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National Antarctic Expedition: Report of the Commander

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Source: *The Geographical Journal*, Vol. 22, No. 1 (Jul., 1903), pp. 20-37

Published by: geographicalj

Stable URL: <http://www.jstor.org/stable/1775047>

Accessed: 27-06-2016 04:20 UTC

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Meanwhile, the heroic Discoveries are still working for us at their numerous observations under increasing hardships caused by the small stock of coal. They have full faith in us, and that the needful funds will be found by us. Look once more at your maps. Look at their discoveries. Do not these men deserve well of their country? Will not their country recognize their services? I feel sure that it will, and that we shall yet welcome them all here, after one of the most successful and glorious achievements that have ever adorned our geographical annals.

NATIONAL ANTARCTIC EXPEDITION: REPORT OF THE COMMANDER.*

UNDER the title of "Brief Summary of Proceedings," Captain Scott sends the following report addressed to the Presidents of the Royal and Royal Geographical Societies. It is dated "*Discovery*, Winter Quarters, February 23, 1903."

As is known, the *Discovery* left Port Chalmers, New Zealand, on Christmas Eve, 1901, heavily laden.

With a fair wind, we made good progress under sail alone until our arrival in the pack.

On the evening of January 1 we passed several table-topped bergs, and on the following day, in lat. $66^{\circ} 30'$, fell in with streams of loose field-ice.

The antarctic circle was crossed early on the 4th, the pack remaining easy and the weather favourable, except for occasional thick fogs.

On the 6th the pack became much heavier and our progress consequently slower; later all traces of a swell disappeared, and we forced our way through rotten floes of very large area.

We passed through several leads of open water on the 7th, and on the morning of the 8th crossed the southern edge of the pack in lat. $70^{\circ} 25'$, long. $173^{\circ} 44'$, the edge being well defined, with a clear open sea beyond, and soundings in 1480 fathoms.

Opportunities were taken before and after this to sound, dredge, and take water samples, but owing to closeness to the coast and the thick pack which was usually about us, much less of this work was possible than I could have wished.

We arrived at Cape Adare on the evening of the 9th, having to force our way through a line of thick pack in entering Robertson bay; after taking magnetic observations, watering ship, and leaving a record, we weighed anchor again at 3 a.m. on the 10th, passing out close under the land, where we became involved in a very heavy pack running fast to the northward past several grounded bergs. After several hours of struggling, I was glad to get through this into clearer water.

We turned down the coast, passing outside the Possession islands,

* Map, p. 120.

but had now to face an increasing south-easterly wind and continual streams of pack passing to the northward.

We arrived off Coulman island on the night of the 12th, but as the wind had increased to half a gale and the glass was falling, I decided to make for shelter under the island; we arrived there on the evening of the 13th, and on the following morning the wind had increased to a full gale. Except as regards the sea and pack, the island afforded little shelter; the wind swept down from the heights with terrific force, and the ship was repeatedly driven to leeward, narrowly escaping collision with several small bergs.

On the 15th the wind fell rapidly, and in the afternoon I was able to place a record at Cape Wadworth, in the spot arranged.

In the evening, in bright calm weather, we were able to stand into an inlet in the ice-barrier in Lady Newnes bay, and all hands were employed in killing and skinning seals for winter consumption; we left this inlet at 8 a.m. on the following day, but had to pass again to the northward of Coulman island to avoid the pack.

We had now to make a very long circuit to clear heavy pack, and arrived off Wood bay on the night of the 17th.

The bay ice was cracked, but had not moved out; it was very thick and heavy, and consequently I abandoned the idea of leaving a record at this spot.

At noon on the 18th we passed close to Cape Washington in clear water, obtaining as shallow a sounding as 8 fathoms. From this cape the absence of pack allowed us to trace the coast-line at a very easy distance, and to observe and sketch the mountains in the background. In about lat. $75^{\circ} 30'$ an enormous floe of the inland ice descends into the sea and extends for many miles to seaward. The ice-mass, which must be afloat at its outer edge, closely resembles the Great Barrier and the barrier formation which entirely fills Lady Newnes bay.

On the night of the 18th we entered a curious inlet at its northern junction with the land. From this point we were obliged to pass direct to the eastward, skirting ice-cliffs rising to 150 feet in height.

At noon on the 19th we rounded the end of this ice-mass, but were unable to again approach the land immediately, though at 6 p.m. we again turned in that direction.

A bluff headland now observed to the south-west gave indication of a harbour, and our course was shaped for it, but this necessitated passing through streams of very heavy hard ice, and our progress was therefore slow, and it was not until 6 p.m. on the 20th that we entered a long inlet which gave promise of forming an excellent winter harbour.

A landing was effected, and some hours spent in exploring the inlet and securing specimens of rock, moss, etc. Leaving the harbour shortly after midnight, we continued for some distance in clear water, but later encountered streams of loose ice, and by the forenoon were in thick pack

with an uninterrupted stretch of ice before us. We made such poor progress that at 8 p.m. (21st) I decided to turn to the eastward, more especially as I then fully thought I could trace continuous land between Mount Erebus and the mainland.

The weather since our departure from Coulman island had remained wonderfully clear and bright.

Passing south of Beaufort island, we arrived off Cape Crozier on the evening of the 22nd, and landed at the foot of Mount Terror, visiting the penguin rookery, placing our record and taking magnetic observations. Climbing a foothill to the height of 1350 feet, we here got our first view of the barrier. The shore party were re-embarked at 4.30, and we stood close around Cape Crozier.

