

DR. R. W. COPPINGER'S REPORT ON PETERMANN FIORD, MAY AND
JUNE, 1876.

H.M.S. "Discovery," at Barden Bay,

12th September, 1876.

Sir,

In compliance with your Order of August, 1876, that I should furnish you with a Report on the Petermann Fiord, I have the honour to inform you that the party under the command of Lieutenant Fulford, to which I was attached, started from Thank God Harbour on the 22nd May, and on the second journey rounded Cape Tyson and entered the fiord. On leaving Cape Tyson and Offley Island, which were considered to mark the north-east side of the mouth of the fiord, we saw some miles before us an abrupt, precipitous wall of ice, extending in an irregularly wavy but unbroken line from shore to shore. When we had got about 10 miles S.S.E. of Offley Island, the young floe on which we had been travelling terminated, but was connected through the intervention of a hummock hedge with an old glassy-hummocked floe, over which we proceeded until we reached the margin of the heavy ice above-mentioned.

Here at 11½ miles S.S.E. of Offley Island, and about 1,000 yards from the high precipitous cliffs which form the N.E. shore of the fiord, we made our second camp (see plan). The old floe on which we camped was rigidly connected with the heavy ice; in some places the precipitous and cleanly-fractured face of the latter meeting the old floe at a sharp right angle. On examining the surface of the heavy ice, we found it to be totally different in character from that of a floe. It was of glassy smoothness, and so slippery and uneven that walking (in the ordinary sense of the word) was impossible, and to get along at all it was frequently necessary to resort to crawling. The surface was thickly studded with circular pits, about six inches deep, and from 1 to 18 inches in diameter, usually containing a little snow and some dark powder, of which I obtained specimens. In general configuration the surface of this ice was arranged for the most part in undulating ridges, extending obliquely down the fiord in a N. and S. direction; but as a rule interrupted by wide fissures and faults, so that few of the ridges were directly continuous for a greater length than two miles. The height from crest to furrow was usually about 30 feet, and the slope so steep and slippery that in many places it was quite impossible to cross the ridges except by cutting steps, or by some such contrivance. The furrows, as a rule, had a certain amount of snow bed, and so far as they went afforded good travelling; but where the ice was devoid of snow, not even a dog could obtain foothold. It is not to be understood from the above that the ice-surface was everywhere disposed in these great ridges and furrows; for, on the contrary, there were many patches from five to six acres in extent of bare ice exhibiting an irregularly undulating surface from 30 to 35 feet above the water level, and intersected by narrow fissures.

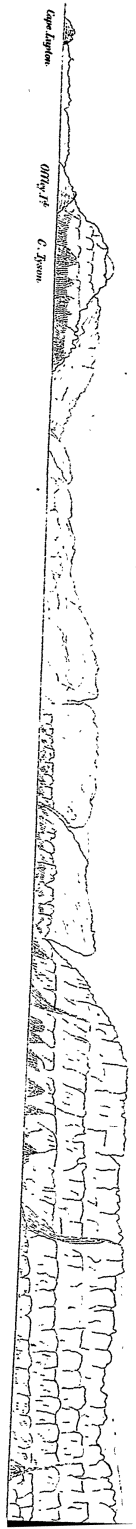
Having explored all the ice within a day's journey of this camp, and ascertained that by keeping for three-quarters of a mile to the old floe, which sent a tongue (as shown in the plan) under the N.E. cliffs, and that by taking to a furrow of the glacier ice for another three-quarters of a mile we could advance our position, we packed up and proceeded.

