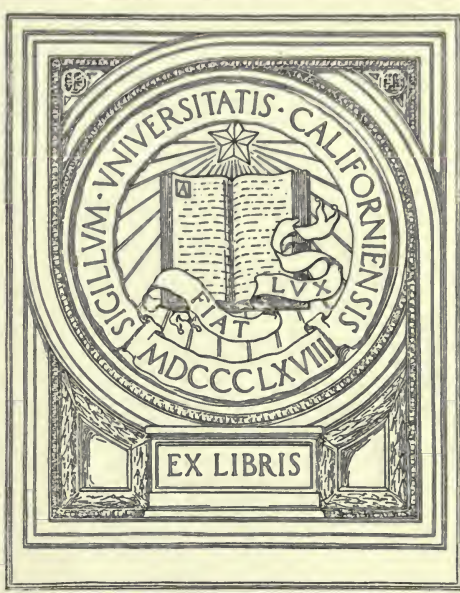
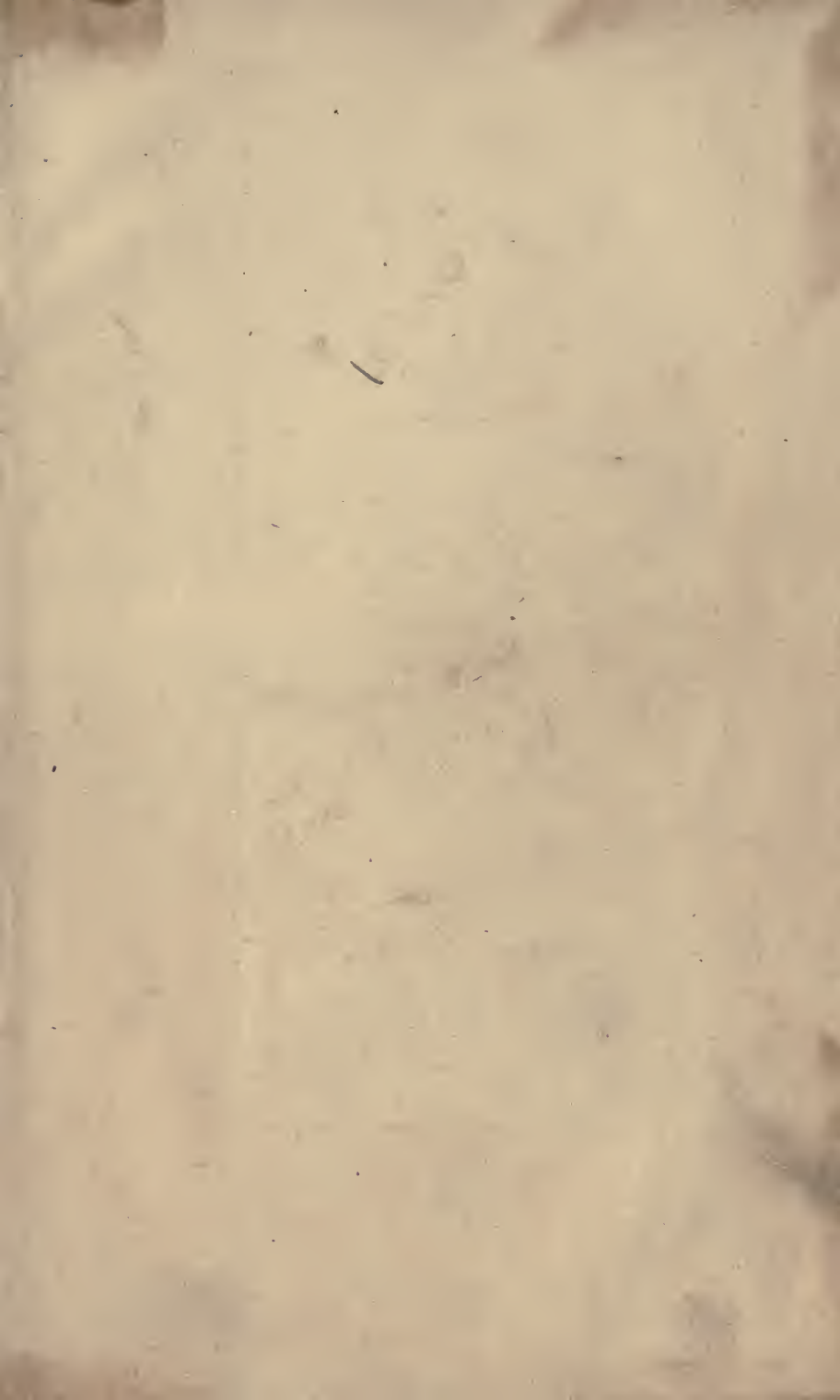


