tell. The supply of venison was most fortunate.

“One gradually becomes more of an *animal* under this system of constant exposure and unremitting labour. Our immediate wants are our first care, and of these the most important are eating and drinking; at least it is that to which we devote most attention. Now that fresh meat is abundant, we consume $\frac{2}{3}$ rds of a pound of pemmican and a pint of chocolate for breakfast; $\frac{1}{4}$ lb. of bacon for lunch; a kettleful of fresh stewed meat for supper; besides $\frac{3}{4}$ lb. of biscuit during the day. The kettle is capable of containing 13 pints of water, and is always crammed full of meat for supper: yet we consider this a *light meal*, divided amongst the nine of us. I think a still more liberal allowance would be beneficial; but the want of fuel restricts us.”

Depositing most of our provisions under a heap of earth,—for stones were scarce here,—we proceeded to explore Intrepid Inlet, Green's Bay, and the northern part of Eglinton Island, the latter being named after his Excellency the Earl of Eglinton and Winton, the then justly popular Viceroy of Ireland. Leaving the sledge, to explore Green's Bay, I set off, with two men and a few days' provisions, to examine Intrepid Inlet. On the 17th the temperature rose to 34°, and on the 19th to 47°!! At this time I was encamped with my two men on a gravel ridge, which did not afford us the luxury of a stone for a pillow. We had no tent; the day calm and dull; there was neither wind nor sun. I awoke at 1 o'clock, bathed in perspiration; got out of my blanket-bag, yet felt too hot to sleep; so spent an hour in thermometric experiments. When the thermometer was placed in its gutta-percha case, upon a black surface, it stood at 65°; when taken out of the case, and laid on the black surface (painted canvas), it fell to 52°; and when placed with its bulb an inch above the wet sand, the other end resting on the snow, it stood at 47°. All that night the atmosphere felt oppressively close: we threw off all our outer garments, yet perspired freely; snow thinly falling, the crystals being in the form of minute spiculæ. On the 22nd it blew a violent gale, and the temperature fell to 14°. After the recent warm weather, we felt this searching blast as if it was blowing through our frames as freely as it did through the holes in our garments. In the midst of this I rejoined my party, who were snugly encamped at the appointed rendezvous. I never fully appreciated the shelter of a tent until then. Westward of Port Wilkie the shore is a muddy flat, on which there was nothing remarkable except one large mass of gneiss. About half a mile inland there is a succession of low hills. Following the coast line towards Intrepid Inlet, we

passed under a range of dark limestone cliffs, containing bands of Lydian stone and chert, extending a few miles. Here I found some fragments of coal and pieces of Lydian flint. The shores of the Inlet are low; the eastern side is the most favoured in point of vegetation, supporting a considerable quantity of the usual Arctic plants, including sorrel. The low land on this side is chiefly mud or clay, in which the frozen foot-prints of oxen, deer, and sea-birds are frequently met with.

On the west side of the Inlet the land is uniformly high, probably 500 feet, and is in many parts broken into flat-topped masses, surrounded by very steep slopes: so that the small hills, which do not quite rise to the general level of the country, are exact pyramids, and the larger ones resemble truncated cones. The land near the beach is composed of fine gravel, and is entirely destitute of vegetable life. There was no ice-pressure upon the shores, and the tide-crack not always perceptible: therefore the rise and fall cannot exceed a couple of feet. The first seal of the season was seen here upon the ice. On examining the hole down which he disappeared, I saw that the water was fully three feet below the surface of the ice, and that there was a recess or cavern, scooped out horizontally, just above the water, and large enough to contain two or three seals. This habitation was amongst hummocks, and seemed to be formed in the deep drift of snow collected about them; the roof, although strong enough to walk over, admitted sufficient light; the interior was coated with ice, and the numerous icicles afforded proof that this winter abode had been sufficiently warm before the hole to the surface (which seals always require to breathe through) had been increased to its present dimensions.

Leaving Green's Bay, we travelled about twenty-five miles further to the south, along shore, before crossing over to Eglington Island. On the 22nd, just after leaving Green's Bay, we saw, and shot two very large musk-bulls. They were in better condition than any we had hitherto shot, and as we had consumed the last of our venison for breakfast, this was a well-timed supply. I shall never forget the death-struggle of one of these noble beasts. Shot through the lungs, and with blood gushing from both nostrils upon the snow, he stood fiercely watching us, prepared, yet unable, to charge; his small but fixed, glaring eyes were almost concealed by masses of shaggy hair, and his whole frame was fearfully convulsed with mortal agony, communicating a tremulous waving motion to his enormous covering of tangled hair and wool. He was silent;

but the wild gleam of savage fire which shot from his eyes, and his menacing attitude, were far more terrible than the most hideous bellow. I had never imagined for a moment that such an apparently stupid beast, under any circumstances of pain or passion, could have presented such a truly appalling spectacle. It is almost impossible to conceive a more terrific sight than that which was presented to us in the dying moments of this monarch of the northern wastes. We watched in silence, for time was doing our work, nor did we venture to lower our guns until, his strength becoming exhausted, he reeled and fell. A mile or two further we saw four cows and a very small calf.

We now proceeded to explore the west and north shores of Eglinton Island. The soil is dark; there is much clay-ironstone, some lumps of quartz, and large stones of gneiss, but sandstone greatly predominates. The north extreme is a series of low sandhills, and the beach a muddy flat. Neither vegetation nor animals seen.

On the 28th May we had another gale of wind, and return of low temperature, with dense clouds of driving snow; but our good supply of fresh beef amply consoled us, not merely by affording good breakfasts and suppers, but—quarters of beef kept down the sides of our tent, quarters of beef served to fasten the tent-ropes and bowlines to, and a frozen quarter served as a chopping-block for the rest. After picking up our depôt at Point Wilkie, we continued our exploration of the north-east shore of Prince Patrick's Land. A weary fortnight of constant struggling through deep snow brought us to Cape Krabbé, its north extreme. The whole coast is low, uninteresting, and almost devoid of vegetation and of game. The only land near the sea attaining moderate elevation is on the north side of Jameson's Bay, where a range of steep muddy hills extends for two or three miles; the highest of these is about 150 feet, upon which is a remarkable peak, formed of a rounded mass of tenacious clay; in it horizontal bands, differing slightly in colour, are very distinctly marked. The earth about the peak has apparently been carried away by the annual "washing down" of melted snow. Near the northern termination of this range I noticed a little stony mount, remarkable for the sandstone rock composing it, being rent by frost into thin wavy plates, about as large, and almost as much curved, as ordinary tiles. Two or three miles inland of this, and rising very conspicuously above the flat snowy plain, is a circular mount, with perpendicular sides and flat summit. We at once named it the Redoubt. From Point

Wilkie the beach is a continuous belt of mud, imprinted with numerous foot-marks of oxen, deer, and sea-fowl. In lat. $76\frac{3}{4}^{\circ}$ N. my attention was attracted by a remarkable dark mass, exactly resembling a mud hut. On examination it proved to be a mound of earth, 12 feet high, and 23 feet in diameter at the base, with flat summit. It had formed part of a ridge, the traces only of which remain extending from it to the S.S.E. and N.N.W.: the evident result of ice-pressure from the N.E. Although scarcely ten feet above the sea, yet it is 200 yards within the grounded hummocks.

This is the first indication of ice-pressure from the eastward, and is a very gratifying discovery, as it indicates an extensive sea in that direction.

On 6th June, after crossing the 77th parallel, I made out a musk-bull with my spy-glass, at a considerable distance inland. All our fresh meat had been finished, so I set off with two men to obtain a supply. This solitary bull allowed me to approach within fifty or sixty yards, but his massive horns so effectually shielded his body, that I waited for a more favourable opportunity to fire. He stood quietly rubbing the tips of his horns against his forelegs, and I sat on the bank of a ravine examining my caps and preparing to reload quickly, when suddenly I heard his gallop and saw him coming on at full speed; I instantly fired both barrels, just in time to stop him when within ten or fifteen yards. Whilst slowly retreating to a more respectful distance, I reloaded, and terminated his sufferings.

This ill-favoured animal was small, very old, and very thin; nevertheless, I felt grateful for such an opportune supply. The wonder is, how so large an animal can support life in such an extremely barren country. I suppose he had been expelled from the herd, and had wandered here to die in peace. A few days after, I wrote in my diary:—"That vicious old bull is the toughest animal I ever attempted to eat; my teeth regularly ache for half-an-hour after every meal. The kettleful of pemmican is despatched with perfect ease in less than five minutes, but this beef affords us active employment for three-quarters of an hour. The process of mastication requires most vigorous exertion. To me supper is the hardest task of all; but as the men prefer quantity to quality, I give them this whilst it lasts."