Until the 28th we continued to push close along the barrier edge in face of a steady south-easterly breeze and westerly set.

On the 26th the wind increased to half a gale, and we stood off under sail; but the wind again fell in the morning, and we were able to close the ice. During this time soundings were taken three times daily, and the height and irregularities of the barrier edge observed as closely as possible.

It is impossible to give details of this work until we have had time to plot it; but in general it may be remarked that the soundings remained fairly uniform at something over 300 fathoms until the night of the 29th, when 100 fathoms was obtained; and the barrier edge is most irregular, varying from 30 feet to 215 feet, though long stretches of it appear to be of uniform height. On the 29th the barrier was observed to be very irregular in outline, and in the evening we ran into a sharp bend amongst many stranded and overturned bergs. Here we first obtained shallow soundings (100 fathoms), and observed that the barrier rose to the eastward in gradual snow-slopes to a height of 800 or 900 feet, continuing to form a number of undulating hills, trending to the northward. From this time the fine clear weather we had had so far enjoyed deserted us, and a northerly breeze brought continual snowstorms, which prevented our seeing clearly for any considerable distance. On the morning of the 30th we were skirting the edge of low fast ice embayed between ice islands; much pack lay in the offing. The soundings varied greatly, but several were between 70 and 100 fathoms. At four, a lift in the fog showed us high rising snow-slopes in the background, descending gradually towards the sea until they fell away into heavy ridges and precipices 300 or 400 feet in height, from the base of which a gentle slope led to a barrier wall, capable of sending forth table-topped bergs. Though morally certain we were in the vicinity of land, the appearance of ice-formation is so deceptive in thick weather that I was glad when several dark patches loomed out of the mist and were quickly distinguished as patches of bare rock. These patches stand at a height of 2000 to 3000 feet, and are evidently the sharp spurs of hills which are otherwise completely snow-capped.

During the morning of the 31st we skirted along the edge of solid fast ice, and later were amongst several ice-islands; these are mostly dome-shaped on top, descending to ice-cliffs 50 to 60 feet in height; the soundings close to being about 100 fathoms, it is impossible to know whether these are ice-capped islands, ancient grounded bergs, or the remains of a receding barrier formation. They undoubtedly prevent the fast ice from breaking away to the coast-line.

Very large colonies of Emperor penguins were seen in this vicinity.

During the night of the 31st we became embayed amongst ice-islands and grounded bergs, almost completely connected by fast ice; in the bay the temperature fell, and young ice formed with extraordinary rapidity. After looking fruitlessly for an outlet, we were forced to come out through the narrow passage at which we had entered. I then made a *détour* to the westward in hopes of finding an open lead, but as we increased our distance from the land we were faced in all directions by heavy pack.

At this point, seeing the inadvisability of wintering in these regions, and not knowing how late a date it would be possible to find winter quarters in Victoria Land, I determined to turn back, though it is now evident we could have pursued our exploration to a later date.

On February 3 we entered an inlet in the barrier in lat. $78^{\circ} 30'$, long. $196^{\circ} 15'$. It was wholly sheltered, and we were able to lay alongside an ice-foot on to which we could step from the ship's rail. The barrier here undulated in long waves running approximately west-south-west and east-north-east; the ship lay in an inlet formed in the hollow of one of these undulations, and a long crack continued the inlet to the westward. Numerous seals lay about on the ice in the vicinity of this crack. This night I despatched Lieut. Armitage with a small sledge party to explore the ridges, and prepared to inflate our balloon. On the 4th the balloon was inflated, and I was able to ascend to a height of 700 feet, the wire attachment being unfortunately too heavy to allow of a higher ascent. The day was clear; the alternate light and shade of many parallel lines of undulation could be seen to the southward, and nothing beyond. Shortly after noon Lieut. Armitage returned, having travelled about 9 miles to the south and traversed several of these undulations. After securing the carcasses of eighteen seals killed in the morning, we put to sea again at 7.30. A sounding taken in the inlet showed 315 fathoms, and it was noticeable that the ship neither rose nor fell in relation to the ice throughout our stay.

We returned along the barrier and rounded Cape Bird on the evening of the 7th in heavy and continuous snowstorms. I now made for some steep headlands in about lat. $77^{\circ} 30'$, which we had observed on our way south, and hoped to find the limits of a harbour similar to that which we had entered to the northward.

The day was fine (8th), but when within 10 miles of the land we

were brought up by a heavy pack, and decided to skirt this, making as much southing as possible. In the afternoon we passed close to an extraordinary *débris*-strewn and water-worn glacier snout, on which we landed. Proceeding as before, we now found ourselves going about due east and towards the southern side of Mounts Erebus and Terror. Finally, in the evening we arrived at Hut point, securing the ship to the ice-foot.

I give elsewhere a description of our winter quarters, with the present position of the ship, and a rough plan of the neighbourhood.

Everything pointed to the desirability of this spot as winter quarters. The one year's ice was moving out rapidly, and showed absolutely no signs of pressure. Hut point would provide an additional safeguard against such a possibility; suitable places were easily found for the huts, to communicate with the agreed position, for our record position at Mount Terror seemed (and proved) easy; the road to the southward appeared open, and the distance from the mainland was small enough to ensure an attempt at its exploration.

