
The Austro-Hungarian Polar Expedition of 1872-4

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PAPERS READ
BEFORE THE
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DURING THE SESSION 1874-75.

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I.—*The Austro-Hungarian Polar Expedition of 1872-4.*

By JULIUS PAYER.

[Read, November 10th, 1874.]

IT was not the object of the Austrian Expedition to search for the unknown country which the results of our preliminary expedition, undertaken in 1871, had made it likely would be found to the north of Novaya Zemlya, but to discover a north-east passage. This, its principal object, the Expedition has failed to attain, and the country referred to was discovered instead.

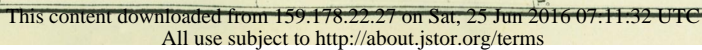
The limited time, as well as the dignity of a scientific meeting, require that in the following report all those events of a mere personal nature, and the adventures incidental to every Arctic Expedition, should not be dwelt upon; and this all the more, as the limited time will not even permit us to treat facts of scientific interest at as great a length as we should desire.

The *Tegethoff*, a screw-steamer of 300 tons, left Bremerhafen on the 13th of June, 1872, furnished with stores and provisions calculated to last about three years. Including Captain Carlsen, the well-known Norwegian navigator, who joined the Expedition at Tromsø in the capacity of ice-mate and harpoonier, the crew numbered twenty-four men, all told, amongst whom were sixteen Dalmatian seamen.

On the morning of the 14th of July we left Tromsø, shaping our course towards the north-east. A few days afterwards we doubled the North Cape; and on the 25th of July, when in 74° 30' N. lat. and 48° E. long., we reached the edge of the

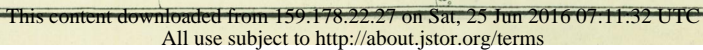
VOL. XLV.

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from a Survey by
JULIUS PAYER.

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packed ice, the unexpectedly southern position of which we had every right to consider a bad omen.

The masses of ice against which we had to struggle at that time, as well as those which we encountered subsequently, were certainly far less formidable than those with which we had become acquainted five years before, on the coast of Greenland; but they nevertheless seriously obstructed our progress. Large floes, separated by navigable lanes of water, were rarely met with, but immense quantities of broken fragments. Early in August we were actually beset for a few days, so as not to be able to move. Subsequently, however, we regained our liberty, and in lat. 75° N. we reached the open water extending along the coast of Novaya Zemlya. The decreasing temperature and quantity of ice showed, indeed, that the summer of 1872 was the very opposite of that of the year before. Aided by steam-power, we fought our way through a second barrier of ice, and only reached open water in the latitude of William Island. When still a little south of that island, we were overtaken by the yacht *Isbjörn*, in which Count Wilczek had effected his difficult passage from Spitzbergen, in order to establish a dépôt for our use near Cape Nassau.

The two vessels kept company as far as the low Barents Islands, where compact masses of ice, driven by south-westerly winds towards the coast, barred all progress for a week. Only on the 21st of August, the ice having exhibited symptoms of breaking up, we parted company, and the *Tegethoff* steamed slowly away toward the north.

But our hopes were vain! Night found us encompassed on all sides by ice, and for two long and dreary years! Cheerless, and barren of all hope the first year lay before us, and we were not any longer discoverers, but doomed to remain as helpless voyagers on a floe of drifting ice.

The unusually severe frost of the autumn of 1872 soon solidified the surrounding fragments of ice, from which neither sawing or blasting were able to effect our release. All our exertions were frustrated by its incredible elasticity, and by the rapidity with which pieces sawn asunder froze together again. Thus fettered, we drifted, at the mercy of the winds, towards the north-east.

Our position was thus sufficiently miserable, but on the 13th of October it became gloomy in the extreme. On that day the lethargy in which everything around us had so long been buried suddenly gave place to active commotion, and thenceforth we were exposed to the fearful pressure of the ice. Many a time we were summoned to be ready to save ourselves in case of the vessel foundering, and all this in the midst of a Polar night, and

without knowing whither to turn for safety. Our vessel, however, bravely withstood the pressure, though the floe upon which it was fixed had been uplifted by others which had forced their way under it, thus raising her aft, and causing her to heel over to port.

Preparations for passing the winter had by this time been made. The deck was covered with snow, an awning was spread from the mainmast forward, and a rampart of ice fixed round the ship. The latter required to be repaired frequently in consequence of the havoc caused by the motion of the ice.

Special care was taken to keep the crew employed. Watchers were set regularly, exercise was taken, and school kept. On Sundays the members of the Expedition met for a simple but impressive Divine service under the awning, when the Bible was read in Italian by the light of a train-oil lamp.

Meteorological observations were made regularly, Lieutenants Brosch, Orel, Captains Carlsen, Lusina, and Krisch relieving each other every two hours. The uncertainty of our position rendered it necessary to keep a watch constantly on deck, through which we were regularly informed of the approach of Polar bears, whose flesh formed a most important addition to our diet. Nevertheless, the sanitary condition on board during the first winter left much to be desired, so that our excellent surgeon, Dr. Kepes, was kept fully occupied. Scurvy and affections of the lungs made their appearance in spite of every precaution, the former partly on account of the congelation of the damp covering our cabin walls, and partly owing to mental depression brought on by our critical position, and which only disappeared when it became more hopeful, and the summer's work kept every one fully occupied.