Our journeying has become most monotonous; the land is uniformly low in the extreme, and covered with snow; there are no traces of animals, and an ever-clouded sky. We have

nothing to look at but an expanse of snow, overlying the ice to a depth of three feet : even a good large hummock would be welcomed as an old acquaintance. We sadly miss the long zigzag lines of crushed-up floe edges, fancifully termed the "hedge-rows of an Arctic landscape."

From the 12th to the 15th June we were examining the Polynia Islands, the northernmost of which I named "Ireland's Eye;" it lies almost under the 78th parallel. None of these islands are more than sixty feet above the sea; they are entirely composed of gravel. On searching about, I found a few large lumps of gray gneiss in small fragments, some light-coloured quartz, and granite. The centre of one of the largest islands is so very low that we saw many masses of blue sea-ice far inland, half buried in the gravel, which is tossed up into innumerable heaps, as if the ice was in the habit of making frequent inroads alternately from east and west. On the beach were many bivalve, and a few spiral shells; the colouring and hinges of the former were still perfect.

Upon one of these islands I saw two birds' nests of former seasons; they were chiefly made of moss, and much more of it had been used in their construction than I have seen growing upon the whole group. The broken pieces of egg-shell were pale olive, with irregular dark-brown blotches. Small fish-bones and bones of lemmings were strewed about.

Cape Krabbé, the north extreme of Prince Patrick's Land, will be sufficiently described by inserting a few lines from my diary, written on the spot:—"We are encamped amongst sand-heaps, which extend far out towards the islets. It is impossible to delineate this coast-line correctly; the land and ice are confusedly heaped together all about us. The gravel ridges, which form the only raised portions of this coast, are generally half-moon-shaped, convex, and highest to seaward; they rise like islets to forty, fifty, or sixty feet above the adjoining land. On looking inland from these, one sees only a boundless plain of snow, with here and there the top of a bare ridge appearing through it at long intervals, like a dark horizontal line. Small pieces of gray gneiss are met with here."

On the 18th June, having gone as far as my remaining provisions would permit, I commenced my return journey from Point M'Clintock. About here I found many small fragments of decayed wood. Landing upon a small islet in Satelette Bay, I found it to be an oval ridge of gravel, its longest diameter being about a quarter of a mile; its highest part was

to seaward, and about forty feet; all within was a lagoon. There was neither ice-pressure nor tide-crack; more fragments of decayed wood and gray gneiss. Upon an island near this I was surprised to find mud and clay, instead of the usual gravel ridges, and still more so at finding moss and a little grass. It was now the 16th of June. Already six brent geese made their appearance; also a sea snipe; small black spiders were crawling about. I found here a bone of a deer, and traces of the fox and lemming. We heard the pleasing chirp of the snow-bunting during the day.

June 21st.—Up to this date we have had to deal with dry snow only; but at length the thaw has begun, and we have had two hours of rather smart rain. Whilst upon the east shore of Prince Patrick's Island, we have found the snow uniformly deep, averaging nearly three feet, in consequence of the prevailing westerly winds having blown it off the land. This was made apparent on rounding Cape Krabbé, where the prevailing wind being from seaward, the ice was swept tolerably free of snow. Here I saw an ivory gull seated upon her nest on a bare patch of gravel near the beach; there was but one egg in it,—the same one which is now in the Museum of this Society; the nest was exactly the same as those seen upon the Polynian Islands, but in addition to the moss there was a little white down and a few feathers within it. This nest had served for former seasons, as there were bleached bones of lemmings strewed about it; there were also fresh fragments of their bones and hair, proving that those little animals are preyed upon by these gulls; and until I had learned this fact in their natural history, was quite puzzled as to what they subsisted on at this early season. My opinion of the fresh fragments of bones and hair is, that they were pellets ejected, after the manner of birds of prey; but I cannot state it as an ascertained fact. Ivory gulls and brent geese now began to appear daily; lemmings also, in their brown summer coat. My men are suffering from badly inflamed eyes, the effects of the snow glare. The thaw advanced rapidly. On the 23rd June, we waded through two shallow rivers, then travelled round "Torture Cove," a name that we at least felt it deserved. I shall not easily forget this night's march; although perspiring profusely, as we struggled along knee-deep through water and snow, in pretty equal proportions, yet my feet were most painfully cold: had they but been numbed, I would not have felt the sharp points of the "needle-ice," over which we were occasionally obliged to pass. After eleven hours of this work, and splashing

and tumbling down in the water, we found that our reserve of dry stockings, &c., purposely kept for sleeping in, had been well soaked upon the sledge.

Before taking our final leave of Prince Patrick's Land, I jotted down the following observations, when at Point Giddy, in lat. 77° N.:—25th June.—“ Although this Point is low, the land in the interior is moderately high, with dark, steep slopes to eastward. We have met with recent tracks of oxen and reindeer, and have seen a ptarmigan; two small deer were shot immediately on their arrival from Emerald Island; lemmings are so numerous that the men amuse themselves by chasing them. The land is a mixture, or rather an alternation, of gravel and clay; stones are rarely met with, except on the hill-tops; amongst them I saw some fossil wood; the pieces were small, and found only in a few spots, lying near each other, as if detached by frost. About the same spots were some perfectly rounded pieces of sandstone, varying in diameter up to three inches. These hills were 140 feet high, and a mile inland.

“ I picked up a small piece of drift wood on the beach, and found a very similar piece, to all external appearance, on this point, buried in the surface soil; but, on breaking it, the interior resembled dark, hard stone, similar in colour and appearance to the rounded stones dug up with it in building our cairn. Found the earth still frozen below ten inches in depth. It is necessary here to mention the very different sort of ice met with to the westward of the Polynian Islands: it was that kind known as the tremendous “ Polar pack;” its edge lying aground, from Ireland's Eye, as far to the south-west as I went, and forming a colossal range of hummocks, forty or fifty feet high. This ice lay against the western faces of the islands—thus indicating a pressure from the westward, of an ice-covered sea, of vast, unknown extent. All the other ice traversed has been of the ordinary kind described in the previous journeys.” We left this low, uninteresting shore without regret, and soon found the floe to be exactly in the condition we expected: the snow upon it partially thawed, and knee-deep, the lower six inches being saturated with water. The men worked uncommonly well; so that, by frequent “ standing pulls” and occasional “ digging out,” they got the sledge along at the rate of two-thirds of a mile in an hour. The flattering title of “ Emerald Island” was conferred upon the island we next visited, rather in the comparative than the positive meaning of the word. It certainly has much moss, and altogether a better show of

green than the contiguous shores of Prince Patrick's and Melville Islands; yet its surface appeared very like a ploughed field after an unusual deluge of rain,—a dark, rich, tenacious clay, more laborious to walk upon than the sludge-incumbered floe. The centre of the island rises to about 250 feet above the sea, with gradual slopes and low shores. Several deer were seen enjoying the peace and plenty of their island home. No wolf would attempt to cross from the mainland in the present state of the ice. Some dead lemmings were found upon the snow along the shore: they appeared to have perished from wet and exhaustion after crossing the frozen strait. A few skua gulls and red phalaropes were also seen.

From Emerald Island we crossed to Point Cleverly, and retraced our steps from thence homeward, closely examining every indentation of the coast-line. Repassing Dépôt Island, we encamped near a pretty little cove, at the bottom of a deep bay, where we found abundance of moss and grass; also lemmings proportionably numerous: five dead ones were seen during the last march upon the ice, and cut off from the land by a continuous lane of water along the shore. The Arctic willow grew here, which is the farthest point northward that we have observed it. I saw some vesicular ice whilst upon this march: it resembled an aggregation of thermometer stems, from two to six inches in length, their vertical columns being extremely regular. This ice has, I believe, been brought into this state by heavy rain-drops falling, and is termed "needle ice" by the Canadian voyagers. My diary now becomes somewhat less monotonous.