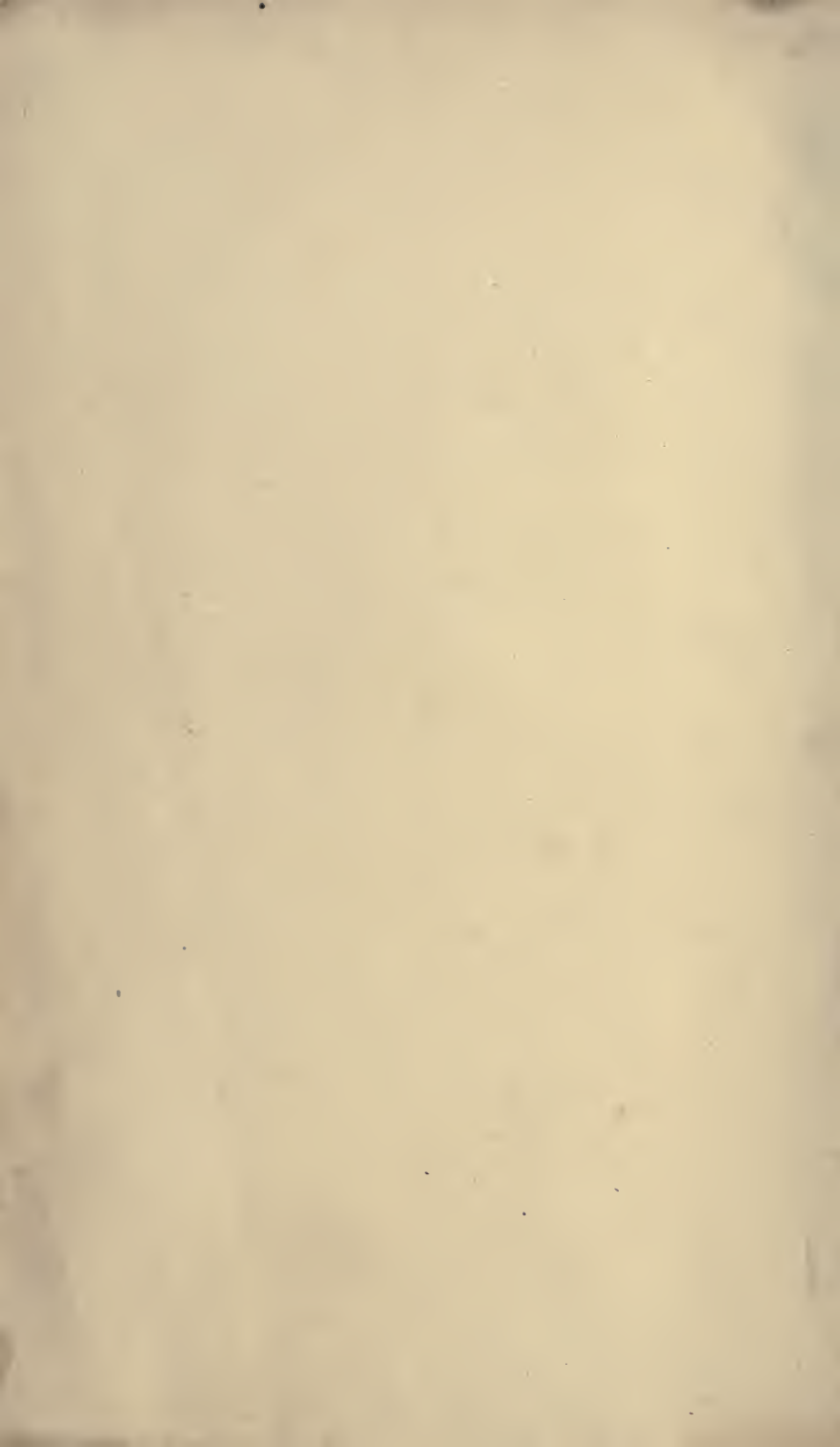


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