Our small stock of wine was reserved for the use of the sick. The rest contented themselves with a daily allowance of artificial wine, which we prepared on board from glycerine, sugar, meat extract, tartaric acid, alcohol, and water. A small plant-case, suspended over the cabin stove, supplied us every week with a little cress and cabbage for the scorbutic. The dogs—whose number had by time been reduced to seven—were lodged on deck in boxes filled with straw. They were fed, at first, with dried horseflesh, and subsequently on the flesh of seals and bears.

On the 28th of October the sun disappeared below the horizon, not to rise again for 109 days. All the birds had left us, and during five long winter months we were obliged to burn lamps in our cabins. For weeks it was next to impossible to leave the ship. The Polar night was rarely of that indescribable clearness which has been noticed on land and by ourselves on the

coast of Greenland. Whenever a sudden change of temperature caused the expanse of ice to break up, dense vapours arose from the fissures, which not only further obscured the generally inky sky, but likewise produced that immense amount of precipitation which we experienced, especially during our second winter. A fine snow fell almost continuously, and in the course of the winter of 1873-74 it attained a depth of 12 feet. On the arrival of spring our vessel was completely buried in it, although nearly the whole of the snow which fell during the preceding winter had disappeared during the summer.

Our observations on the evaporation of the ice during the Polar night agree in the main with the results obtained by Parry on Melville Island. The winds nearly balanced each other as regards direction as well as force.

A hut of coal had been built on the ice, to serve as an asylum in case of the vessel being lost, but it was destroyed by a movement of the ice on Christmas Eve; and we considered ourselves fortunate in being permitted to open Christmas Day itself in undisturbed tranquillity, occupied with thoughts of home.

The first day of the new year brought with it no prospect of an early release. We were still drifting towards the north-east, and even imagined that we might be carried to the coast of Siberia. Fate, however, had ordained otherwise; for after we had crossed the 73rd degree of longitude, the wind shifted, and thenceforth, helpless as before, we drifted towards the north-west.

On the 16th of February the sun again made his appearance above the horizon; and on the 25th the pressure of the ice which had tormented us hitherto, having literally hemmed us in by a wall of craggy ice-mountains, ceased as suddenly as it had begun. The cold continued to be severe: the mean temperature of February was -31° Fahr., and towards the close of that month it reached its highest minimum, -51° Fahr. But this cold is borne easily, as the cabin affords ready means for warming oneself; and consequently several of our men only reluctantly put on their fur clothes when ordered on deck.

The Aurora in its ineffable beauty illumined the heavens during the whole of the winter, but diminished in frequency as the days grew longer. It generally appeared in the south, and only rarely was more than one corona seen on the same night. (Since the beginning of September they were the only incitation which we received from beyond.) Like mighty streams it rushed over the firmament, sometimes from west to east, at others in a contrary direction; and the corona vanished as rapidly as it appeared. It was most intense between eight and ten in the evening, and its appearance was never attended by

noise. Magnificent lights proved generally the forerunners of bad weather.

In the summer of 1873 our hopes of an early destruction of the floe, and consequent liberation, revived. The mean temperature of the past year had been $2\cdot75^{\circ}$ Fahr. In the course of the summer we observed a maximum temperature of 45° Fahr.; the black-bulb thermometer occasionally indicated a solar heat of 113° Fahr., and on days like these, when there was no wind, we had a sensation of stinging heat. Our hopes were based upon the evaporation of the ice, caused by the powerful effect of the sun, and upon its destruction by winds and waves, but not upon its melting in a sea the surface temperature of which never rose above freezing-point. The progressive conversion of the surface ice into sludge was witnessed by us from day to day, the cliffs and walls of ice crumbling away and evaporating, until nearly the whole of the sea was covered with a thick chaotic layer of sludge.

Thus encouraged, we made fresh efforts to regain our liberty, and the months of May, June, July, and August, were spent in futile endeavours to saw through the ice which surrounded us; but our floe, which had attained a thickness of 40 feet, in consequence of other floes forcing themselves underneath it, rendered all our attempts futile. The centre of our vessel, and the uplifted part abaft, remained immovably fixed upon the floe. The surrounding ice and snow having melted away and evaporated to the extent of 12 to 18 feet, we found ourselves fixed at a considerable elevation above the general level; and the danger of being capsized had to be provided against by supporting our masts with strong spars. I ought to state that our floe varied considerably in size from time to time; during the last winter it was shattered almost daily, but congealed again immediately. At the time now referred to (August, 1873) it was 5 to 7 miles in diameter.

The northerly winds of July drifted us to the south, as far as lat. 79° ; but August saw us again drifting to the north. I ought to state distinctly that nothing justified us in the assumption that the direction in which we drifted was at any time due to oceanic currents. The winds alone caused it, and a cessation of the wind led to a cessation in the movement of the ice. It struck us as remarkable that the direction in which we drifted was always on the right hand of that in which the wind blew, and that our vessel should have veered only to the extent of one degree in azimuth during the four preceding months.