Our third camp, then, reached on the 25th May was 13 miles from Offley Island and 200 yards from the N.E. line of cliffs. Here Lieutenant Fulford obtained "sights" for latitude. From 4 miles to the northward of this position, these cliffs presented a vertical face about 1,100 feet high, composed of alternating bands of light-grey and dark slate-coloured fossiliferous limestone rock, and the cliffs from abreast our third camp, were surmounted by an ice-cap, whose blue jagged edge lying flush with the face of cliffs, we estimated at a thickness of 40 feet. The cliffs of the S.W. shore of the fiord presented a similar ice-cap, but of greater extent, as it began about 10 miles to the southward of Cape Lucie Marie, *i.e.*, on the south side of the first glacier, and was continuous to the southward as far as the cliffs were seen to extend.

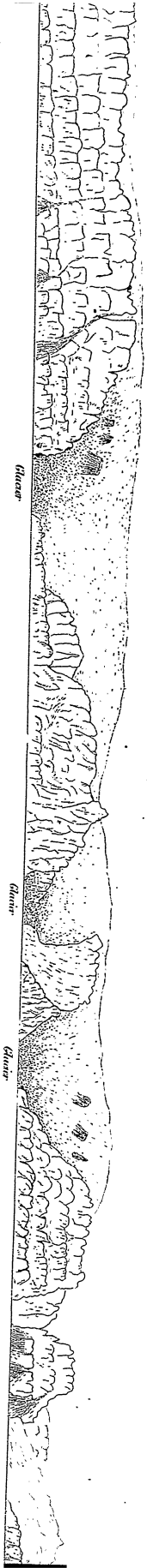
From both sides the ice seemed to be flowing steadily over the cliffs, as evidenced by frequent avalanches in which great masses of the ice-cap projecting over became detached, and carrying with them in their descent masses of rock torn from the face of the cliffs, came thundering down to the floe, marking their flight by dense clouds of snow, and accompanied by a long series of echoes, creating a most grand and imposing effect. Some idea of the force with which these avalanches came down may be gathered from the fact that large stones were sometimes projected across the floe to a distance of 80 yards from the foot of the cliffs.

At this third camp, the furthest position to which with our disabled sledge and unsuitable equipments we could move our baggage, we spent three days devoted to

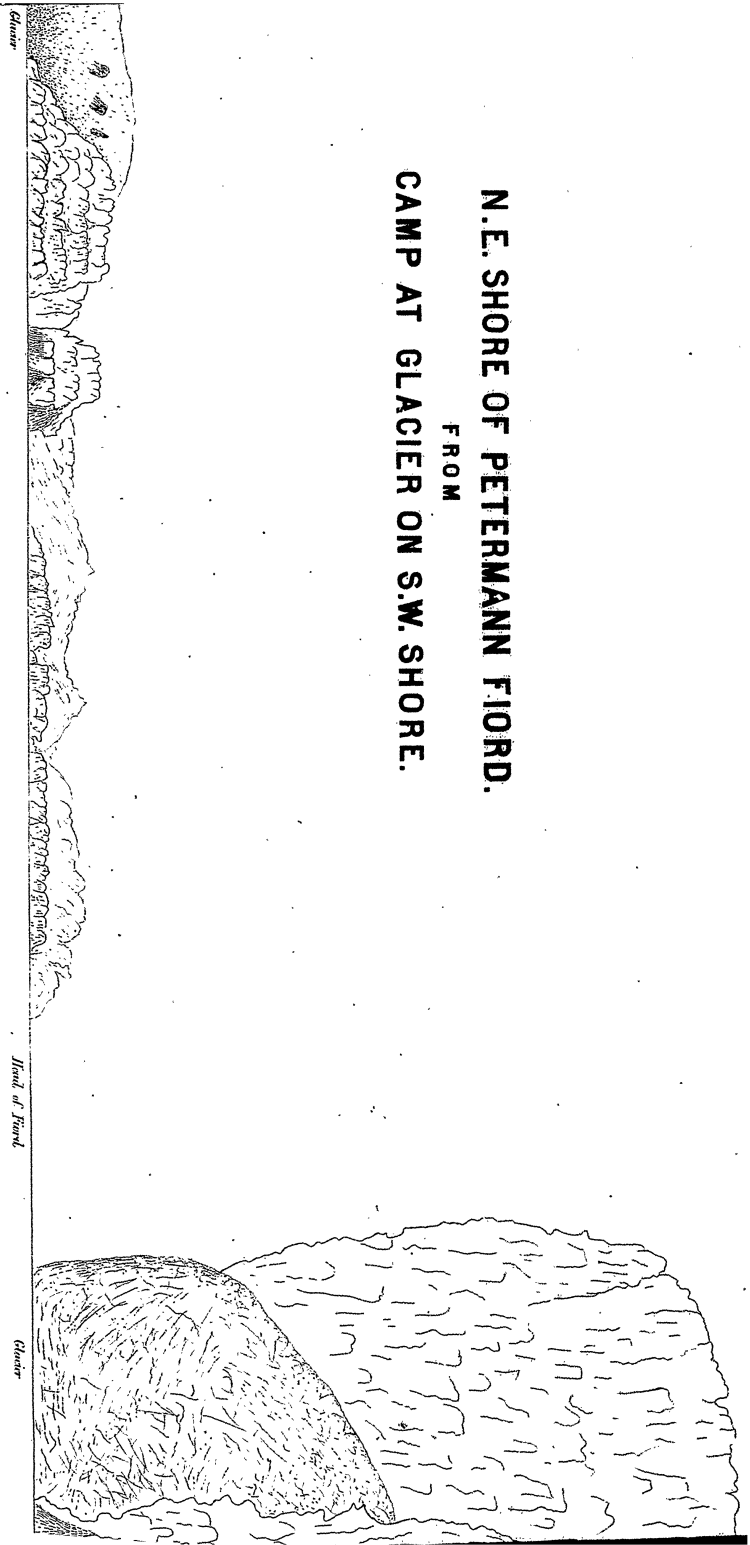
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**N.E. SHORE OF PETERM
FROM
CAMP AT GLACIER ON S**