No thought that the ice might not again move out this season entered any one's head, and, of course, was the less likely to do so as the open sea extended farther and farther beyond Cape Armitage. Personally, my fear was that some sledge party might be cut off by the ice moving out too quickly, and without warning, as it did last year.

On February 11 we commenced erecting the huts, but the task was much interrupted by strong south-easterly winds; whilst the amount of work on ship and shore prevented all ideas of despatching early sledge parties.

On the 18th, three of the officers—Messrs. Shackleton, Wilson, and Farrar—crossed to the island, which lies about 15 miles south-south-east of the ship; they returned on the 22nd, with considerable information as to the lie of the land.

On the 24th we were able to land coal, oil, and provisions, and thus established a *depôt* in the event of the ship being driven off. The magnetic huts were erected, and the instruments in adjustment, in time for the term day observations of March 1.

The work was now so far advanced that I proposed to take a sledge party round to Mount Terror, but, unfortunately, strained my leg whilst exercising on ski, and was forced myself to abandon the project.

On Monday, March 3, the party started under the direction of Mr. Royds, and included Mr. Barne, Dr. Koettlitz, Mr. Skelton, and eight men. As they entered the eastern bay, the snow grew daily softer, and the work finally so fatiguing, that Mr. Royds decided to push on with Dr. Koettlitz and Mr. Skelton on ski, sending the remainder of the party back under Mr. Barne, they having no ski.

By this time the ice had broken away well past Cape Armitage, and it was necessary for the returning parties to cross the hills, rising to an altitude of 1000 feet, to reach the ship.

Mr. Barne reached the crest of the hills at about noon on March 11, and camped for lunch, during which meal the wind sprang up very suddenly, bringing a heavy drift; the temperature fell, and the party, not experienced in such conditions, suffered much from frost-bites and general discomfort. In these circumstances, and imagining themselves closer to the ship than they actually were, they decided to leave the sledges and make for her. Soon after their start the gale increased, and they were enveloped in a whirl of drifting snow and entirely lost their bearings. Mr. Barne did his best to keep the party together, the more so when it became evident that the slope on which they stood was affording a less and less secure foothold. Before long, however, one of the men, Evans, slipped and disappeared from sight. After shouting and receiving no reply, Mr. Barne, cautioning the men to remain where they were, decided to follow, and very deliberately started to slide down the slope himself. He was firmly under the impression that the slope was one well known to us all close to the ship, and that after making certain he would be easily able to regain the summit and bring the men on. After waiting for some time, another of the men (Quartly) decided to follow Mr. Barne, and was immediately lost to sight. The experience of these three was identical: after the first start they were soon going at a speed which left them absolutely no control of their movements, and this continued for some 400 or 500 yards, until they were suddenly brought up in a patch of soft snow within 15 feet of a sheer drop into the sea.

Meanwhile, of the party above, one, Hare, had decided to go back to the sledges to change his footgear, and the remaining five, after a long wait, proceeded along the slope, as they supposed, towards the ship, led by an able seaman (Wild). Luckily, Wild had nails in his boots, for, after travelling some distance, he suddenly and without warning (so thick was the snow) found himself within an ace of stepping over the cliff into the sea. He had the presence of mind to shout to the others to stop, which they were all able to do, except poor Vince, who missed his footing, shot past Wild, and was immediately lost to view. Vince was a thoroughly good man, always cheerful and bright, and popular throughout the ship. With great difficulty the remaining four men succeeded in retracing their steps, and eventually reached the crest of the hill, from whence, taking a more easterly course, they fell on some landmarks and found their way to the ship. Great credit is due to Wild for the manner in which he conducted and kept together the small party. A large search party was immediately despatched on their return to the ship, and the siren was kept going. With some difficulty the search party succeeded in finding the sledges, and in the vicinity they found Mr. Barne, Evans, and Quartly half frozen and wholly dazed; they did not know how they had again reached the summit of the hill. No trace was found of Hare or Vince. A further prolonged search was

made on the following day, a roped party descending the slope with crampons, but without result. On the third day I got up steam on the bare possibility of finding an ice-foot below the ice-cliff over which Vince had fallen, and whilst we were preparing to weigh, Hare was seen descending the hill opposite the ship; he was quickly brought on board, and found to be neither frost-bitten nor in any way hurt by his exposure; he had turned to find the sledges, failed to do so, wandered aimlessly about, and finally lost consciousness; thirty-six hours later he awoke, to find himself buried in snow and only a trifle stiff; he imagined it to be the morning after the accident, and was astounded to learn that he had slept through a whole day.

On taking the ship around to the scene of the accident, we found no ice-foot, and it was evident that Vince must have fallen directly into the sea from a cliff 150 to 200 feet in height.

Though Mr. Barne made an error in breaking camp in a snowstorm, it must be remembered in extenuation that he, in common with all, was inexperienced in the climatic conditions of these regions; that he imagined himself much closer to the ship than he was; and that his party, expecting higher temperatures, were very ill provided with fur clothing, and would have been most uncomfortable in their tents. The event proved a lesson to all, and Mr. Barne has in his more recent expedition taken exceptional and most praiseworthy care of his men.

On March 20 Mr. Royds and the remaining officers returned to the ship; they had failed to reach the spot for depositing the record, but chiefly because they had encountered very severe weather in the vicinity, and their provisions were too short to allow of delay. They were evidently very close to the spot, and no doubt remained that we should be able to reach it in the spring.