In the course of the summer of 1873, when in about 79° N. lat. and 60° E. long., we drifted over an extensive bank; our

soundings, which had hitherto varied between 100 and about 270 fathoms, becoming much less.

The temperature of the sea was measured at different depths; and the use of the dredging apparatus resulted in a small zoological collection, only a portion of which we were able to bring to Europe. Drawings of some of the specimens which we had to abandon have, however, been made.

Our hopes that the ice would break up grew less and less every day, though the familiar grating sound which proceeds from the ice giving way was heard frequently, and dark streaks on the horizon pointed to the existence of fissures in the ice. We had already resigned ourselves to the necessity of being obliged to pass a second winter as inactive and perilous as the first, when the state of affairs all of a sudden underwent a change in our favour.

We had long ago been drifted into a portion of the Arctic Sea which had not previously been visited; but in spite of a careful look-out, we had not been able hitherto to discover land. It was therefore an event of no small importance when, on the 31st of August, we were surprised by the sudden appearance of a mountainous country, about 14 miles to the north, which the mist had up to that time concealed from our view.

At that moment all our past anxieties were forgotten; impulsively we hastened towards the land, though fully aware that we should not be able to get further than the edge of our floe. For months we were doomed to suffer the torments of Tantalus. Close to us, and in fact almost within reach, was a new Polar land, rich with the promise of discoveries, and yet, drifting as we were at the mercy of the winds, and surrounded by open fissures, we were unable to get any nearer to it.

At length, towards the end of October, we approached within 3 miles of one of the islands forelying the main mass of the land. Every other consideration was now thrown to the winds, and making our way over the rugged, hummocky surface of the ice, we for the first time placed our feet upon land, in lat. $79^{\circ} 54' N$. The ice covering the sea close to the shore was only one foot in thickness, and it was clear that an open lane of water had existed periodically during the preceding summer. An island more desolate than that which we had reached can hardly be imagined, for snow and ice covered its frozen and *débris*-covered slopes. But to us it was of such importance, that the name of Count Wilczek, the originator of our Expedition, was conferred upon it.

The sun had deserted us for the second time on the 22nd of October; but we availed ourselves of the few hours vouchsafed us for a week afterwards to make a few excursions to a distance

of 10 miles from the vessel, without, however, being able to enlarge our knowledge of the new country. Was it merely the southern capes of islands of small extent which we had before us, or a country of large extent? Nor were we able to determine whether the white patches which we discovered high up between the mountains' summits were glaciers or not.

The increasing darkness of the Polar night for the present rendered every attempt at exploration impossible; and we feared lest northerly winds might drift us far away from our present position before the approach of spring should enable us to commence our exploratory journeys. Nor was our position at that time at all a safe one. Southerly winds had driven us close to the land, and during the first half of October we still suffered seriously from the pressure of the ice. Our floe was shattered into fragments, and it almost appeared as if the anxious days through which we had passed were about to return. In expectation of an unfortunate issue, we took the same measures of precaution which we had taken during the preceding winter, and were ready to leave the ship at a moment's notice. Fortune, however, did not again forsake us, and we were permitted to pass the second Polar night (125 days in length) without suffering the horrors of the first. There occurred no further pressure from the ice; and our vessel, fixed to its floe, and surrounded for the first time by icebergs, remained immovable, close within the outer edge of the land-ice, and at a distance of three miles from the nearest coast.

This position enabled us to look towards the future with a certain amount of assurance; it rendered existence more endurable, and enabled Weyprecht, Brosch, and Orel to determine the magnetic elements with a great amount of accuracy. Orel, moreover, determined the astronomical position of our winter-quarters, which he found to be in lat. $79^{\circ} 51' N.$, and long. $58^{\circ} 56' E.$

During the winter of 1873-74 much more snow fell than during the preceding one, and snow-drifts, brought on by northerly winds, continued for days. At the height of the Polar night we were scarcely able to distinguish night from day, and were enshrouded in darkness for weeks. Christmas was celebrated in a snow-house built upon our floe. In January the cold set in again exceedingly severe, and the mercury remained frozen for more than a week. The snow became as hard as pumice, and its surface granular. The petroleum froze in the glass lamps under the awning, the lamps went out, and even our cognac was changed into a solid mass.

The visits of bears were as frequent then as they had been at other seasons of the year: they came close up to the ship,

and were killed by regular volleys fired from deck. The bears here are certainly much less ferocious than those we met with in Eastern Greenland, where they not infrequently attacked us, and, on one occasion, they even carried one of the crew out of the ship: here they generally took to flight as soon as we made our appearance. As regards the disputed question whether bears pass the winter in a dormant state or not, we observed that amongst the great number shot by us during two winters, there was not a single female; and during our second sledge expedition in the spring of 1874, we even discovered a tunnel-shaped winter hole in a snow cone lying at the foot of a cliff, which was inhabited by a female bear and her cubs. On encountering bears, we found it generally most advantageous to fire after they had approached within a distance of 50 or 80 paces.