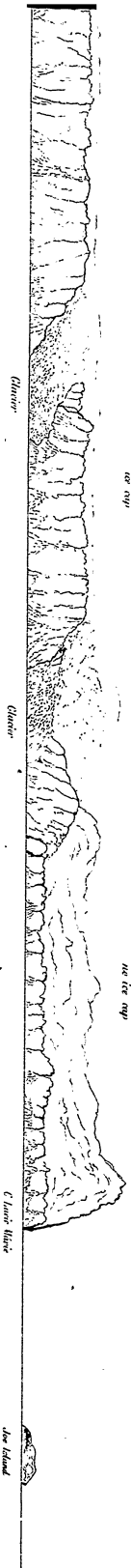
N.E. SHORE OF PETERMANN FIORD.
FROM
CAMP AT GLACIER ON S.W. SHORE.



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S. W. SHORE OF PETERMANN FJORD FROM CAMP OF 25TH



S. W. SHORE OF PETERMANN FJORD FROM CAMP OF 25TH MAY, 1876.

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walking excursions. The greatest distance up the fiord to which we could proceed was 6 miles from camp, and to attain this distance we had to run some risks of falling through hidden crevasses, or slipping from high ice slopes into water-chasms; so that we had to content ourselves with making our furthest look-out point the summit of an ice-pinnacle 18½ miles from Offley Island.

About one mile from us was the nearest glacier of the N.E. shore, two miles beyond it a second, and half a mile further on a third. We had found, as we approached these glaciers, that the main ice of the fiord became more and more fissured, and that the faults in the continuity of the ridges and the furrows became more frequent and embarrassing; but from the eminence now attained it seemed that these glaciers were the nuclei of disruptions of the main ice, and hence the progressively-increasing difficulties of travelling. Carrying the eye along the N.E. line of cliffs, we saw the land terminate abruptly about 20 miles off in a prominent bluff, and from this point for a quarter of the way across the head of the fiord no land was to be seen, but the same strange undulating sea of ice, which from the main ridges lying in a north and south direction, would seem to be flowing into the fiord in an east to west direction. The fact of our distinctly seeing those ridges at so great a distance was perhaps due to the gradual shoaling of the water up the fiord, and the consequent rise in the elevation of the ice.