During the month of March ice repeatedly formed about the ship, but was constantly blown out; that which formed immediately around her on March 24 has remained, though for some time, I think, only because the ship held it in.

On April 1 Mr. Armitage and I started with a party of twelve men and the dogs to lay out a dépôt to the south-east. After crossing the new ice and rising to the barrier surface, the temperatures fell rapidly until the average was below -40° ; the dogs' coats were in very poor condition, and we could get no work out of them; the fur clothing proved to be unsuitable, and the men, wholly unaccustomed to the conditions, suffered severely. After three days, therefore, the temperature having fallen to -48° , I decided to turn back, and returned to the ship.

From this time preparations for the winter were pushed on, the winter awning was spread, and the ship made as snug as possible.

The winter passed very comfortably. The men remained cheerful throughout, plenty of work was found for them out-of-doors, and a regular routine was maintained; the only drawback was the prevalence

of a keen but apparently purely local south-east wind, which often made our exercise unpleasant and not infrequently impossible. It was not until May 3 that a strong southerly gale brought the first heavy snowfall, allowing the decks and sides of the ship to be partially covered with snow; this greatly improved our comfort below. The same gale blew the strait clear of ice to within 200 yards of the ship.

I fear I have not the time to relate all the incidents of the winter, but I would mention that officers and men did their best to continue all the scientific observations possible under the conditions. Mr. Hodgson was always out and about, keeping holes open in the ice for his nets and fish-traps, and, whatever the temperature, volunteers were always ready to assist him at the work.

All the officers joined in taking the night meteorological observations, though Mr. Royds alone took those between 10 a.m. and 10 p.m.

Mr. Bernacchi tended his magnetic instruments with zealous care, and took regular observations with the electrometer. Ice-measurements were taken as often as possible, and tidal observations regularly. Experiments were carried out to determine the temperature and salinity of the ice at various depths. Auroral displays were infrequent and feeble, but were carefully observed when they occurred.

We experienced our lowest temperatures in the spring, when also the wind became even more persistent and annoying. Every indication pointed to the temperatures to the south and on the Barrier being far lower than those which obtained about the sheltered position of the ship.

On September 2, I started with five officers and fifteen dogs to the northward to explore the bay towards Cape Bird and examine the islets and glacier in it. This short journey convinced me that it was possible to start the prearranged reconnaissance trips. I returned on the 5th, and on the 10th Mr. Royds, with Dr. Koettlitz and five men, proceeded to the south-west with a fortnight's provisions in an attempt to reach the mainland.

On the 11th, Mr. Armitage, with Mr. Ferrar and five men, started to the westward with the same intention. Approximately south-south-east of us lies a white snow-covered island, and south-south-west a black wind-swept one; a bold headland connected with the mainland can be seen beyond through the gap almost due south of the ship. My own intention was to lay out a dépôt in this direction.

Mr. Royds returned to the ship on the 19th, having experienced very low temperatures and much wind; from his report I learned that no clear water to the mainland was likely to be found in a south-western direction.

I started with my party on the 17th, but at the first camp, about 12 miles from the ship, encountered a heavy gale, which blew throughout the 18th with a temperature below -40° (min. -51°); as our sleeping-bags were filled with ice, and one of the party badly frost-

bitten, I returned on the 19th, and again started on the 23rd with Mr. Shackleton, the boatswain, and the dogs.

We reached the north side of the cape in three days, but found our further progress barred by heavy ice-upheavals, cracks, and crevasses, evidently the result of the barrier ice pressing up from the southward around the cape. Turning to the eastward, we had, in a bad light, to cross very disturbed ice with deep, lightly bridged crevasses; into one of these the boatswain fell, and was only saved by his harness, which luckily held, though stranded. We arrived on the southern side of the cape on the 30th, and, selecting suitable leading marks, deposited the *dépôt* about 8 miles from the land and 60 miles south of the ship.

From this point land could be seen to the south-south-west, continuing the outline of Victoria Land, but from this direction through south to the slopes of Mount Terror, bearing slightly to the eastward of north, an unbroken horizontal line indicated the continuance of the barrier surface. Returning outside the snow-covered island, and therefore skirting the disturbed ice, we regained the ship in $2\frac{1}{2}$ days. On my return I learned that Mr. Armitage, after an arduous journey, had arrived back on the 25th with his party in a more or less broken-down condition.

The cause was undoubtedly scurvy, and, as undoubtedly, the disease was brought out by the severe work and exposure to which they had been subjected.

The most severe cases were Mr. Ferrar, Cross, P.O., and Heald, A.B.

A thorough examination of the ship's company showed that there was a taint of the disease in both officers and men.

The following steps were taken: all tinned meats were discontinued, and only seal meat served out.

An extra allowance of bottled fruit was issued, and lime-juice provided.

The holds and storerooms were again thoroughly overhauled and disinfected.

Under these conditions, to which must be added the gradual improvement in the weather, and the inspiring effect of the lengthening days, all symptoms quickly disappeared. Mr. Ferrar, Cross, and Heald rapidly recovered.

I realize that this outbreak of scurvy, such as it has been, is more than likely to be exaggerated by irresponsible persons, especially in view of the tales that may be told by or attributed to the men now being discharged from the ship. Whilst appreciating the gravity of the disease in this climate, I beg to assure you that the outbreak was in reality slight, as indicated by the rapidity with which it was thrown off. I doubt if its existence would have been discovered but for the severe work which brought it to light in Mr. Armitage's party.