"July 3rd.—In the evening we crossed our snug little haven, and travelled along, under high land, with rich mossy slopes, for Grassy Cape. Ptarmigan were numerous, and I began to try how many I could shoot; but at 10 o'clock, when I had killed but four of them, I discovered three musk-bulls and a reindeer at some distance inland. Being desirous of giving the men rest (which two of them were much in want of), and also of adding fresh meat to our stock of provisions, I ordered the tent to be pitched, and, leaving the two lame men to do so, set off inland with the rest. Two of the bulls were shot; the second one we were obliged to kill to prevent accidents, as he seemed determined to be mischievous; the third one still stood by his fallen companions, and was at length driven off a couple of hundred yards: but not until he had been well pelted with clods. This animal remained watching the dismemberment of his brethren, and only went off

when they were no longer recognisable. The reindeer would not allow me to approach within two hundred yards.

“Some king-ducks were enjoying themselves on a fresh-water pond. Lemmings, ptarmigan, and skua gulls have become common. I saw a family of drowned lemmings, which a rapid brought down, their burrow having probably been flooded; the young ones were as large as mice.

“There is abundance of sorrel with leaves of this year: the dwarf buttercup, the purple saxifrage, and a white *Drabæ* are in flower; the *Saxifraga flagellaris* is just bursting out. The hill-tops are barren and dry, but all the rest of the land is saturated with wet, and as abundantly covered with mosses and all the common plants as the shores of Bridport Inlet; very little snow remains on the land, and scarcely any upon the ice,—in crossing the latter, nearly three-fourths of the distance must be performed through pools of water.

“July 4th.—A heavy gale at south has been blowing all day. Several dead flies were found on the ice, blown off by the gale: there are only two varieties of them: and these, together with a few small black spiders, and one lively little worm, about an inch long, are all the insects that I have yet seen, except some caterpillars early in May.

“Midnight, halted to lunch. These halts are always disagreeable. At the commencement of our journey we were obliged to keep moving about to prevent our feet being frost-bitten, whilst we got through a few mouthfuls of frozen bacon as dexterously as we could, with huge mitts on. At this season we have also to keep moving about, to prevent our feet getting benumbed, which they are always too ready to do after walking for several hours through the ice-cold water; and just now our upper garments, which have escaped the splashing, are saturated by four hours' rain. Under all circumstances we have one unfailing comfort, in the welcome *drop of grog*, which constitutes the only enjoyable part of our nightly luncheons.”

After rounding Grassy Cape, a very small piece of rotten drift-wood was picked up: and upon the ice, two shrimps and the vertebræ of two fish of the cod species, about fifteen inches in length. In the interior is a lofty range of hills extending south-eastward to the north side of M'Cormick's Inlet; their elevation varying from 800 to 1100 feet. Again my diary will speak for itself. “July 7th.—Our supper yesterday morning cleared off all the *small game*, namely, two brent geese, two king-ducks, and four ptarmigan; yet, to fill up the

kettle, several slices of musk-ox beef were added. On rounding Hillock Point, I picked up a few fossil shells which appeared to have been shoved up by the ice, along with light grayish sand. They are Carboniferous species, viz.: *Productus sulcatus*, Pl. VII., Figs. 1, 2, 3, 4, 7, and *Spirifer Arcticus*, Pl. IX., Fig. 1.

“ There is no evidence of very recent pressure upon this Point, which has been named in consequence of the shingle being confusedly arranged upon it in heaps of twenty feet, and even sixty feet in height. The pretty little plant, *Parryia*, grows abundantly here; its lilac flower is now in full bloom. Saw a herd of nineteen musk-oxen, including five calves: some deer were also seen. The two lame men have got the better of their ailments, but two others are complaining,—one of lameness from rheumatism, and the other from sore feet and violent pain in his right side, occasioned, he thinks, from dragging. If he can carry himself back to the ship, it is quite as much as I expect. In exploring a large island in M^cCormick Inlet, I found it to be almost barren: a dark, hard rock, traversed by veins of quartz, underlies the ordinary sandstone, but is exposed in the sides of ravines; and, in a little peninsula, it protrudes through the sandstone, and forms a rocky eminence: it contains impressions of fossil corals. On the eastern extreme of this island numerous small fragments of coal were found. Far inland, across the head of the Inlet, the blue hills of Parry, which commence at Liddon’s Gulf, continue to extend their range to the north-west. We now crossed over to Cape Fisher, and encamped. As it rained all this march, the entire of which was through pools of water, our ducking was complete, so I determined to stop a day here to dry and mend clothes, and to rest the men. This is the first day we have halted, when the weather admitted of travelling, for ninety-five consecutive days. Along the shore I picked up a few rather large univalve shells, and the head of a fish resembling a haddock. Generally the ice is uneven and slippery; but along the tide-crack, where there has been an overflow and subsequent drainage, a surface has been left resembling a closely packed series of points, over which walking is painful, in thin and well-soaked boots. This morning, July 9, it was high water at half-past 2 o’clock, the rise of tide being two feet six inches.

“ In a walk to-day over the hills, I saw several oxen and reindeer, and shot one of the latter. Met with the skeleton of an ox upon a very barren hill; its flesh and skin had long

since disappeared, and the bones were bleached by time, but its thickly matted hair and wool still lay strewed about, and through it, a rich crop of fresh green grass had sprung up in very strong contrast with the ordinary Arctic vegetation." In following the shore round to Port Nias, the effect of aspect was strikingly seen. So long as there was an eastern aspect, we found vegetation and animals in tolerable abundance; at one time upwards of thirty reindeer were in sight. The beach was usually of mud, brought down by abundant drainage of the land; and water along shore was continuous, and so deep that we could seldom land without wading up to our hips; but when the shore bent round, so as to have a northern or north-western aspect, everything was changed; animals and vegetation almost gone; but little drainage off the land; the beach composed of sand or stones; and we could often walk ashore dry. A south-eastern is the most favourable aspect for warmth and vegetation.

As an illustration of the change effected since we crossed this bay,—rather less than three months ago,—I will give a brief extract of my diary of 10th July, when near the spot in which we were detained by a N.W. gale, with temperature at 24° below zero, on 16th April. "From 4 o'clock until 7 this evening, it blew a furious gale, which, under existing circumstances, is a cause of considerable uneasiness to me. The tent is, of necessity, pitched on the top of a hummock, fully exposed to the gale; the flood has encroached close round, and the heavy, pelting rain easily forces an entrance through our well-worn tent. If the prospect within is cheerless, that without bears a most gloomy and threatening aspect: thick mist veils the land, and the narrow limits of the lane of water, although scarcely eighty yards wide, resembles a dark, angry sea, beating against the ice, and sending its spray over our tent. Even the ice looks more blue and cold than usual; it would be very awkward for us if it broke up, and drifted out before the gale. Numerous holes have been thawed through it."

Arrived at Point Nias. I proceeded to examine Parry's monument, and copied the record left by him when here in June, 1820. After carefully replacing it, together with my own, and a small chart of recent discoveries, I commenced a search for the site of his encampment. I fortunately found it close to the beach, and very near my own. We recognised it by the stones arranged for keeping down the sides of his tent: a few large ones were placed within, as if they had

served for seats or pillows. I picked up several pieces of white line, rope-yarn, and wood; and whilst so engaged the men made a still further and more startling discovery,—the narrow-rimmed wheels of Sir E. Parry's cart had left *tracks*, still wonderfully distinct, in the soft, wet earth, thinly coated with moss!! In one place these cart-tracks were continuous for thirty yards, and they were also very distinct where the cart, having come from the eastward, turned up towards the encampment. No lichens had grown upon the upturned stones, and even their deep beds in the soil, whence Parry's men removed them, were generally distinct. In two or three cases we recognised at a glance the stone to which each had belonged. This astonishing freshness of traces, after a lapse of thirty-three years, compels us to assign a very considerable antiquity to the circles of stones and other Esquimaux traces which we find sparingly strewed along the southern shores of the Parry group, since they are always moss-covered, and often indistinct.

The health of my men now began to give way: one man was taken suddenly and seriously ill, so much so that at one time I despaired of his recovery. After a day's halt, he so far recovered as to be able to travel on the sledge, and subsequently recovered sufficiently to walk. As the leader of the party, all the trials, cares, the hopes and fears of the last hundred days seemed as nothing in comparison to my anxiety, as *doctor*, for the last eighteen hours.

Having arrived at the place for recrossing the land, where I had left a cart last autumn for the purpose, we mounted our sledge on the top of it, and set off on our land journey for Bridport Inlet.