Carrying the eye to the right of a bearing of N.120° (mag.) from our furthest position, a background of land about 30 miles distant was clearly seen extending behind, and as it were overlapping the apparent termination of the S.W. line of cliffs. The latter cliffs presented to the eye an appearance almost precisely similar to that of the N.E. cliffs, with which they seemed to correspond as if originally parts of the same land. Both were of about equal height, were equally precipitous, presented the same arrangement of strata, the same description of ice-cap; and both were grooved by glaciers, there being four on the S.W. side and three on the N.E. side of the fiord.

When about a mile from the nearest glacier we came to a wide fissure, about 30 yards broad, which seemed to extend nearly across the fiord, and whose precipitous glassy walls, 50 feet high from brink to water, we had no means of descending. The bottom of this fissure was composed of treacherous-looking, slushy ice, with a lane of dark water, 2 feet wide, along the middle; so that had we succeeded in getting down we should probably have been unable to cross. About this same locality were several narrow fissures, some of which, from the very slippery nature of the ice, it was difficult to avoid falling into. One of these, in a tolerably level part of the ice, we found by measure ment to be 2 feet wide above, and 23 feet deep, from brink to a probable false bottom of loose snow, on which the light weight of our measuring line rested.

The ice was incessantly crackling. Wherever we stood we heard about every half minute a noise varying between the sharp crack of a whip and the report of a guncap, resulting, as we soon discovered, from the formation of thread-like cracks, many yards in length, which formed a kind of network over the surface of the ice.

The behaviour of the water in the wide fissures was very puzzling. It seemed to rise and fall to a certain extent through the ice, but not enough to account for the whole tidal movement; and we were therefore inclined to believe that the glacier ice was only aground at certain periods of the tide, and that it consequently behaved in some respects like a floe, and in others like grounded ice. Not being provided with a sounding line, no estimate of the depth of any part of the fiord was made. However, to solve the question as to the existence of a vertical tidal movement in the ice, Lieutenant Fulford took a series of sextant angles between the summit of the cliff adjoining our camp and a marked spot on the ice, and taking observations at different periods of the tide, came to the conclusion that there *was* a certain amount of vertical motion.

Having failed to get up the fiord by the N.E. side to a greater distance than 18½ miles from Offley Island, Lieutenant Fulford decided on moving round by the edge of the glacier ice to the opposite or S.W. side, and on trying there to discover a more practicable route than we had hitherto encountered. In the latter attempt, however, we were disappointed, for after travelling along the floe under the S.W. cliffs to a distance of 13 miles from Cape Lucie Marie, we found the glacier ice jammed right against the face of the cliffs, and not affording anywhere a practicable route for our sledge. Between the young floe and the glacier ice was a well marked tidal crack, which extended for three-fourths of the way across the fiord, that is, for as far as the young floe and the glacier ice met without the intervention of an old floe. (See diagram.)

On the 3rd June we commenced our return journey, and stopping for one day at Offley Island, had opportunities of collecting specimens of Silurian fossils, and of observing the glacial planings and scorings which this island exhibits to a remarkable degree. The scorings run uniformly from the summit of the island, at its N.E.

extremity to the beach at the S.W. end, grooving successive layers of grey and black limestone. The layers of rock lie horizontally; both are fossiliferous, the grey abounding in fossil corals, and molluscs, the black containing corals, but to a less extent. The N.E. extremity presents an abrupt precipitous face, 513 feet high, showing the same arrangement of stratified rock as on the glaciated slope, and closely corresponding with the appearance presented by the opposite face of Cape Tyson, one mile distant. Subsequent observations at Cape Tyson showed that in geological formation it closely corresponded with Offley Island. Being under the impression that Esquimaux remains had been found at Offley Island by the U.S. "Polaris" Expedition, we searched carefully round the island for signs of winter or summer habitations, but were unable to discover any, probably owing to the great accumulation of snow on the lower parts of the land.