A portion of the flesh of sixty-seven ice-bears which we killed, amounting altogether to about 12,000 lbs., proved to be the most efficient remedy against the scurvy, from which several of our men were again suffering. The care of our surgeon, as well as the re-appearance of the sun on the 24th of February, saved most of our patients from protracted suffering; but owing to our stock of medicines having become very much reduced, a third winter would certainly have exhibited far more unfavourable results. This consideration, joined to the certainty that our vessel was indissolubly fixed to the floe, which in the ensuing summer would again drift about at the mercy of the winds, as well as the danger of its capsizing on the melting of the snow, led to the resolution to abandon the vessel towards the end of May, and attempt a return to Europe by means of our boats and sledges.

The interval was to be devoted to an exploration of the country by means of sledge expeditions, the fortunate termination of which must be left in no small measure to chance. For had the vessel been drifted away during the absence of the explorers they would have been exposed to certain destruction, and the crew remaining on board would have been weakened considerably. But the exploration of the country, lying as it did so invitingly before us, was considered to be worth the risk.

March had arrived, and although the cold was still severe and the weather by no means favourable, the necessity of making the best of the short space of time at our disposal induced us to start upon our first sledge expedition. On the 10th of March, the Tyrolese, Haller and Klotz, the sailors, Cattarinich, Lettis, Pospischill, and Lukinovich, three dogs, and myself, left the *Tegethoff* with our big sledge. We travelled in a north-westerly direction, along the coast of the extensive Hall Island, ascended

Capes Tegethoff and M'Clintock, 2500 feet in height, and traversed the picturesque Nordenskjöld Fiord, the interior of which was bounded by the gigantic ice-wall of the Souklar Glacier. The land before us appeared to be utterly void of life—immense glaciers looked down upon us from between the desolate mountains, which rose in steep doleritic cones and plateaux. Every object around us was clothed in a mantle of glaring white, and the ranges of columns of the symmetrical mountain-terraces looked as if they were encrusted with sugar. In no single instance could we see the natural colour of the rock, as in Greenland, Spitzbergen, or Novaya Zemlya. This was owing to the immense precipitation and the moisture of the air, which condensed on coming into contact with the even surface of the cliffs. The unusual moisture of the air, moreover, caused us frequently to over-estimate distances, which is quite contrary to the usual Arctic experience. Perfectly clear days were exceedingly rare.

The cold during this journey was very great, and amounted on one occasion to -58° Fahr. (on board ship it was -46.25° Fahr.). We were bound to exercise the greatest precaution: our nightly rest in the tent was disturbed, and the crossing of the Souklar Glacier, during a slight wind, was exceedingly painful. Our clothes were as stiff as a coat of mail; and even our rum, strong as it was, appeared to have lost both potency and fluidity. We slept in fur coats; but in the daytime we found that clothes made of the skins of birds were best adapted for resisting the rigour of the climate. In spite of every precaution, however, we suffered much from frost-bites, against which a mixture of iodine and collodion proved most efficacious.

Immediately on our return to the vessel, on the 16th of March, we set about making preparations for a second sledge expedition, which was to extend over thirty days, and was to be devoted to an exploration of the land in the north. Soon afterwards one of our companions (Mr. Krisch, the engineer) succumbed to a protracted tuberculosis of the lungs, aggravated by scurvy. On the 19th we buried him in a lonely spot surrounded by columnar basalt, and erected a wooden cross upon his grave.

On the 24th of March we started for the north. Our party included Mr. Orel, the two Tyrolese, three sailors (Zaninovich, Sussich, and Lukinovich), and myself. We all wore snow-spectacles, blinkers, masks covering half the face, knitted woollen gloves, and sail-cloth boots. We were armed with doubled-barrelled Lefaucher rifles, having a calibre of 12^{mm} , and firing explosive bullets and steel projectiles. In preparing our equipment we followed explicitly the advice given by Admiral

Sir Leopold M'Clintock, and the successful issue of our expedition is due largely to this circumstance.

Our team of dogs, unfortunately, was not any longer complete, and only three of them assisted us in dragging our large sledge, which carried stores and provisions weighing 16 cwts. The rest of the dogs were either dead or incapable of rendering service; but even the three remaining ones, being powerful animals, proved valuable auxiliaries.

The temperature during this journey, quite contrary to our expectations, did not fall below -26.50° Fahr., but snow-drifts and moisture, the opening of fissures in the ice, and the flooding of our path by the sea gave us much trouble.

The results of this journey cannot be fully appreciated without reference to maps and sketches; and, anticipating the chronological order of our report, we will at once state that the newly-discovered country equals Spitzbergen in extent, and consists of several large masses of land—Wilczek Land in the east, Zichy Land in the west—which are intersected by numerous fiords, and skirted by a large number of islands.

A wide sound—Austria Sound—separates these masses of land. It extends north from Cape Hansa to about lat. 82° N., where Rawlinson Sound forks off towards the north-east. The latter we were able to trace with the eyes as far as Cape Buda-Pest.