We soon found the earth was too soft to admit of progress with our laden cart. We tried it with a light load, abandoning sledge, tent, and spare provisions; but this likewise failed. The whole country inland was flooded and boggy. This state of the land had not been anticipated: from its sandy character, I had erroneously calculated upon a *thirsty* soil and rapid drainage, quite overlooking the fact that the thaw never penetrates beyond a few inches below the surface; hence there is no escape for the suddenly dissolved snows, except by ravines, discharging into the sea, and the still slower process of evaporation. With knapsacks on our backs, containing provisions and dry stockings only, we reluctantly left the entire of our equipment, to be sent for subsequently if circumstances permitted; and after three marches, across muddy plains and

stony hills, with rapid rivers in every ravine, reached our ship on the 18th July, after an absence of 105 days, and having accomplished a distance of 1400 statute miles. To part from my specimens was a trial; I could carry away but a few of the smallest of the geological ones; even my fossil bone I was obliged to leave behind. From unavoidable circumstances, this spot was never subsequently visited.

Circumstances combined to render this long journey one of unusual fatigue. The ice was uniformly old, with very rugged surface, and the snow lay deep. At the outset we crossed the land with very great labour, and upon our return found it quite impassable for sledge or cart. Three-fourths of our time were occupied in discovery, which compelled us to carry on with us the whole of our provisions. Lastly, the few men at my disposal for this service rendered any selection impossible, and obliged me to allot to them much heavier loads than had ever been attempted before.

These facts will show the necessity, in a sledge-crew, not only for great bodily endurance, but also for strong mental resolve: and that my party possessed these requisites, this meagre sketch of their labours abundantly proves. Their health continued good until within the last fortnight, when several began to fail. We enjoyed total exemption from accident, and were most fortunate in obtaining game, but no fuel of any kind could be got. In proportion to our efforts did we share in the disappointment common to all those who have searched after the ill-fated expedition. With the exception of Parry's record, and traces at Port Nias, not a vestige was found which could lead one to suppose that the shores we discovered and examined for 680 geographical miles had ever been visited by human beings.

A comparison of 300 thermometric observations made upon this journey, and those simultaneously registered at Bridport Inlet, in latitude $74^{\circ} 56'$ N., shows a difference of $3^{\circ} 5'$ of lower temperature for my more northern position, for which, as a mean, we may assign the parallel of $76\frac{1}{2}^{\circ}$ N., being about 100 miles north of the ship. The means of temperature thus compared were $18^{\circ} 5'$ and 22° .

These observations having been made between 12th April and 15th July, sufficiently account for the diminished vegetable growth, and consequent decrease of animal life upon the land; whilst the absence of the polar bear is significant of a similar scarcity in the frozen deep.

As bearing upon the distribution of animal life, I subjoin a record of all that were shot or seen.

Locality.	Date.	Musk-oxen.		Rein-deer.		Hares shot.	Seals seen.	Gulls.	Brent Geese.		Ducks.		Ptarmigan.	
		Shot.	Seen.	Shot.	Seen.			Shot.	Seen.	Shot.	Seen.	Shot.	Seen.	
Melville Island,	Between April 4, and May 13,	2	59	2	29	1	—	—	—	—	—	—	9	16
"	July 1 and 19, . . .	2	30	1	74	2	15	34	3	107	2	18	4	12
Prince Patrick's Island,	May 14, and June 26,	3	5	5	8	1	2	12	2	20	—	5	9	37
Emerald Island,	June 26 and 30 . .	—	—	—	13	—	1	7	—	—	—	—	—	—
Total amount of Animals met with, .		7	94	8	124	4	18	53	5	127	2	23	22	65

No traces of bears were found. A few wolf-tracks were seen, but only on Melville Island. No traces of oxen, deer, foxes, or ptarmigan beyond the 77th parallel, except in one instance, when a decayed bone of a deer and traces of a fox were found. Up to 77° N., fox-tracks were frequently seen, although we never saw the animal. Lemmings were tolerably numerous wherever there was vegetation. Three kinds of gulls were seen. The ivory gulls (*Larus eburneus*) were the earliest to arrive, and were found furthest north; they began to lay eggs before the thaw commenced: eight only were seen, and all of them upon Prince Patrick's Land. Seventeen glaucous, and twenty-eight skua gulls (*Lestris parasiticus*), the latter chiefly on Melville Island. Of the ducks, three were long-tailed (*Anas glacialis*), and the other twenty-two were king-ducks (*Anas spectabilis*). Several snow-buntings, sparingly, but universally distributed; four or five red phalaropes; two sea snipes; a raven; and a bird supposed to be a snowy owl, complete the list.

We have now glanced rapidly over Arctic ice-travel, from the first to the last and longest of the Franklin searching parties, and we have seen its gradual expansion from journeys of 500 to 1400 miles. Truly may we, Arctic explorers, exclaim—"Knowledge is Power!" It is now a comparatively easy matter to start with six or eight men, and a sledge laden with six or seven weeks' provisions, and to travel some 600 miles across desert wastes and frozen seas, from which no sustenance can be obtained.

There is *now* no known position, however remote, that a

well-equipped crew could not effect their escape from by their own unaided efforts. We *felt* this; and by our experience, gained in a cause more glorious than ever men embarked in, have secured to all future Arctic explorers a plan by which they may rejoin their fellow-men. I will not venture to define the exact ratio in which risk of life has thus been diminished; but I can confidently affirm that, had Franklin and Crozier's crews this experience to guide them, they would undoubtedly have abandoned their ice-bound ships, and, in all human probability, would have been long ago restored to their native land. I must, however, here observe, that the only information which has ever reached this country respecting their fate rests only upon *Esquimaux second-hand report*. Franklin and his 137 associates were public servants, engaged in the faithful discharge of a public duty. It is in our power to rescue the survivors, or, at least, to ascertain their fate, *without periling* a single life, and at a comparatively trifling expense. That we refuse to do so is most assuredly a deep national disgrace. I cannot do better than conclude this paper with an extract from a memorial on the subject, addressed to Lord Palmerston, some months since, by a large number of the most eminent, high-minded, and scientific men in the kingdom:—

“Now, inasmuch as France, after *repeated fruitless efforts* to ascertain the fate of *La Perouse*, no sooner heard of the discovery of some relics of that eminent navigator, than she sent out a searching expedition to collect every fragment pertaining to his vessels; so we trust that those Arctic researches, which have reflected so much honour upon our country, may not be abandoned at the very moment when an explanation of the wanderings and fate of our lost navigators seems to be within our grasp.”

WILKIE POINT, PRINCE PATRICK'S LAND (LAT. 76° 20' N.; LONG. 117° 20' W.)

LIAS FOSSILS.

- Ammonites M'Clintocki*, Pl. IX. Figs. 2, 3, 4.
Monotis septentrionalis, Pl. IX. Figs. 6, 7.
Pleurotomaria, sp., Pl. IX. Fig. 8.
 Cast of some Univalve, Pl. IX. Fig. 7.
Nucula, sp.

Fig 1.

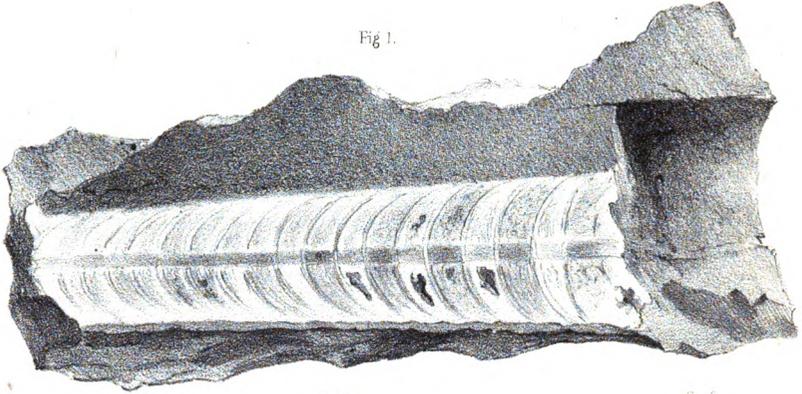


Fig 2.

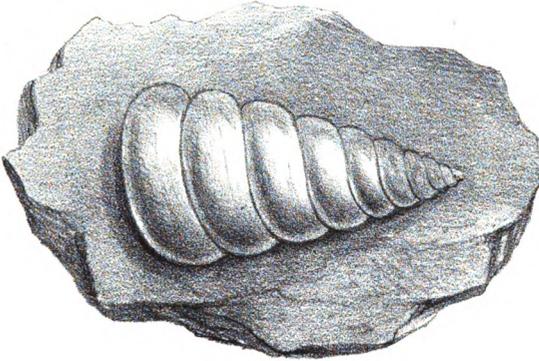


Fig 3.