In consultation with the doctors, I can arrive at no satisfactory explanation of the cause of the outbreak. The tinned meats used in

the winter are of excellent quality, and every tin was examined by the doctor before use. For the greater part of the winter seal meat was issued three times, and fresh mutton once a week.

A possible cause may lie in the following facts:—

- (1) For a month before the commencement of sledging the supply of seal meat ran short; very few seals came up on the ice, and the full ration could not be issued.
- (2) The cook, though quite capable of cooking well, served up the dinners, and especially the seal meat, in a most unappetizing manner.

I fear it is not in my ability to throw more light on what has happened, but I beg to call your attention to the certainty of recovery which results from a liberal supply of seal meat.

This was the more evident in connection with the extended summer sledge journeys: the disease again manifested itself in a slight degree, but was immediately dispelled on the return of the men to the ship.

There is absolutely no cause for anxiety should we be forced to spend another winter here. The men remaining are now in the most splendid health and condition, and we shall have no difficulty in laying in an ample supply of seal meat. We have already shot a large number of Shua gulls, which we find excellent eating.

Mr. Armitage, in his reconnaissance, succeeded in reaching the surface of a glacier on the mainland, and continued to ascend it to a height of several hundred feet; he reported a good prospect of being able to continue on it to the inland ice.

On October 4 Mr. Royds, Mr. Skelton, and four men left the ship for Mount Terror, to renew the record previously left at the Penguin Rookery.

The eastern slopes of Mount Terror are terribly wind-swept, and their surface is bare to the summit. On arrival at their foot the party encountered a heavy gale, which blew continuously for five days, for the greater part of which they were confined to their tents, round which the snow steadily accumulated, narrowing their space. Cooking was rarely possible.

Mr. Royds suffered severely from cramp, and in consequence when this gale ceased Mr. Skelton started with two men to find the record. This was successfully accomplished, and on the following day the same small party, roped together, wearing crampons and carrying ice-axes, succeeded in descending to the sea ice, where Mr. Skelton had previously observed a large number of Emperor penguins. As a result of his enterprise he was able to get several specimens of young Emperor penguins in down, and an excellent series of photographs and notes.

Mr. Skelton deserves great credit for this discovery, the descent on to the sea ice being a very hazardous proceeding over the very disturbed ice at the place at which he made it.

Mr. Royds returned to the ship on the 24th. During the first part of the journey he had experienced very low temperatures, one of which, -57° , is the lowest recorded on any of our journeys.

By this time preparations for the southern trip were almost completed.

On October 30 Mr. Barne started with eleven men as a supporting party, with instructions to make for the depôt (A) which I had already established off the Southern cape.

On November 2 I left the ship myself with Dr. Wilson and Mr. Shackleton and nineteen dogs. The dogs were in splendid condition, and, though loaded with 100 lbs. apiece, were so fresh that we were obliged to sit on the sledges to restrain them. We caught up Mr. Barne that night as he was starting on a night march, having been detained by bad weather. The weather continued very unsettled, and we did not reach the depôt till the 10th, and the supporting party joined us there on the following day, and we started due south in company on the 12th. The dogs were in such excellent condition that they far out-distanced the men, and we gradually increased their loads until on the third day they were dragging the whole of our own loads, and the supporting party, which I had intended carrying some way further, were no longer of use. On November 15, therefore, in lat. $79^{\circ} 15'$, I directed them to return to the ship, and we continued our journey alone.

At this time we had high hopes of being able to explore to a considerable distance over the barrier, but within a very short time the aspect was completely changed. Almost at once the dogs began to show signs of weakening, and at first it was very difficult to discover the cause; rest and increase of food made no improvement. We eventually discovered that it was the nature and not the amount of food that was at fault. Norwegian stock fish was the food selected and strongly recommended from its use in Greenland, where a team of twenty-three dogs had been worked on it for three years without the loss of a single animal. This being so, one can only conjecture that the fish deteriorated on its passage through the tropics: certainly its effect on our dogs was most disastrous. We continued to the southward, but were forced to do so by advancing half our load at a time; the surface became more difficult, and dogs failed so speedily that we were obliged to pull ourselves to get even the half-load along.

As we proceeded, we could distinguish new but distant land on our right, continuing that which we had observed from depôt (A) to the west-south-west, and it soon became evident that this land extended to the south approximately parallel to our course.

We crossed the 80th parallel on November 27, when our progress became so laborious that we could hope to do little without establishing a further depôt, and the course was altered to south-west and later to west-south-west.

It was not until December 15 (after twenty-nine days of relay work) that we arrived sufficiently close to the land to obtain good leading marks for our dépôt. As we could not rely on the dogs for our return, I left here (dépôt B) three weeks' provisions, and proceeded to the south with the four weeks' which we had remaining. We lightened our load in every way possible, carrying no dog food, and calculating our own food for something less than 2 lbs. per day per man.

Dépôt B was approximately in lat. $80^{\circ} 30'$, long. 162° E., about 7 miles from a snow-covered headland, which formed the northern extreme of a mass of land with high and irregular ranges of mountains in the background. To the north of this headland, between it and another mass of high land, the barrier ran back through an apparent strait, behind which nothing could be seen, though it is evident, from the disturbed state of the surface, that ice is pressing out through the strait.

Another such strait exists at the farthest point we reached, and another to the northward.