The tide rises about 2 feet in Austria Sound, and exercises but a small effect, merely causing the bay-ice to break near the coasts. Dolerite is the prevailing rock. Its broad, horizontal sheets, and the steep table-mountains, which recall the Ambas of Abyssinia, impart to the country its peculiar physiognomy. Its geological features coincide with those of portions of North-eastern Greenland. A tertiary carboniferous sandstone occurs in both; but only small beds of brown coal were discovered. On the other hand, amygdaloid rocks, which are so frequent in North-eastern Greenland, were not met with in Francis-Joseph Land; and whilst the rocks in the south were frequently aphanitic in their texture, and resembled true basalt, those in the north were coarse-grained, and contained nepheline.

It is an established fact that portions of North-eastern Greenland, Novaya Zemlya, and Siberia, are being slowly upheaved; and it was, therefore, very interesting to meet with raised beaches along the shores of Austria Sound, which attested that a similar upheaval was taking place here likewise.

The mountains, as a rule, attain a height of 2000 or 3000 feet, and only towards the south-west do they appear to attain an altitude of 5000 feet. The extensive depressions between the mountain-ranges are covered with glaciers of those gigantic pro-

portions only met with in the Arctic Regions. Only in a few instances were we able to determine the daily motion of the glaciers by direct measurements. On the coast they usually form mural precipices, 100 to 200 feet in height. The Dove Glacier, on Wilczek Land, is undoubtedly one of the most considerable of the Arctic Regions. The glaciers visited by us were characterised by their greenish-blue colour, the paucity of crevasses and extraordinarily coarse-grained ice, a small development of moraines, slow motion, and the considerable thickness of the annual layers. The *névé*, or glacial region above the snow-line, was much more elevated above the sea than in Greenland or Spitzbergen.

Another peculiarity which characterises all the low islands in the Austria Sound is their being covered by a glacial cap.

The vegetation is far poorer than that of Greenland, Spitzbergen, or Novaya Zemlya, and, excepting in the Antarctic Regions, no country exists on the face of the earth which is poorer in that respect. The general physiognomy of the flora (but not that of the species) resembles that met with in the Alps at an altitude of 9000 or 10,000 feet. The season during which we visited the country was certainly that in which vegetable life first puts forth its appearance, and most of the slopes were still covered with snow; but even the most favoured spots near the sea-level, which were no longer covered with snow, were unable to induce us to arrive at a different conclusion. On level spots even we scarcely met with anything but poor and solitary bunches of grass, a few species of Saxifrage, and *Silene acaulis*. Dense carpets of mosses and lichens were more abundant; but most abundant of all was a lichen—the winterly *Umbilicaria arctica*.

Drift-wood, mostly of an old date, was met with on many occasions, but only in very small quantities. We once saw lying, only a trifle higher than the water-line, the trunk of a larch, about a foot thick and some 10 feet in length. The drift-wood, like our vessel, has probably been carried to these latitudes by the winds, in all likelihood from Siberia, and not by currents.

The country, as might have been supposed, has no human inhabitants; and in its southern portion scarcely any animals, excepting ice-bears, are met with.

Many portions of the newly-discovered country are exceedingly beautiful, though it bears throughout the impress of Arctic rigidity.

This and the subsequent sledge journeys have convinced us of the difficulty which any future expedition would meet with in discovering a harbour to winter in, no locality for such a purpose having been discovered by us.

It has always been a maxim of Arctic explorers to name their discoveries in honour of the promoters of their enterprise, or of their predecessors. The countries discovered may never become of commercial importance; but the only manner in which I was able to record my gratitude towards those who had devoted their means to the success of our Expedition, consisted in connecting their names with the newly-discovered countries. The name of H.I.M. Francis-Joseph was consequently bestowed on the whole of the country discovered by us, and other names to the several parts of it.

Owing to the mists which generally hung over the ice, we should not have been able to trace the northerly direction of the Austria Sound had we not frequently ascended high mountains. The ascents of Capes Koldewey ($80^{\circ} 15'$), Frankfurt ($80^{\circ} 20'$), Ritter ($80^{\circ} 45'$), Kane ($81^{\circ} 10'$), and Fligely ($82^{\circ} 5'$), moreover enabled us to survey the surrounding country, and to select the more suitable tracts to follow.

An uninterrupted expanse of ice, with numerous icebergs scattered over its surface, extended from coast to coast. It was evidently of recent formation, and numerous fissures and barriers, formed of hummocks, crossed it in many places, and constituted serious obstacles to our progress, which we were able to surmount only at a vast expenditure of time and labour. Our track then led over this expanse of ice; and starting from Cape Frankfurt, at the portal of Austria Sound, it led us through regions, with respect to which we had learnt nothing during our first sledge journey.

Omitting for the present all details concerning our journey, it may suffice to state that we crossed the 80th degree of latitude on the 26th of March, reached the 81st degree of latitude on the 3rd of April, and observed five days afterwards the latitude of $81^{\circ} 37'$. We imagined at that time that we had approached nearer to the Pole on land than had ever been done before, for we were not then aware that the American Expedition, under Hall, had reached $82^{\circ} 9'$ on land, and $82^{\circ} 26'$ by sea, the year before.