Fig 4.



Fig 5.

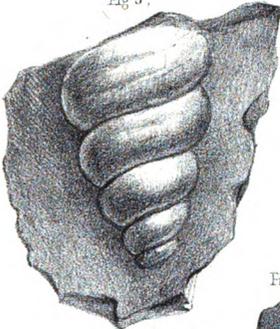


Fig 6.



Fig 7.



Fig 8.



Fig 9.



Fig 10.



Fig 11.



DESCRIPTION OF THE PLATES TO ILLUSTRATE THE GEOLOGY
OF CAPTAIN M'CLINTOCK'S ICE-TRAVELS.

Plate V.

FIG. 1.—*Orthoceras Griffithi* (Haughton).

Orthoceras Griffithi.—*Testá cylindrato-conicá ; cellá ultimá omissá* $6\frac{3}{4}$ *uncias longá, $\frac{9}{10}$ uncias latá in parte inferiori ; septis numerosis ; cellis penultimis 2 lineas altis ; marginibus orbiculatis ; convexis ; siphunculo centrali, simplici, $1\frac{1}{2}$ lineas lato.*

This fossil was found in great abundance at Griffith's Island, where Captain Austin's squadron wintered. It differs from all the *Orthocerata* described by Mr. Salter in Sutherland's Voyage, and I have named it after Mr. Griffith, the founder of Irish geology.

I have used M. Questedt's method of determining the total length of a specimen in which the last septum is visible, viz. :—

$$\text{Length} = \frac{HD}{D - d}$$

in which *H* signifies the total length of the fragment, *D* and *d* the greater and lesser diameters.

I found *D* = 0·8 inches ; *d* = 0·5 inches ; *H* = 2·5 ; containing 15 cells. From these data I readily obtain—

Length, not including the last cell = $6\frac{3}{4}$ inches.

Angle of cone = $6^{\circ} 52'$.

Six cells to the inch.

The angle of the cone is found from the following formula :—

$$\text{Angle of cone} = 57^{\circ} \cdot 3 \times \frac{D}{L}$$

L denoting the length of the specimen, not including the last cell.

FIGS. 2, 5.—Two specimens of *Loxonema M'Clintocki* (Haughton), from Port Leopold, North-East Cape, 1100 feet above sea-level.

Loxonema M'Clintocki.—*Testá conicá ; spiræ angulo 34° ; anfractibus (8-10), convexis, superne complanatis ; duas uncias longá ; sublevi.*

FIGS. 6, 8, 9, 10, 11.—Five specimens of *Loxonema Rossi* (Haughton), always found associated with the *Atrypa phoca* (Salter) of the Silurian Limestone of Beechy Island.

Loxonema Rossi.—*Testâ cylindrato conicâ ; spiræ angulo 15° ; anfractibus (7-9) convexis ; minutâ, ½ unc. longâ.*

These two species of *Loxonema* were found associated with *Atrypa phoca* and the two univalve shells described by Mr. Salter, Sutherland's Voyage, Pl. V., Figs. 18, 19. They are only found in casts, which renders it difficult to give an exact description of them; but I have no reason to believe that they show the slightest signs of the sinus band which is characteristic of the genus *Murchisonia*, and I have, therefore, placed them under Phillips' Carboniferous genus, *Loxonema*, which they resemble in a striking manner. A species of *Macrocheilus*, not figured, was found along with these specimens. One of the most beautiful specimens brought home by Captain M'Clintock is a fine slab of limestone, containing the *Atrypa phoca*, and the first kind of *Loxonema* or *Murchisonia* described by Mr. Salter. This fine specimen is deposited in the Museum of the Royal Dublin Society.

FIGS. 3, 4, 7.—*Atrypa phoca* (Salter).

This is the *Rhynchonella phoca* of Salter, Sutherland's Voyage, Pl. V., Figs. 1, 2, 3. I have ventured to place it under the genus *Atrypa*, as I cannot find any trace of an aperture in or under the beak. I insert Mr. Salter's description, altering only the name of the genus.

Atrypa phoca.—"Rounded, globose; valves longer than broad, their greatest breadth at about the middle of the shell, thence rapidly narrower towards the front, which is somewhat truncated; valves equally convex in middle age; in old specimens the smaller one rather gibbous near the beak, but not raised into a ridge; beak small, but prominent, incurved in full-grown specimens; front not at all raised, but indented by a broad, shallow sinus; the large valve has a distinct narrow median sulcus in the depression; surface concentrically striated, often interrupted by lines of growth."

The true *Rhynchonella*, as defined by D'Orbigny, differs little from *Terebratula*, and always has an aperture with a well-defined margin placed just under, and somewhat encroaching upon the beak. For this reason I have called this character-

Fig 1

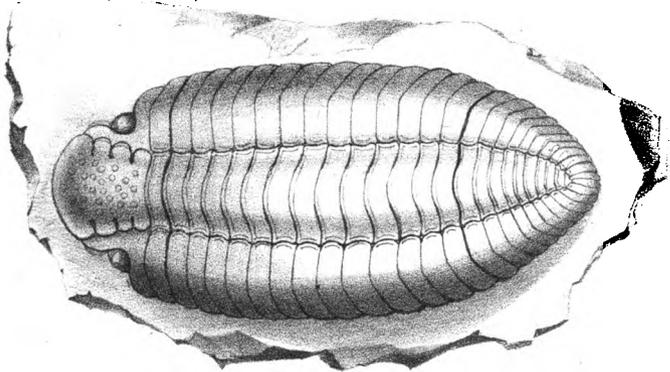


Fig 2

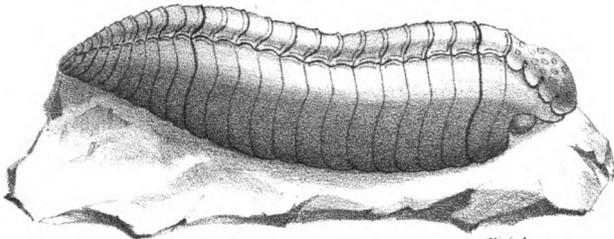


Fig 3

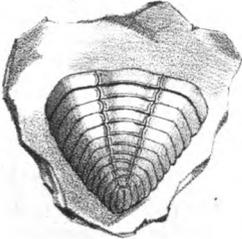


Fig 4

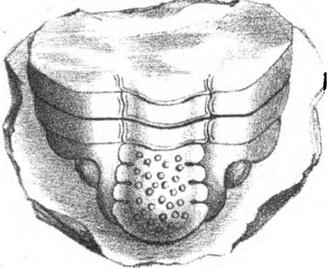
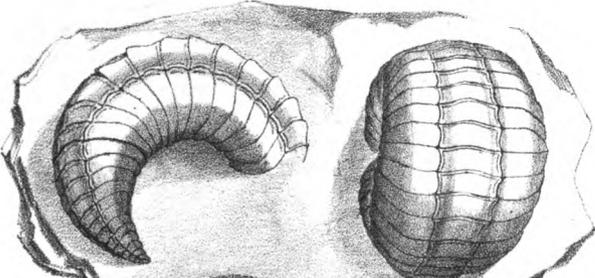


Fig 5



ristic fossil an *Atrypa*. It is very abundant at Beechy Island, Garnier Bay, and other upper Silurian Arctic localities.

The specimens figured are from Beechy Island.

Plate VI.

FIGS. 1, 2, 3, 4, 5.—*Cromus Arcticus* (Haughton).

This fine Trilobite was found in many localities, and may be regarded as eminently characteristic of the Arctic Silurian regions. Figs. 1 and 2 represent two views of a fine specimen found by Captain M'Clintock at Garnier Bay. Figs. 3 and 4 are from Cornwallis Island; and Fig. 5 represents a fine specimen from Griffith's Island.

Cromus Arcticus.—*Capite undique granoso; glabellâ quadrilobatâ, antice latiore; genis planis, oculis aliquantum exsertis; thoracis segmentis (12) levibus, extremis segmentorum axis protinus curvatis, pleuris in medio abrupte deflexis; caudâ trigonâ, in parte posteriori adpressâ, pleuris (8) depressis, sulcis trans caudæ axem continuis.*

DIMENSIONS.