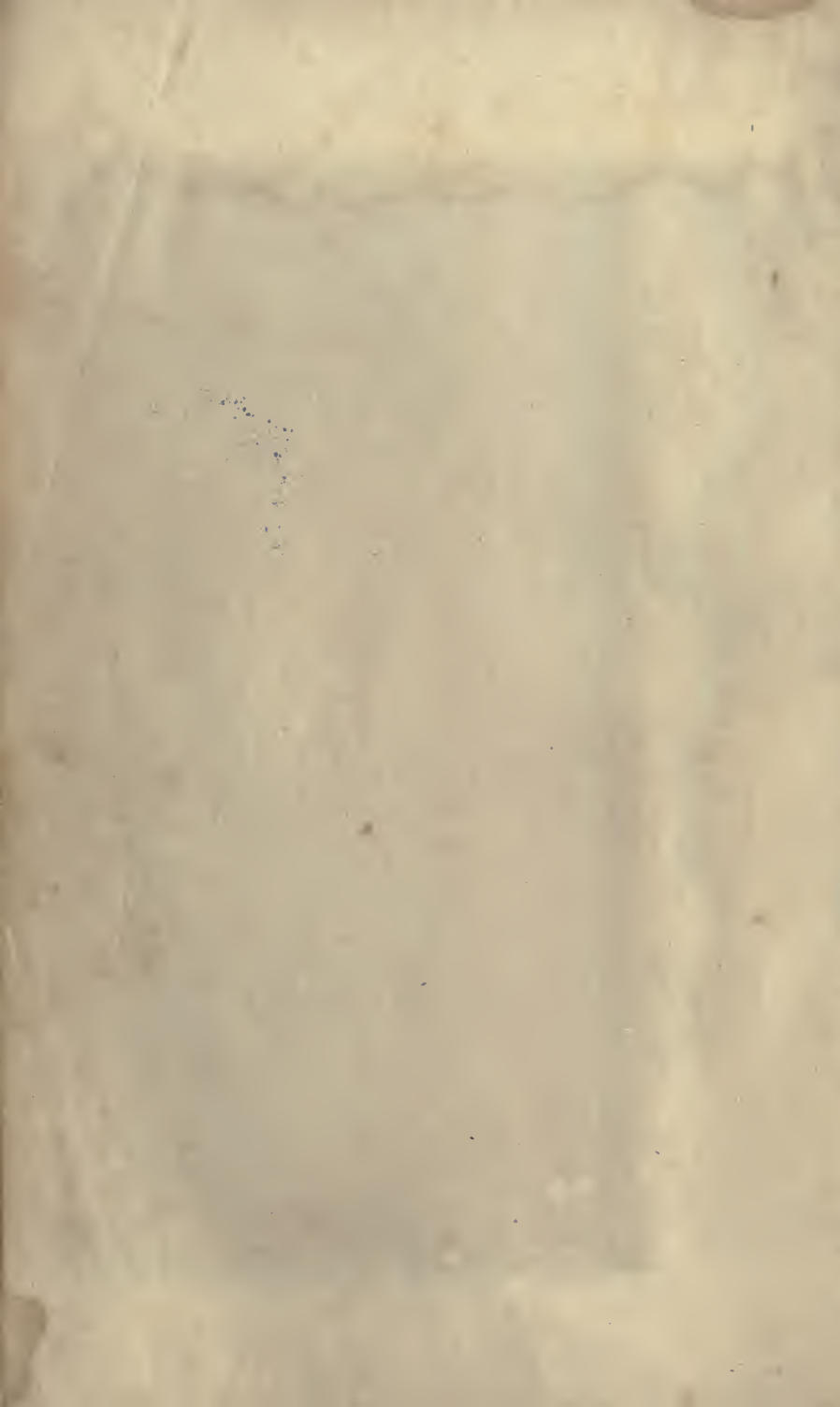
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TWILIGHT AT MIDDAY, FEBRUARY 1874.