To the south-east of Crown Prince Rudolf Land we turned into the vast Rawlinson Sound, which promised to lead us almost straight to the north; but we soon got entangled in a chaotic mass of ice, which, owing to its height, prevented us from seeing the land, through which it required our utmost exertions to force our way. The small horizontal intensity of the needle, moreover—which is but natural in a high latitude—repeatedly made us lose our way; and finding that the hillocks of ice became more formidable in proportion as we advanced, we changed our course, and returned to Austria Sound. We

frequently encountered ice-bears while in Rawlinson Sound. They came towards us whenever they caught sight of us, and fell an easy prey to our rifles.

The decrease of our provisions and want of time made forced marches necessary, and necessitated a separation of our party. The large sledge, with Haller and four others, was left behind in lat. $81^{\circ} 38'$, under a cliff of Hohenlohe Island, whilst Orel, Zaninovich, and myself, with the dog-sledge and half the tent, continued the journey. The sledge was now drawn by two dogs only; the third, a Lapland reindeer-dog, having some time previously perished in a snow-storm. Haller was ordered to wait a fortnight for our return, and then to make the best of his way back to the vessel.

Our first aim was to cross Crown Prince Rudolf Land in a northerly direction. This necessitated our crossing the extensive Middendorf Glacier, which past experience and the great cold justified us in believing to be possible, and we at once set about it. After a laborious journey along the terminal cliff of the glacier, we at length succeeded in gaining its surface, but had scarcely proceeded a hundred paces when an immense crevice swallowed up Zaninovich, the dogs, and the heavily-laden sledge. Mr. Orel, fortunately, had remained some distance behind; and I escaped a similar fate by cutting through my harness. Not being able by myself to extricate those engulfed, I ran back to Hohenlohe Island, 12 miles distant, whence I quickly returned with the rest of our party. By means of long ropes we succeeded at length in raising men, dogs, and sledge, to the surface, and were fortunate in being able to continue our journey on the following day without having sustained serious injury. The men returned to the depôt; our small party, having abandoned the treacherous surface of the glacier, gained the western coast of the island by a circuitous path, along which we travelled to the north.

Here we were destined to witness a most striking change in the aspect of nature. A water-sky of a dusky colour made its appearance in the north, foul yellow vapours collected below the sun, the temperature rose, the ground under our feet became soft, and the snow-drifts broke under us with a rumbling noise. We had previously noticed the flight of birds from the north, here we found the rocks covered with thousands of auks and divers. They rose before us in immense swarms, and filled the air with the noise of their vehement whirring, for breeding time had arrived. Traces of bears, hares, and foxes, were met with everywhere, and seals reposed sluggishly upon the ice. We were justified, therefore, in believing that open water was near at hand, but personal observations which we were able to make

on the following day, after we had ascended the hills, and the results of which I embodied in a sketch, showed that even our not very sanguine expectations as regarded the extent of open water were not realized.

Our track henceforth was far from safe. We were no longer travelling over old ice, but now a crust of young ice, hardly one or two inches thick, covered with *salt*, very flexible, and crossed by veritable walls, built up of fragments, resulting from recent fractures of the ice. We tied ourselves to the rope, carried our things separately, opened a path with the axe, and continually examined the thickness of the crust which bore us.

We rounded Auk Cape, which resembled a gigantic aviary, and reached the two lonely rocky towers of the Cape of Columns. Here we first found open water extending along the coast.

This distant world was sublime in its beauty. From a height we looked down upon the dark sheet of open water, dotted with icebergs like so many pearls. Heavy clouds hung in the sky, through which penetrated glowing rays of the sun, causing the water to sparkle, and above was reflected the image of another sun, but of a paler hue.

At an apparently immense height the ice-mountains of Crown-Prince Rudolf Land, bathed in a roseate hue, stood out clearly visible through the rolling mists.

The 12th of April was the last day of our advance to the north, and, although not perfectly bright, it was more so than most of its predecessors. The thermometer stood at 54° 50' Fahr.

From the Cape of Columns, owing to the open water referred to, it was no longer practicable to travel over the ice, and we were compelled to take to the hills.

On starting we buried our baggage in the crevasse of a glacier, in which we had slept, and where it was safe from prowling ice-bears; and with the dog-sledge we travelled over a snow-field towards the hills, which were 1000 to 3000 feet in height. On reaching the prominent rocky Cape Germania we observed the meridional altitude (81° 57' N.). Here we left the sledge, and, tied to the rope, crossed the *névé* of a glacier, which descended in gigantic steps towards our left. But the many crevasses which obstructed our path, and into which we broke frequently, as well as the certainty of having reached 82° 5' N., after a march of five hours since noon, induced us to abandon further discovery, and having pushed to the north for seventeen days, we halted on the height of Cape Fligely.

We were now in a position to judge of the extent of coast

water. It turned out to be a "Polynia," bounded by old ice, within which floated ice-masses of recent formation, not very close. As I am anxious on this occasion to confine myself to a record of fact, I abstain from entering upon a discussion concerning the navigableness and nature of those portions of the Arctic Ocean which have not hitherto been seen by anyone.

There cannot, however, be any doubt that the facts observed, and the sight upon which we looked from Cape Fligely, spoke as little in favour of the theory of those who believe in the existence of an open Polar Sea as of those who maintain that the Polar Basin is covered with ice throughout the year. The truth will probably be found to lie between these two extremes. The hope of finding a navigable sea in latitudes not hitherto attained is not yet extinct, and is most likely to be realised by hugging the coast, but depends in a large measure upon a favourable year.