Length of cephalic buckler, in half inches,	1·28
Breadth,	2·34
Length of thorax,	2·78
Breadth,	2·32
Length of tail,	1·32
Breadth,	1·65

This fine fossil has been identified by Mr. Salter with *Encrinurus levis* (Anselm), and he proposes to consider it as an Arctic variety. Mr. Salter describes nine or ten ribs on the tail, while my specimens contain only eight, showing a still closer agreement with *E. levis* (Anselm). Angelin's figure tapers towards the tail—a character inconsistent with the almost cylindrical form of Captain M'Clintock's beautiful specimen from Garnier Bay. The artist has not counted the number of segments, and consequently there is much confusion in the Plate, which does not give the same number of ribs even in Figs. 1 and 2, which are different views of the same fossil. There ought to be only twelve segments in the thorax, and eight in the tail.

I have placed this fossil under *Cromus*, and not *Encrinurus*, in consequence of its four-lobed glabella, and the ribs being continuous across the axis of the tail, and equal in number to the side ribs; whereas in *Encrinurus*, the divisions of

the axis of the tail are always much more numerous than the side ribs, and occasionally replaced by rows of tubercles.

Plate VII.

FIGS. 1, 7.—Full-grown specimens of *Productus sulcatus*.

FIGS. 2, 3, 4.—Young specimens of same.

The fine specimens from which these figures are taken were found by Captain M'Clintock in the carboniferous limestone of Hillock Point, Melville Island. I have no hesitation in identifying them with the European *P. sulcatus*, although there are a few slight differences (such as the greater depth of the furrow of the upper valve, the greater hollowing out of the lower valve, and the absence of the decussation caused by the lines of growth), which might warrant us in considering it as a variety of the well-known European fossil.

Productus sulcatus, var. Borealis.—*Testâ transversâ, sub-ovatâ, gibbosâ, sinu lato, alto, usque in umbonem producto, munitâ; costis longitudinalibus granulatis, plerumque latis, non bifurcatis; valvâ inferiore notabiliter concavâ; margine cardinali non extenso, auriculato, tubis auriculæ in laqueum angustum semiellipticum dispositis; umbone recurvato, vix prodiente.*

DIMENSIONS.

Length of ventral valve, in half inches,	3·66
Breadth,	4·74
Length of dorsal valve,	2·45

FIG. 5.—*Cardiola Salteri*.

I am indebted to Mr. Salter for the following description of this interesting and new Silurian fossil, and I have named it after that distinguished palæontologist.

Cardiola Salteri.—"Nearly orbicular; beaks oblique, and very convex; surface with regular equidistant concentric rugæ, with wide furrows between them. Radiating ribs, direct, numerous, and strong, closer and fainter on the angulated cardinal area; diameter nearly one inch."

"A new and beautiful species, reminding us strongly of the *C. interrupta* of Britain, but easily distinguished by the numerous ribs, which cross *regularly* the strong concentric ridges and furrows, and give a fimbriated appearance to the former. The inflexed or angulated cardinal portion is broad, and free from rugæ; the ribs are continued but very faintly over it."

Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6



Fig 7

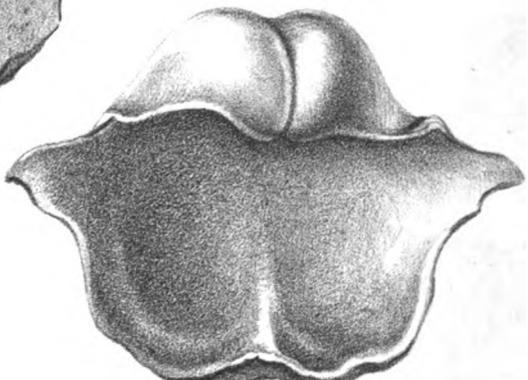


Fig 1.

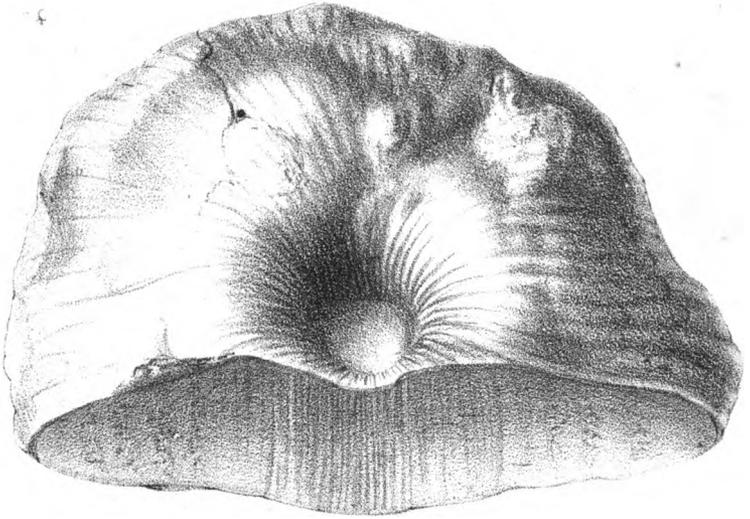


Fig 2.



Fig 1

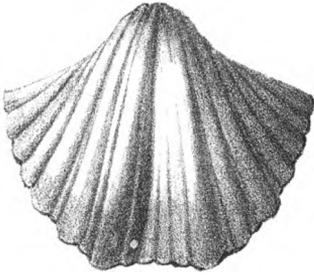


Fig 3

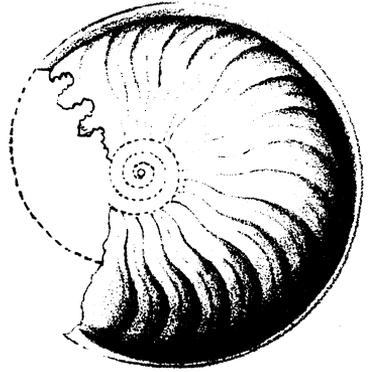


Fig 2



Fig 4



Fig 5



Fig 6



Fig 7

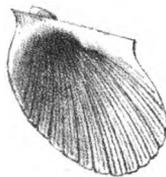


Fig 8



Only one specimen of this fossil was found by Captain M'Clintock, and that was brought from Cornwallis Island.

FIG. 6.—I have here figured a unique specimen from Garnier Bay; it is, probably, a Bryozoan coral, but the structure is very imperfectly discernible.

Plate VIII.

FIGS. 1, 2.—Two remarkably fine specimens of *Cyathophyllum helianthoides* (Goldfuss), from Garnier Bay, North Somerset. It differs somewhat from the *C. helianthoides*, but not sufficiently so as to require us to place it in a different species.

Cyathophyllum helianthoides.—*Solitarium vel cæspitosum, cellulâ terminali margine subreflexo, expanso, centro late umbilicato, radiis (80-84) geminatis in disco confluentibus* (Goldfuss).

DIMENSIONS.

Occasionally more than $5\frac{1}{2}$ inches broad.

Breadth of umbilic, in half inches, 1.56

Goldfuss admits into this species corals having from 60 to 80 lamellæ or ribs; in the Arctic specimens which I have seen, the number is very exactly 80 or 84. The only part of Goldfuss's description which does not apply to Captain M'Clintock's specimens is the expression "*radiis in disco confluentibus*," a character not exhibited by them. The base is not conical in the specimens from the Arctic regions, which are widely expanded, and rather thin and flattened. This coral is found abundantly on the shores of Lake Huron, and in the Eifelian beds of Rhenish Prussia.

Plate IX.

FIG. 1.—*Spirifer Arcticus* (Haughton).

The specimen here figured was found by Captain Osborne on the north coast of Bathurst Island, and the same fossil was found by Captain M'Clintock at Hillock Point, Melville Island, in conjunction with *Productus sulcatus*. Although it resembles several carboniferous *Spirifers* of Australia, it is certainly not identical with any of them. It is distinguished by the large, strong ribs being themselves marked by two or three smaller ribs.

Spirifer Arcticus.—*Testâ magnâ, subtransversâ, ellipticâ, tumidâ; sinu lato; rugis lateralibus magnis, numero 6, parvulis plicaturis (2-3) substriatis, sulcis depressis; areâ altâ, triangulari, testæ latitudinem æquante; umbone maxime recurvato.*

DIMENSIONS.

Breadth, in half inches,	2·81
Length of ventral valve,	2·42
Length of dorsal valve,	1·80

Some of Captain M'Clintock's specimens are two inches in width.

FIGS. 2, 3, 4.—Different views of the fine Liassic fossil found by Captain M'Clintock *in situ* at Point Wilkie, Prince Patrick's Land.