We continued south along the coast-line until December 30, the surface often soft and sticky, and close to the land invariably so, the dogs growing daily more feeble and sickly.

We had now arrived in lat. $82^{\circ} 17'$, long. 163° E., and were close to a cape which bounded the northern side of another apparent strait running in a north-west direction. To the west-south-west there was a range of magnificent mountains, and another range of great altitude lay to the south, close to the coast-line, which continued as far as could be seen in a direction south by east of our position.

I fear it is impossible without a chart, and in the time at my disposal, to inform you of the many points of interest of this journey.

I took as careful observations as I could for our positions, and of the bearings of the various land masses, the altitudes of the mountains, etc., but it will take a considerable time to work out and plot these observations. Dr. Wilson has a most excellent series of sketches of the coast from many points of view, and Mr. Shackleton has some photographs of interest.

On December 31, we made an attempt to reach the land to secure rock specimens, though undoubtedly the rock is of the same volcanic nature as that to the northward. After proceeding about 4 miles on ski, we were confronted by an immense chasm, a mile in width, and about another mile from the cliffs. The chasm was filled with huge irregular blocks of ice. With the aid of a rope and with much exertion we commenced to climb across and around these blocks. As we proceeded they became sharper and "newer" in outline, and much less snow lay about them. When within a few hundred yards of the other side, we found that the inner boundary of the chasm consisted of a huge perpendicular ice-foot trench, resembling that we had seen both east and west bounding the lands and washed by the sea. A gentle snow-slope

descended from the foot of the cliffs to the ice-foot, and the blocks of ice that lay in the chasm had evidently calved from it. As it was obviously impossible to climb this ice-wall, we were forced to return to camp.

On January 1 we started back for depôt B. The dogs were now utterly spent and practically useless from this point; on the 9th, we unharnessed them, and, hoping to keep some alive, carried their food on our sledges. The weather now became very thick, and the land was obscured; the surface seemed to grow more difficult, and we had most serious trouble in steering a course, our fickle guides being the sun, wind, and astrugi, or the tail end of a cloud: during these days, most of these, and sometimes all, failed us. On the 13th, we were forced to camp for this reason; we had only two days' provisions left, but though we had been travelling for some time almost by dead reckoning, I knew we must be in the vicinity of the depôt. I was therefore much relieved when at noon a slight clearance of the mist showed us the depôt flag about 2 miles to the northward,

On returning to this depôt, I hoped to be able to make another attempt to reach the land, and to carefully pilot the coast-line to the northward; the former was rendered impossible, and the latter difficult, by the sudden breakdown of one of my companions, Mr. Shackleton. Before reaching depôt B, it seemed to me he was feeling the strain of our recent work much more than Dr. Wilson or I were; he suffered considerably from shortness of breath.

When we left depôt B on January 14, the congestion had greatly increased: he was breathing asthmatically and spitting up a considerable amount of blood. Recognizing the gravity of the case, Dr. Wilson and I decided we must push on at all costs, and keep Mr. Shackleton walking on ski beside the sledges. This necessitated Dr. Wilson and I dragging 260 lbs. apiece, and I do not think we could have carried Mr. Shackleton as well. By this time our dog team had dwindled to two—the other poor animals, growing too weak to even walk alongside the sledges, had been dispatched; for the two (our best) we were carrying food, hoping to save them, but at this crisis I abandoned this idea, and they were killed. Relieved of all camp work and pulling, Mr. Shackleton made some progress towards recovery, and was able to keep up well until we reached depôt A on January 28, when he was again thrown back by a snowstorm, and caused us the gravest anxiety. On the 30th we were able to push on once more, and arrived back at the ship on February 3. Mr. Shackleton has since practically recovered, but both the doctors agree that he ought not to risk further exposure, and, much as I regret parting with him, I do not think the health of an executive officer of this ship should be open to any doubt. I am, therefore, sending him home by the *Morning*.

On my return to the ship, I learnt that the programme for other sledge parties, which had been arranged before I started, had been

carried out with some success and without accident. Mr. Royds journeyed again to Cape Crozier on November 3, accompanied by two men, to revisit the Emperor penguin rookery and make further observations. These objects he satisfactorily accomplished, and though the Emperor penguins had left, he obtained more specimens of the young, and had the good fortune to find an egg. The Ross sea, which had been cleared by the gale on his previous visit, was again frozen over when he arrived. The party again experienced very bad weather on the Terror slopes, being tent-bound on the 7th and 8th, and again on the 11th and 12th. The Adelie penguins had returned to their rookery and started to lay eggs, a number of which were brought back to the ship; the party returned in good health and condition on the 17th.

Mr. Armitage started on his main western trip on November 29. He was accompanied by Mr. Skelton and ten men, with a supporting party, consisting of Dr. Koettlitz, Mr. Ferrar, and seven men. They proceeded towards the glacier previously ascended, reaching a line of "sokers" which fringe its edge, extending for about 10 miles north and south, at 29 miles from the ship, on December 2.

The glacier descends between precipitous granite mountains. On December 6 they reached a point at which it turned abruptly to the south, running behind the high range of mountains visible from the ship. They had now travelled 15 miles over the surface of the glacier, and ascended 3400 feet. Skirting the ice-clad foothills of the above range, they arrived at the summit of a pass, from which to the westward a steep descent led to another glacier, which discharged its ice, after many windings, farther to the northward.