The success of an expedition sent out to attain the highest possible latitude depends, moreover, largely upon the routes selected. The plan of penetrating through Smith Sound, which has been advocated in this country, appears to offer most advantages in these respects. Any theoretical reasons adduced in favour of this route are seconded most powerfully by the fact that a very high latitude has been reached here on repeated occasions. If an expedition should succeed in reaching a winter harbour in a latitude as high as that reached by the last American Expedition, it would then be in a position, by means of extensive sledge journeys along the coast, to reach a latitude in the course of spring, the attainment of which would be attended by far greater difficulties along any other routes.

Our own track to the north of Novaya Zemlya carries no weight in considering this question, for we were indebted for our progress to a floe of ice, and not to our own exertions. The difficulties which any succeeding navigator would have to contend with on this route may be estimated from the fact, that on our return we found the sea encumbered with ice to such an extent that even boat-navigation was hardly possible, and we were obliged to haul up our boats many hundred times and drag them over the ice. We, certainly, should not have been able to return in our vessel, although the summer of 1874 was exceptionally favourable. But if an expedition be fitted out, not with a view of reaching the highest possible latitude, but to study the nature of Arctic countries, then the interior of Greenland would certainly appear to be deserving of the first consideration. But our neighbourhood was at that time of more immediate interest to us than the question of the navigableness of a remote portion of the Arctic Ocean. We had before us

extensive lands covered with mountains, and bounding a wide sound stretching towards the north-east, which we were able to trace as far as lat. 83° N., where the imposing Cape Wien (Vienna) forms the western extremity of a country upon which I conferred the name of Petermann, to whom geographical science, and particularly Arctic explorers, are so largely indebted.

Crown-Prince Rudolf Land extended towards the north-east, its furthest visible point being a cloud-wrapt rocky promontory in lat. $82^{\circ} 20'$ N., named in honour of Admiral Sherard Osborn. Two other localities, visited by us, but not on this occasion, were named after two other renowned English navigators, namely, Admirals Collinson and Back.

We do not desire to start any fresh theory with reference to the distribution of land around the Pole; but the coast as well as the gigantic glaciers certainly gave us the impression of having entered a group of islands of considerable extent, thus partly confirming Petermann's theory of an Arctic archipelago.

The innumerable icebergs met with in all the fiords of Francis-Joseph Land formed a remarkable feature, for to the south of it—that is, in the Novaya Zemlya Sea—scarcely any were met with. We are not in a position to ascribe the presence of these icebergs to ocean-currents, though their absence in the Novaya Zemlya Sea would appear to point to their finding an outlet towards the north.

Having planted the Austro-Hungarian banner upon the farthest point reached by us, and deposited a document, testifying our presence, in a cleft of the rocks, we turned back towards our vessel, which lay some 160 miles to the south.

Having rejoined our comrades, who anxiously waited for our return at Hohenlohe Island, forced marches, and a deliverance from all impedimenta excepting the tent and provisions, soon brought us to lower latitudes. But after we had crossed the glaciers of the imposing Ladenburg Island, and reached Cape Ritter (19th April), we were disquieted by the observation that the sea-water had permeated the lower layer of snow, whilst a dark water-sky hung over the broad entrance to Markham Sound. On retiring to rest, we distinctly heard the grinding noise of ice, and the surge beating against the shore.

The next day found us on an iceberg not far from the Hayes Islands, with open water in front of us, and no boat to cross it. The water set rapidly towards the north, owing, probably, to the tide. The southern portion of Austria Sound had been converted into a "Polynia," and at a distance of 30 paces from where we stood, the surf lashed the ice. After wandering about for two days, during a fearful snow-storm, we managed, by following the land and the mural termination of glaciers, to go

about this open water which shut off our return; and it was with a feeling of deliverance that we again stepped upon the solid ice near Cape Frankfurt. Our last apprehensions were removed when we found that our vessel had not drifted away, and on the 24th of April we again boarded the *Tegethoff* on the very spot south of Wilczek Island where we had left her thirty days before.

A few days had necessarily to be devoted to repose, for although we had eaten the flesh of eight bears, which we had killed during our journey, this addition to our diet was not sufficient to counterbalance the reduction in our strength brought about by the extraordinary exertions which we were called upon to undergo when dragging a sledge for eight to ten hours at a stretch, and a night's rest of only five hours' duration.

Our third sledge journey was devoted to an exploration of the extensive M'Clintock Island. Brosch, Haller, and myself with the dog-sledge joined in it. When about 40 miles to the west of our ship we ascended a high mountain, and were able to survey the country as far as about long. 50° E. It was mountainous in character, the mountains again bearing a great resemblance to the Ambas of Abyssinia, and attained its culminating point in the Richthofen peak, about 5000 feet in height. Closely-packed ice covered the sea towards the south as far as the eye could reach, and rendered our prospects of a speedy return home by no means cheerful.

On the termination of this journey Lieutenant Weyprecht measured a base-line on the ice near the ship, and we then considered that we had done everything in our power to accomplish the objects of the expedition, and our thoughts were directed exclusively upon our return home.