Ammonites M'Clintocki (Haughton).—*Testâ compressâ, carinatâ, anfractibus latis, lateribus complanatis, transversim undato-costatis; costis simplicibus, juxtâ marginem interiorem levigatis; dorso carinato acuto; aperturâ sagittatâ, compressâ, antice carinatâ; septis lateribus 4-lobatis.*

This fine Ammonite resembles several species common in the upper Lias of the Plateau de Larzac, Sevenses, in France. It approaches *A. concavus* of the lower Oolite, but is distinguished by having only four lobes on the lateral margins of the septa, and by its showing no tendency to a tricarinated keel. The following measurements give an exact idea of its form, as compared with that of the species mentioned:—

	Diameter. Inches.	Width of last Spire. Diam. = 100.	Thickness of last Spire.	Overlapping of last Spire.	Width of Umbilic.
<i>A. M'Clintocki,</i>	1·83	$\frac{11}{100}$	$\frac{4}{100}$	$\frac{0}{100}$	$\frac{0}{100}$
<i>A. concavus,</i>	2·95	$\frac{50}{100}$	$\frac{4}{100}$	$\frac{0}{100}$	$\frac{1}{100}$

The principal difference here observable is in the somewhat greater size of *A. concavus*, and the larger umbilic of *A. M'Clintocki*. It certainly resembles this well-known Ammonite very closely; and it appears to me difficult to imagine the possibility of such a fossil living in a frozen, or even a temperate sea.

The discovery of such fossils *in situ*, in 76° north latitude, is calculated to throw considerable doubt upon the theories of

climate which would account for all past changes of temperature by changes in the relative position of land and water on the earth's surface. No attempt, that I am aware of, has ever been made to calculate the number of degrees of change possible in consequence of changes of position of land and water; and from some incomplete calculations I have myself made on the subject, I think it highly improbable that such causes could have ever produced a temperature in the sea at 76° north latitude, which would allow of the existence of Ammonites, especially Ammonites so like those that lived at the same time in the tropical warm seas of the south of England and France, at the close of the Liassic, and commencement of the lower Oolitic period.

FIGS. 6, 7.—*Monotis septentrionalis* (Haughton).

Testá oblique ovatá, valvis dissimilibus, dextrá plano-convexá, sinistrá convexá, costis radiantibus geminatis, ad extremum paulum bifurcatis, interstitiisque alternis majoribus et minoribus; auriculá retroflexá, levi.

This *Monotis* differs from any with which I am acquainted, but bears a certain degree of resemblance to *M. inaequalis* (Goldfuss). The lines of growth are scarcely visible, and are quite obliterated on the posterior ear of the shell. Fig. 6 represents the left valve, which is very convex, but the artist has not shown the striæ in pairs, which is a striking character in the larger shells. Fig. 7, which shows the right valve, is too hollow, as the convexity of the right valve is only about half that of the left valve. It is worthy of remark that species of *Monotis* are of common occurrence in several parts of Europe, in connexion with the Ammonites of the upper Lias.

FIGS. 5 and 8 represent casts of two species of Gasteropoda, the first quite undeterminable, and the second a *Pleurotomaria*, with a very flat spire.

Plate X.

FIG. 1.—*Calophyllum phragmoceræ* (Salter), Sutherland, Pl. VI., Figs. 4, 4 a, from Beechy Island.—This specimen shows a portion of the coral, when it has become cylindrical, in which condition it closely resembles the casts of *Turbinolia fungites* found in the Carboniferous Limestone

of Carlingford. The following description is taken from Mr. Salter :—

Calophyllum phragmoceras.—*Growing in large, loosely aggregate clusters of broad, conical tubes. The young buds, six or eight in a group, spring from within the edge of the old tubes, which are frequently 1½ inch in diameter at top, acquiring this diameter rapidly. The surface is coarsely striated lengthwise, the interior showing (either by rough fracture or polishing) strong transverse plates set closely at nearly equal distances from each other, and flat, or but very little concave; in some specimens, however, especially in the younger part, they are depressed and almost funnel-shaped. The edges of these plates are not crenulated, but show in their substance thin lamellæ, corresponding in number to the outer striæ; half of them project more than the rest, but all are very thin and short.*

FIGS. 2 and 2 a.—*Clisiophyllum Austini?* (Salter.)

This coral was found at Beechy Island, and appears to be the same as that described by Mr. Salter (Sutherland's Voyage, Pl. VI., Figs. 6 and 6 a) under the name *Strephodes Austini*. In Captain M'Clintock's specimens, the lamellæ which form the boss in the centre of each cup are not twisted. I have modified Mr. Salter's description to suit these specimens.

Clisiophyllum Austini.—*Surface covered by hexagonal or pentagonal cells, of various sizes, the larger ones frequently four lines across; the smaller ones in groups of two, three, or more at the angles of the others. The extreme edges of the cups are crenulated, their sides thickened, and sloping steeply. They are radiated in the larger stars by 36–44 thin lamellæ, half of which are continued to the centre of the cup, where they unite, without twist, to form a raised boss. The lamellæ are united everywhere by frequent vesicular plates.*

FIGS. 3, 4, and 4 a (natural size).—*Chaetetes Arcticus* (Haughton).

This beautiful coral and its varieties, Figs. 4 and 4 a, were found in abundance at Beechy Island. They present, at first sight, all the character externally of *Calamopora Gothlandica* and *C. alveolaris*, from which, however, they are quite distinct, as there are no perforations in the lamellar walls which constitute the coral.

Fig. 1.

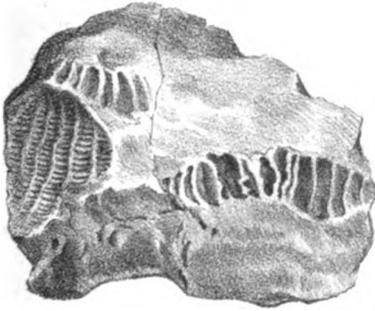


Fig. 2.

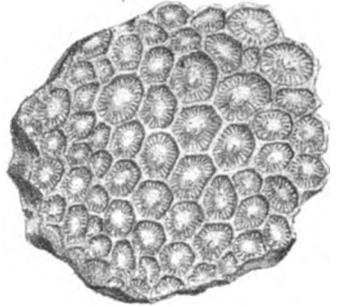


Fig. 3.

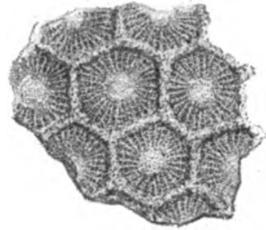


Fig. 4.



Fig. 5.

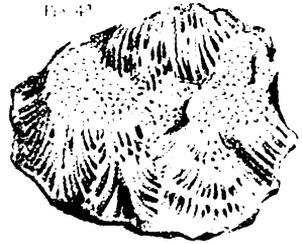


Fig. 6.

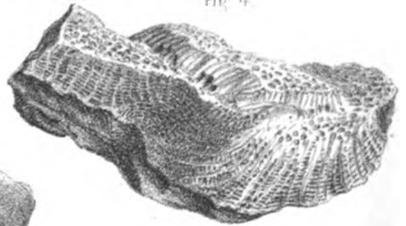


Fig. 7.



Fig. 8.



Chætetes Arcticus.—*Globosa vel placentaformis*; *tubis utrinque prismaticis flexuosis radiantibus, subæqualibus vel minoribus interpositis, multangulis*; *dissepimentis planis in tubis contiguis interruptis*; *tubis contiguis non communicantibus*.

DIMENSIONS.

The variety of *C. Arcticus* which resembles *Calamopora alveolaris* differs only in the dimensions of its tubes, and their somewhat less polygonal transverse section.

C. Arcticus.—Diameters of tubes $\frac{1}{100}$ to $\frac{1}{105}$ of an inch. The dissepiments are sometimes far apart, and sometimes very crowded, varying with the curvatures of the tubes.

Depth of cells from $\frac{1}{100}$ to $\frac{1}{105}$ of an inch.

C. Arcticus, var. *alveolaris* :—

Diameter of tubes, $\frac{1}{80}$ of an inch.

Depth of cells, from $\frac{1}{80}$ to less than $\frac{1}{80}$ of an inch.

FIGS. 5 and 5 a.—*Heliolites porosa* (Edwards and Haime).

Two species of *Heliolites* were found by Captain M^cClin-
tock in the limestone of North Somerset, *H. porosa* and
H. megastoma. The former of these is represented in the
Figs. 5 and 5 a, and agrees with Edwards and Haime's descrip-
tion of the English Devonian coral. This fossil coral con-
firms the inference already drawn from the occurrence of
Cromus Arcticus, and shows that the limestone of North So-
merset is at the very top of the Silurian beds, and near the
base of the Carboniferous.