They were now 53 miles from the ship and 4000 feet above sea-level. On the 9th Dr. Koettlitz and his party returned, and Mr. Armitage, thinking the descent to the westward too steep, ascended a steep slope with the aid of tackles, intending to attempt crossing the mountains. With this idea they ascended another 1700 feet; but they realized the task to be impossible in the time at their disposal, and, returning once more to the pass, decided to attempt the descent to the glacier below. With some difficulty, and considerable risk to the sledges, this was accomplished, and they arrived on the glacier at a point 1900 feet below the pass.

They proceeded to ascend the glacier in a northerly direction towards a range of remarkably bare granite mountains, running north-west and south-east. At the foot of these the glacier formed the junction of two tributary glaciers; choosing the right-hand one, the party proceeded in a north-westerly direction, having to cross heavily crevassed ice where the inclination grew steeper.

Mr. Armitage reports—

"The surface of the glacier was, generally, much out up; in parts like a ploughed field, in others like a cracked glass dome, through the
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cracks of which no bottom could be seen. On the way up the glacier we planted a line of sticks. During a period of twenty-three days the greatest movement shown was 3 feet 8 inches."

This slow glacial movement is in keeping with other observations made in this vicinity.

Mr. Armitage continues—

"On January 2, at an altitude of 8000 feet, some of my men (six) had to be left behind, the rarefied atmosphere and exertion proving too much for them."

Mr. Armitage, with Mr. Skelton and four men, still continued to ascend, until, having gained another 1000 feet in height, they found before them a smooth, open, snow-covered plain, over which they travelled for a short way. The farthest point reached was in lat. $77^{\circ} 21' S.$, long. $157^{\circ} 26' E.$ Observations showed a magnetic dip of $84^{\circ} 24'.$

The snow surface was soft, with successive crusts 9 inches or 1 foot apart; there were no sastrugi.

Mr. Armitage thought he detected a slight descent in the plain to the westward, but of this he could not be certain. The whole horizon to the westward was unbroken and clear.

On January 6 the party started to return, reuniting with the detached party on the same night. One of them, McFarlane, had to be carried on the sledge for most of the way back.

On their return Mr. Armitage remarks, "We found running 'becks' of water on the east side of the glacial valley, 7 feet wide and 9 inches deep. At level places large pools were formed, sometimes 1 mile in diameter. Bergschrunds, 150 feet deep, were found at the base of the mountains; huge 'erratics' were visible on the surface of the glacier (one measured 30 feet by 19 feet by 12 feet)." To ascend to the summit of the pass, they had again to use tackles for the sledges. On the 17th they arrived abreast of the Eskers, and on the 19th reached the ship.

This journey was, I think, a very fine one, and reflects great credit on Mr. Armitage. The sledges had often to be dragged up steep places one at a time, and, consequently, the distance traversed many times. Many dangerous crevasses had to be crossed. Mr. Armitage himself fell into one of these, and was only saved by his harness, after he had fallen some 15 feet; he received a severe shaking in consequence.

As I have not had time to inquire closely into Mr. Barne's or Dr. Koettlitz's journeys, I have asked these officers to draw out a short summary of their work, which I attach hereto.

It will, of course, be extremely difficult to follow the course and proceedings of the various sledge-parties without a proper chart, but this will take some time to construct. I am glad to be able to report that there is a considerable amount of data for its construction.

R. F. SCOTT, *Captain.*

Discovery, Winter Quarters, February 26, 1903.

SUMMARY OF SOUTH-WEST SLEDGE TRIP, DECEMBER 20, 1902, TO
JANUARY 30, 1903.

Left *Discovery* December 20, 1902, with four seamen and one stoker, two tents, two sledges, and five weeks' provisions (one week at dépôt A), and one week's bag for southern party; total weight, 1148 lbs.

Arrived at dépôt A, December 31, 1902; left dépôt A, January 1, 1903.

Travelling towards southern visible land, and altering course to south to clear each successive rise of land as it appeared above the horizon. Passed two gaps, or straits, in the coast, beyond which (to westward) was an apparently flat horizon, land extending to southward.

On January 14, having been out fourteen days from dépôt A, we turned back, the weather having been very thick for the last two days, and being very thick at the time, having got abreast of the southern of the two gaps we saw.

Weather remained thick, with the exception of two days, when a short view of bits of the land was obtained, till the 24th, when it cleared, and on the evening of which day we reached dépôt A.

Reached the ship on January 30.

On the way out, on December 28, we crossed the fresh track of a single Adelie penguin, travelling east, having apparently come from between Mount *Discovery* and Black island; * and on the way home we crossed the track of another one, a few miles further north, and going in about the same direction.

Got rounds of angles and bearings nearly every day till January 15, when we had started back. After that date the weather was thick till the 26th, 28th, and 29th, on which dates I got rounds of angles.

The health of the party was good. Every one wore goggles all the time, and I did not have occasion for any medical treatment.

MICHAEL BARNE, *Lieut. R.N.*

SLEDGE JOURNEYS—REGINALD KOETTLITZ.

1. *For the purpose of investigating the rough old ice and esker-like lines of rock débris which pass to north from "Black" and "Brown islands."*

September 24, 1902.—Mr. Bernacchi, Mr. Daily, and I left on this date, course direct for middle of "Brown island;" reached "old ice" at

* *White island* is that described in my journey as lying to the south-east.

Black island is the wind-swept one to the south-west.

Brown island is another of browner basaltic rock situated at about the same distance south-west by west.