NEW LANDS
WITHIN THE ARCTIC CIRCLE.

NARRATIVE OF THE DISCOVERIES
OF THE AUSTRIAN SHIP "TEGETTHOFF"
IN THE YEARS 1872-1874.

31571



BY

JULIUS PAYER, *retired von*

ONE OF THE COMMANDERS OF THE EXPEDITION.

1842-1915

WITH MAPS AND NUMEROUS ILLUSTRATIONS FROM DRAWINGS
BY THE AUTHOR.

Translated from the German, with the Author's Approbation.

NEW YORK:
D. APPLETON AND COMPANY,
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AUTHOR'S PREFACE.

IN laying this book before the Public I desire, in the first instance, to acknowledge without reserve my sense of the great merits of my colleague, Lieutenant Weyprecht. The reader of the following pages will learn with what unwearied, though fruitless, energy he struggled to free the *Tegetthoff* from her icy prison, and what dauntless courage and unfailing command of resources he displayed in our hazardous retreat from the abandoned ship, till the moment of our happy rescue. The order and discipline maintained on board ship, and in the terrible march over the Frozen Ocean, as well as in the perilous boat voyage after leaving the ice-barrier, were mainly due to his distinguished abilities. He had supreme command of the expedition, as long as its duties were strictly nautical; when the operations of sledging and surveying began, I had the responsibility of a separate and independent command.

Nor ought I to be slow to pay my tribute of respect to the perseverance and constant self-denial of Lieutenant Brosch and Midshipman Orel. It would be difficult to determine, whether they shone more as officers of the ship, or as observers of scientific phenomena. The highly important duty of managing the stores and provisions was discharged also by Lieutenant Brosch with a conscientiousness that secured the confidence of all.

To the watchful skill of Dr. Kepes we owed it, that the health and constitution of the members of the expedition suffered so little from all their hardships and privations.

Frank J. Brosch gift
8/44 from U.S.C.

The conduct of the crew was on the whole praiseworthy. Their obedience to command, their perseverance and resolution shown on every occasion, will be cited as an example of what these virtues and qualities can achieve amid the most appalling dangers and trials.

With regard to my narrative, I make no claim for it founded on its literary excellence; rather I sue for indulgence to its manifold shortcomings. I have not written for the man of science, though I have not shunned a few scientific details. Nor have I aimed at presenting a record, which might be profitable to those who shall follow us in the same career of discovery, though some hints will be found in my pages which will not be without their use to those who may consult them for information and guidance. Rather I have endeavoured to narrate our sufferings, adventures, and discoveries in a manner which shall be interesting to the general reader who reads to amuse himself.

The magnetical and meteorological observations, so carefully taken and tabulated by Weyprecht, Brosch, and Orel, together with the sketches of the Fauna of the Frozen Ocean, drawn by myself from the collection of Dr. Kepes, were presented to the Imperial Academy of Sciences of Vienna, and will in due time be published under the auspices of that august body.



PRELIMINARY NOTICE

BY THE TRANSLATOR.