Heliolites porosa.—*Corallum compound, forming generally a globular mass, which in some specimens is subgibbose, in others cylindrical*; *sometimes composed of very distinct superposed layers*. *Calices somewhat unequal in size, placed rather irregularly at distances equal to about two or three times their diameter, surrounded by a very thin rim, and slightly elevated above the general surface of the corallum*. *The calicular fossula large and rather deep*. *The pores of the Cœnenchyma small, almost equal in size, and nearly regularly hexagonal*; *one-eighth of a line in diameter*. Calices, $\frac{1}{100}$ of an inch in diameter (Edwards and Haime).

Plate XI.

FIG. 1 (natural size); FIG. 1 a (magnified). *Favistella Franklîni* (Salter).

Quantities of this beautiful coral were found at Cape Riley, by different officers of the several exploring expeditions, and,

as it readily attracts attention, more of it was brought home than perhaps of any other fossil. It is fully described by Mr. Salter in "Sutherland's Voyage," Plate VI. Figs. 3, 3a.

Favistella Franklini.—*Masses a foot in diameter, composed of long polygonal tubes, nearly two lines broad, of very nearly equal size on the surface; the growth is by interposition of young tubes, which soon attain the adult size. The walls of the tubes are thick, but appear thin from the absence of lamellæ; these are reduced to mere longitudinal striæ (shown in Fig. 1a), seldom projecting at all into the tube, and in general scarcely visible to the naked eye. The diaphragms are very closely packed, about four in the space of a line throughout the largest specimen. They are seldom quite flat, usually a little waved up or down (Salter).*

FIG. 2.—*Syringopora geniculata*.

The beautiful specimen here figured was found at Cornwallis Island. It appears to be identical with the variety of the Irish Carboniferous *S. geniculata*, in which the corallites are at a distance from each other, somewhat exceeding their diameters, and in which the connecting tubes are about two diameters apart.

FIGS. 3 and 3 a.—Natural size, and magnified view of part of *Calamopora Gothlandica*.—These specimens were found at Port Leopold, and are unquestionably identical with the celebrated fossil of Goldfuss. In the Fig. 3 a, the double rows of pores are filled with siliceous, minute plugs, presenting the knobbed appearance represented in the figure.

Calamopora Gothlandica.—*Globosa vel placentaformis, tubis utrinque prismaticis rectis subæqualibus vel minoribus interpositis, dissepimentis planis, poris communicantibus geminis ad latera dispositis (Goldfuss).*

FIG. 4.—*Terebratula aspera (Schlotheim)*.

This interesting Brachiopod was found in limestone by Captain M'Clure, at the Princess Royal Islands, in the Prince of Wales' Strait, between Baring Island and Prince Albert Land. I have no hesitation in pronouncing it to be identical with Schlotheim's fossil, which is found in the greatest abun-

Fig 1

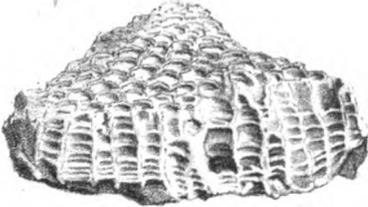


Fig 2.

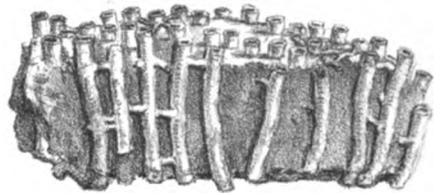


Fig 1^a

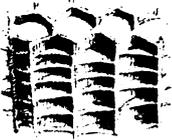


Fig 3.

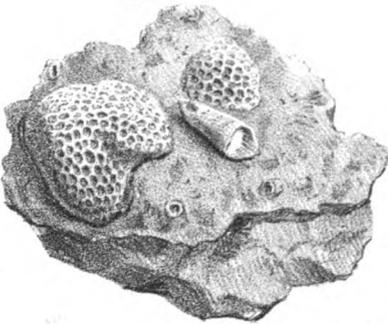


Fig 4



Fig 3^a

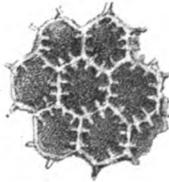


Fig 5.

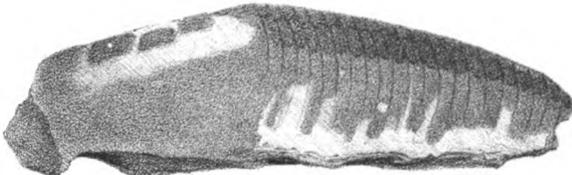


Fig 6



dance at Gerolstein, in the Eifel. Banks' Land, or Baring Island, is composed of sandstone, similar to that at Byam Martin's Island, and at the Bay of Mercy. This sandstone contains beds of coal, apparently the continuation of the well-known coal-beds of Melville Island. It is a remarkable fact, that these carboniferous sandstones *underlie* beds of undoubtedly the Carboniferous Limestone type, and that at Byam Martin's Island, where fossils are found in this sandstone, they are allied to *Atrypa fallax* and other forms characteristic of the lower sandstones of the carboniferous epoch. It is, therefore, highly probable that the coal-beds of Melville Island are very low down in the series, and do not correspond in geological position with the coal-beds of Wales, which rest on the summit of the carboniferous beds. It is interesting to find at Princess Royal Island, where, from the general strike of the beds, we should expect to find the Silurian limestone underlying the coal-bearing sandstones, that this limestone does occur, and contains a fossil, *T. aspera*, eminently characteristic of the Eifelian beds of Germany, which form, in that country, the upper Silurian strata.

FIG. 5.—*Orthoceras Ommanneyi* (Salter), "Sutherland's Voyage," Pl. V., Figs. 16, 17.

This specimen was found in the upper Silurian limestone of Assistance Bay, and is figured by me to show that it has a beaded siphuncle, a circumstance not noticed by Mr. Salter in his description, but which is well shown in the polished section from which my figure is sketched.

FIG. 6.—*Lithostrotion basaltiforme*.

This fossil coral was found in company with *Spirifer Arcticus*, near Cape Lady Franklin, on the north coast of Bathurst Island; and, although it is not in very perfect preservation, I think it may be safely identified with some varieties of the well-known carboniferous limestone fossil whose name I have ventured to give it. It occurs in the thick bands of carboniferous limestone which occupies the northern coasts of Bathurst and Melville Islands, overlying the coal sandstones of the south, and stretching westward to Prince Patrick's Island. In the hollows of this carboniferous limestone, and not to be distinguished from it in lithological character, ex-

cept by a practised eye, occur the remarkable beds of Liassic limestone found at Point Wilkie and at Exmouth Island.

Map of Discoveries in the Arctic Sea.

1. The Silurian Strata, Limestone, are coloured brown.
2. The coal-bearing Sandstones, Lower Carboniferous, are coloured yellow.
3. The Carboniferous Limestone is coloured blue.
4. The Liassic Beds are Vermillion.
5. The Granitic and Gneissoid Rocks are pink.
6. The Beds of Coal are marked by black lines.

XXV.—*Observations during the Campaign of 1854, 1855, and 1856, on the Crimea, its Climate and Zoology.* By WILLIAM CARTE, L. R. C. S. I., Honorary Member of the Royal Dublin Society, and of the Royal Zoological Society of Ireland; Corresponding Member of the Dublin University Botanical and Zoological Association; late Curator of the Museum of the College of Surgeons; Assistant-Surgeon to her Majesty's Forces, &c.

[Read Friday Evening, January 30, 1857.]

IN giving publicity to the following remarks on the Crimea, its climate and zoology, I would, ere setting out, state, that from the fact of the greater portion of my time being taken up by professional duties, my observations are necessarily of a very limited nature. At the same time, I carefully abstain from mentioning any circumstance of which I have not had either personal experience or information of a reliable nature; and trust the following brief notes may not be altogether devoid of interest.

In September, 1854, I left England for service in the East; and, after a voyage of eighteen days, unmarked by any incident of importance, arrived at Constantinople. On the passage the vessel touched successively at Gibraltar, Malta, and the small Greek island of Syra. This latter place, like all the Greek islands, presents, on approach, but little trace of vegetation. On landing at Constantinople, stumbling over the usual number of mangy dogs, and being worried by the incessant shouting of *hamals* (Turkish porters), I, with some difficulty, reached the Admiral's office, and was there furnished with a passage in a steamer just starting for Balaklava,