Mount Discovery is a very conspicuous isolated conical mountain, nearly 10,000 feet in height, and presenting the same aspect in all directions. It is viewed from the ship between Black and Brown islands, at a distance of 34 miles.

The Bluff is the temporary name given to the conspicuous cape to the south which limited our view of Victoria Land before the sledging commenced.

R. F. SCOTT.

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noon, and outskirts of rough "old ice" by 2.30 p.m.; arrived at esker-like lines following day: 17 geographical miles—some of heaps of *débris* 160 feet high (by aneroid); ice so rough we were obliged to go south to "Black island," which was reached on 27th. Ascended north-west promontory of island on 29th; found a channel apparently existed between "Brown island" and Mount Discovery, which is choked up with lines of rocky *débris* and broken ice, also that a channel separates these from "Black island." Saw that a glacier of some size comes down from the mountains behind Mount Discovery, and it appears to be the source from which the eskers are derived. "Brown island" seemed inaccessible to a sledge party, owing to this side being surrounded by lines of rocky *débris* 3 to 5 miles from its base. Returned to ship down newly found channel on west side of "Black island"—which ends in the barrier to the southward, with several tide cracks running, at its apparent junction, from "Black island" towards the Bluff range—round south side of "Black island;" and reached ship on October 2.

2. *Short sledge trip to Erebus bay, to ascertain whether an Emperor penguin rookery existed anywhere there or not.*

November 3.—Mr. Skelton, Hare, and I left the ship on this date, reached glacier snout by 2 p.m.; examined the marks placed upon it for ice-movement; proceeded and camped on the north side of the outer and larger rocky razor-back island well in the bay. Walked to the spit of rocky land to the north-east at the foot of the mountain; ascended 150 feet and examined all round with binoculars; no signs of any rookery. On return journey explored that portion of inner bay north of glacier snout, and reached ship on evening of November 5.

3. *Return journey of western supporting party.*

December 10.—Mr. Ferrar and I, with seven men, left the main party at "Separation ridge" on above date, upon our return to the ship.

On our march we occasionally separated and examined the hills on each side of our route. We found that those more inland were composed of granite rock, split and broken, as well as weather- or wind-worn into extraordinary shapes. The lower or more outer hills consisted of quartz, etc., with basaltic dykes cutting through them. The weather was too foggy to do much upon the sea and old ice in the bay. Reached ship on 18th.

4. *To attempt to reach and ascend "Brown island" and examine condition of things on western side.*

December 29.—Mr. Hodgson, Mr. Ferrar, and I left ship on this date, making our way towards centre of "Black island" in order to avoid the "rough old ice" as much as possible; reached that island after much difficulty, owing to the rough ice and water (due to thaw) on the

31st; continued along the north shore of "Black island" past the north-western point, across the channel, to within 3 geographical miles of "Brown island;" here the sledges could go no further. Walked over the rough lines of rocky *débris* to the island, wading channels in places; ascended to summit, 2750 feet, which was found to be a volcanic cone, with crater. Saw that the glacier at the back of Mount Discovery was not the source of the esker-like lines of rock *débris* and ice-worn boulders, but that it passed away in a long tongue along the shore of the mainland towards the north; also that a long deep bay existed between "Brown island" and the mainland, having Mount Discovery and the plateau mountain at its head; that the channel (?) between "Brown island" and Mount Discovery is choked with lines of heaped-up *débris*.

1903.—Returned to ship round the south of "Black island," and reached it January 8.

5. *To "Bluff," to ascend it and ascertain the lie and general arrangement of the pressure ridges, etc., as the ice passes that point.*

January 14.—Mr. Ferrar and I left ship; found going very heavy, so did not reach the "Bluff," though our course was direct for it, till the 20th. Camped upon the outskirts of long esker-like lines of rock *débris* and broken rough ice, which fringes this side of the mountain range for half a mile or more in extent. Weather now very stormy; could not leave camp till the 23rd. Walked to the land over the *débris*, crossing two movement or shearing cracks along the base of the land; ascended a shoulder near the "Bluff" end to a height of 300 feet, and had a fair view; could go no further, as the weather continued bad, and looked as though getting worse, so returned to camp; left, on return journey, in a blizzard, used sledge-sail, and arrived at ship on 26th.

NOTE ON THE ANTARCTIC SKETCH-MAP, p. 120.—As the complete charts showing the results of the surveys made by Captain Scott and the officers serving under him have not yet been received, the map of the antarctic regions which accompanies this paper must be considered as only provisional. It has been prepared from all the information at present available, including the report which Captain Scott has addressed to the presidents of the Royal Society and the Royal Geographical Society. A rough sketch of the winter quarters of the *Discovery* by Lieut. Barne, and another of Erebus and Terror island by Lieut. Royds, have furnished the basis for the enlarged inset plan, but the remainder of the new work has been drawn from letters and reports, in which are, however, given the latitudes and longitudes of several positions. The track of the *Morning* has been approximately laid down, from a preliminary chart on a small scale, by Lieut. Evans, and sent home by Captain Colbeck. Lieut. Shackleton has, since his return, looked over a proof of the map and made several corrections, but until the complete charts, based upon numerous observations and careful surveys, arrive, it is, of course, impossible to give anything more than an approximate idea of the geographical work of the expedition. Upon the present map, the newly discovered land is shown in red, while the remainder of the coast-line has been principally taken from the admiralty charts and other material.