The period immediately before starting was devoted to recruiting our strength. We took leave of the grave of our departed comrade, and of the country which the caprice of a floe of ice had enabled us to discover. On the 20th of May, in the evening, the flags were nailed to the masts—an affecting scene for all of us—and we started upon our return home. Our equipment was of the simplest, for circumstances forbade anything approaching to luxury, and in addition to the clothes he wore upon his back, the personal property of each member of the expedition was limited to a blanket to sleep in. The provisions, ammunition, &c., for three or four months were packed in three, subsequently four boats, placed on sleighs, and in three large sledges, each weighing about $17\frac{1}{2}$ cwts. Only the two strongest of our dogs were alive by that time; but even this small contingent proved of great service, for they pulled daily 9 to 10 cwts. between them.

The deep snow which was encountered on first starting compelled us to travel as many as five times over certain distances, for it required the united strength of our whole party to drag a single sledge or boat. Having reached the edge of the land-ice, we had to clamber with our boats and sledges from floe to floe, and sometimes to cross narrow fissures in the ice. Persistent southerly winds, moreover, destroyed the little progress we made, for they drove the ice, upon the surface of which we were travelling, to the north; and after two months of incessant labour we were not more than 8 miles from the ship. It almost appeared to us as if our struggle with the ice would end in a defeat, which would compel us to remain a third winter in our ship uncheered by a ray of hope.

The ice around us was closely packed, and on several occasions we were compelled to lie quietly with our boats upon a floe of ice for an entire week, until it should please some channel to open. Northerly winds set in at length on the 15th of July, which dispersed the ice to some extent, continuous rains reduced its dimensions, and by almost superhuman exertions we advanced 10 miles in the course of as many days. We were fully convinced by this time that no vessel would have succeeded in that year to reach the land discovered by us.

On the 7th of August we observed for the first time a swell coming from the south, and indicative of the proximity of open water. This revived our fading hopes, which fell anew when we again became icebound for the space of five days; but on the 14th of August we reached the edge of the pack in lat. $77^{\circ} 40' N.$, and our safety seemed thus to be secured. Here we were reluctantly forced to abandon our sledges, and to kill our dogs who had been our faithful companions and assistants in times of need, for our boats were hardly large enough to hold ourselves and baggage, besides which we were without water and provisions for their maintenance.

Our final salvation is due entirely to finding the edge of the pack-ice in so high a latitude, and, favoured by the wind, we crossed the open sea in the direction of Novaya Zemlya, and followed the coast of that island towards the south. On the 18th of August we, for the first time, placed our feet upon *terra firma*, near Admiralty Peninsula; and on the evening of the 24th, that is, after a passage of ninety-six days, we found ourselves in the Bay of Dunen (lat. $72^{\circ} 40'$), on board the Russian schooner *Nicolai* (Captain Feodor Veronin), who received us with that heartiness which distinguishes the Russian people.

A speedy passage brought us to Vardö, and at three o'clock

in the afternoon of the 3rd of September, 1874, we stepped upon the hospitable soil of Norway, full of that satisfaction which an escape from a position of danger and doubt brings with it.

Scientific Work of the Second Austro-Hungarian Polar Expedition, 1872-4, by Lieut. WEYPRECHT.

[Translated from the 'Geographische Mittheilungen,' vol. xxi. p. 65.]

It is well known that it was not the object of our expedition to reach a high latitude, but to explore the unknown ocean to the north of Siberia. The attainment of Behring Strait would have realised our idea, though we were by no means over-sanguine with respect to that. But, although we have not had the good fortune to come up to our own expectations, we have, nevertheless, by a series of fortuitous circumstances and untoward disasters, been enabled to obtain elsewhere results amply sufficient to console us for any disappointment we may have felt at having failed to carry out our original intention.

When, in 1871, we were preparing to set out on a preliminary expedition to the regions in question, very little was known with respect to the sea between East Spitzbergen and Novaya Zemlya, and although I took every opportunity to examine Finnish seal-hunters and seamen during a six weeks' stay at Tromsø, I was not able to learn anything with respect to the ice there. Only few vessels had then succeeded in crossing lat. 76° N. In the course of our two expeditions we have navigated this unknown sea between long. 40° and 73° E., we have reached lat. 79° at its eastern, and exceeded lat. 80° in its western half; and we have, moreover, discovered an extensive Arctic country, which Mr. Julius Payer explored in sledges as far as lat. 82° N., and sighted as far as lat. 83° N.

The discovery of an open sea, in 1871, to the north of Novaya Zemlya, and which extended to lat. 78° N., mainly led to the second expedition being started. We proposed to explore this sea in an easterly direction, keeping close to the coast of Siberia, and trusted especially to the influence of the large volume of water brought down by the Siberian rivers, in freeing the coast from ice during summer.

The year 1872, unfortunately, turned out to be one of the most unfavourable ever experienced. In lat. $74\frac{1}{2}^{\circ}$ N. we already met with the ice; it was with difficulty we effected our passage as far as Cape Nassau, and finally we found ourselves enclosed in the pack, at a spot where the year before and two years after