During this expedition few traces of animal life were seen. On the 28th May several dovecies were seen in watercracks, close to the N.E. cliffs of the fiord, and on the same day an ivory (?) gull was seen flying by the cliffs in a southerly direction. Two seals (an usuk and a neitsuk) were shot by Hans, and several others were seen on the young floe, in the vicinity of Offley Island. Near our camp at the first glacier of the S.W. shore of the fiord tracks of a bear were seen by the Esquimaux Hans. No further signs of life were noticed.

It is manifest from the above that the results of this expedition have not been as decisive as could be wished, yet I think enough has been done to justify us in concluding that the Petermann Fiord is the outlet of a huge glacier stream pouring probably from the eastward, to which the glaciers pouring through the N.E. and S.W. cliffs are insignificant tributaries, not adding materially to the main volume of ice.

In several particulars this glacier presented features deviating considerably from the general rule, which points, although already touched on in this report, it may be as well to summarise as follows:—1. The absence of onward sliding motion, probably due to the immobility of the floe in the mouth of the fiord, the low gradient of the glacier, and the prolonged cold season. 2. Its partial subjection to tidal influence for more than a mile above the snout. 3. The absence of detached bergs below the snout. 4. The diminutive height of the terminal cliff, ranging only from 16 to 30 feet above the sea level. 5. The presence of water in the fissures 2 miles above the snout, when the mean altitude was 40 feet. 6. The low gradient of the glacier.

On the 7th June our party returned to Thank God Harbour.

I have the honour to be, Sir,

Your obedient servant,

R. W. COPPINGER, M.D.,

Surgeon, R.N.

To Capt. H. F. Stephenson, R.N.,
H.M.S. "Discovery."

SUB-LIEUTENANT CRAWFORD CONYBEARE. ORDERS TO, 7TH APRIL. ORDERS TO, FROM LIEUT. ARCHER, 15TH APRIL. REPORT OF, 21ST APRIL. SLEDGE JOURNAL, 8TH TO 20TH APRIL. ORDERS TO, FROM LIEUT. FULFORD, 29TH APRIL. ORDERS TO, 7TH MAY. REPORT OF, 19TH MAY. SLEDGE JOURNAL, 2ND TO 18TH MAY. ORDERS TO, 22ND MAY. SLEDGE JOURNAL, 22ND TO 31ST MAY.

H.M.S. "Discovery," at Discovery Harbour,

7th April, 1876.

MEMO.

Lieutenant Archer being detached on an extended journey of exploration down Lady Franklin Sound, I have appointed you to an 8-man sledge, the "Endeavour," victualled for 42 days as an auxiliary to that Officer. You will therefore place yourself at once under his orders, and be ready to leave the ship to-morrow the 8th instant.

2. The two sledges will travel together for seven days, then giving Lieutenant Archer 120 rations, which is separately packed on your sledge, as well as leaving a depôt of 84 rations on the spot selected by him, and exchanging any men with his sledge crew he may wish, return on board by the 22nd April.

3. I desire you will make all possible notes along the coast over which you travel, strictly adhering to the sledge instructions with which you are now fully acquainted.

4. You have my best wishes for a pleasant journey and a safe return.

H. F. STEPHENSON,

Captain.

Fr. Chatel,
Cap. Forecastle.
Drd Stewart,
2nd Cap. Fore-
top.
W. C. Wellington,
Serjeant R.M.A.
Wm. Ward,
Armourer.
J. F. Smith,
Sailmaker.
Hy. Edwards,
A.B.
Hy. Winsor,
Carp. Crew.

To Sub-Lieutenant Conybeare,
H.M.S. "Discovery."