IT will be interesting to English readers to learn a few particulars concerning the two leaders of the Austrian North Polar Expeditions. Carl Weyprecht was born in Hesse-Darmstadt in 1838, and in his eighteenth year entered the Austrian navy. Ten years afterwards he was present at the action between the Austrian and Italian fleets at Lissa—July 20, 1866; was promoted to the rank of lieutenant of the second class, and *decorated* with the order of the Iron Cross in recognition of his services in that battle. It was shortly after this, that Weyprecht volunteered to take the command of a small vessel, manned by only four seamen, which was to sail from Hammerfest to explore the Arctic Ocean. This dauntless offer was the basis of the first German North Polar expedition. When, however, permission to act in this capacity was obtained, Lieutenant Weyprecht was serving on board the Austrian frigate *Elizabeth*, which formed one of the squadron sent by the Austrian Government to bring home the body of the ill-fated Maximilian. Immediately on his return to Europe he repaired to Gotha, eager to place his services at the command of the expedition which had meantime been planned by Petermann and a committee of patrons of Arctic exploration. But unhappily, just at this moment his health, which had suffered from fever caught at New Orleans, failed, and the command of the expedition, known as the first German North Polar Expedition (May 24—October 10, 1868), was undertaken by Captain Koldewey. It was only in 1871 that he recovered his health, and in the June of that year

began, in the *Isbjörn*, his life of Arctic experience and discovery. In the following year, 1872, he was appointed to the naval command of the expedition which sailed in the *Tegetthoff*, whose strange and eventful history is recorded in the following pages.

His companion and colleague, Julius Payer, was born at Schönau in Teplitz, Bohemia, in 1841, and received his education as a soldier at the Wiener-Neustadt Military Academy, 1856-59, where General Sonklar was his teacher in geographical science, and early imbued his mind with a love for the grandeurs of the glacier world. With the rank of "Ober-Lieutenant" he served in the campaign of 1866 in Italy, and was *decorated* for his distinguished services at the battle of Custoza. Afterwards, while serving with his regiment in Tyrol, he gained great celebrity as one of the most successful Alpine climbers, and turned his experience as a mountaineer to profit in his surveys of the Orteler Alps and glaciers. Payer gained his first experience as an Arctic discoverer in the second German North Polar Expedition, under Koldewey and Hegemann—June 15, 1869—Sept. 11, 1870. His services during that expedition were of a most distinguished character. He shared in the most important discoveries which were then made, specially those of König Wilhelm's Land, and of the noble Franz-Josef Fjord. He acquired in East Greenland the experience of sledging, which was of such eminent use in his explorations of the great discovery of the *Tegetthoff* Expedition—Kaiser Franz-Joseph Land. He shines too as an author in his descriptions of Greenland scenes, in the *Second German North Polar Voyage*, published in 1874 by Brockhaus of Leipzig, and partially reproduced in an English translation by the Rev. L. Mercier and Mr. H. W. Bates. For these services, on the return of the expedition, he was again *decorated*, receiving the order of the Iron Crown.

In the voyage of the *Isbjörn*, June 21—Oct. 4, 1871, we find him associated with Weyprecht in the pioneering voyage described in the earlier part of this work, and lastly as joint commander of the renowned *Tegetthoff* expedition, June, 1872—September, 1874.

The Gold Medals entrusted to the Royal Geographical Society were awarded in 1875: the Founder's Medal to Lieutenant Weyprecht, and the Patron's Medal to Lieutenant Julius Payer.

As these pages are passing through the Press, the country has been deeply moved by the unexpected intelligence of the return of the Arctic Expedition. Congratulations on its safe and happy return have been unanimously and eagerly expressed by all the organs of public opinion. Disappointment, however, has, we fear, fallen on many minds as, after the first feelings of joy at the safe arrival of the officers and crews of the *Alert* and *Discovery*; they read the brief telegraphic summary sent by Captain Nares: "Pole impracticable,"—"No land to northward." Popular enthusiasm looked rather for the conquest of the Pole; expected, perhaps, to read, one day, that the Union Jack had been hoisted there, to commemorate the triumph of England's perseverance at last rewarded. Few, we apprehend, would pass through the chill of these two clauses of the message to mark the hope contained in the third—"voyage otherwise successful." In what special respects the success proclaimed was achieved, we must patiently wait for a future record to reveal; but while awaiting the history which no doubt will be written to justify and prove this announcement, let us exercise our loyal belief in the skill and courage of our countrymen, and feel persuaded that what men could do under their circumstances no doubt was done by them.

The interest which will be excited afresh in Arctic discovery and adventure, will doubtless sharpen the interest in the volumes which record the fortunes of the Austrian expedition; and we venture to affirm—without undue partiality—that, though the history of Arctic exploration and discovery abounds in records of lofty resolution and patient endurance of almost incredible hardships, the narrative of the voyage of the *Tegetthoff* will be found to fall below none in these high qualities. The mere destiny of the vessel itself equals, if it does not exceed, in the element of the marvellous, anything

which has before been recorded. Surely this is borne out when we think, that on August 20, 1872, the *Tegetthoff* was beset off the coast of Novaya Zemlya; remained a fast prisoner in the ice, spite of all the efforts made by her officers and crew to release her; drifted during the autumn and the terrible winter of 1872—amid profound darkness—whither they knew not; drifted to the 30th of August in the following year (1873), till, as if by magic, the mists lifted, and lo! a high, bold, rocky coast—lat. $79^{\circ} 43'$ E., long. $59^{\circ} 33'$ —loomed out of the fog straight ahead of them. Close to this land—which could be visited with safety only twice, on the 1st and 3rd of November of that year—the ship remained still fast bound in the ice. Not till the winter of 1873 had passed, and the sun had again returned, was it possible to explore the land, which had been so marvellously discovered. On the 10th of March, 1874, the sledge journeys commenced, and terminated May 3rd, after 450 miles had been passed over, and the surveys and explorations completed, which enabled Payer to write the description of Kaiser Franz-Josef Land (pp. 258-270), which shows that other still undefined lands, with an archipelago of islands, have been added to the geography of the earth.

But the perils of the expedition did not end here. On the 20th of August, 1874, it was resolved to abandon the *Tegetthoff* in the ice, and to return in sledges and boats to Europe. Captain Nares tells us, in his telegraphic despatch, that the sledging parties of the *Alert* and *Discovery* compassed on an average one-and-a-quarter mile per day on the terrible "Sea of Ancient Ice," and discovered, after the experience gained in seventy miles passed under these conditions, that the "Pole was impracticable." If our readers wish to have a conception of the toils and perils of the Austrian sledge parties on their return from the *Tegetthoff*, let them mark the single image presented to the mind by the statement (p. 364):—"After the lapse of two months of indescribable efforts, the distance between us and the ship was not more than nine English miles." Had the ice on the Novaya Zemlya seas remained as obstinate as it seems to

have done in the new desolation, the "Sea of Ancient Ice," escape would have been as impossible to the *Tegetthoff's* crew, as advance towards the Pole was to the sledge parties of our last Arctic expedition. But fortunately, soon after, "leads" opened out in the ice; the boats were launched, and after about another month of alternate rowing and sledging, the ice barrier was happily reached in the unusually high latitude $77^{\circ} 40'$; and the brave men who three months before had left the *Tegetthoff* were saved.

This is perhaps the most marked analogy between the perils of the two expeditions; so far as those of our own are yet known. But the scientific conclusions of Lieutenant Payer, as set forth in the general Introduction to his narrative, strikingly harmonize with the actual discoveries of the *Alert* and *Discovery*. Already it is authoritatively announced, that there is no open Polar Sea; that this hypothesis is as baseless as the existence of President's Land. In the fourth chapter of that Introduction (pp. 25-31), our author has analysed with great sagacity the various theories on which that hypothesis was made to rest, working up to the conclusion, that no such sea exists. The demonstration of experience now takes the place of enlightened argument and opinion; fact and theory are here at one.

Nor can we forbear to direct attention to another statement in the same chapter. Let our readers mark the prophetic spirit of the following passage: "All the changes and phenomena of this mighty network lead us to infer the existence of frozen seas up to the Pole itself; and according to my own experience, gained in three expeditions, I consider that the states of the ice between 82° and 90° N. L. will not essentially differ from those which have been observed south of latitude 82° ; I incline rather to the belief that they will be found worse instead of better" (p. 30). And "worse instead of better" they have been found, as we cannot doubt, when we weigh the ominous significance of the designation the "Sea of Ancient Ice."

History may or may not verify the position which the telegram so briefly resumes—"The Pole impracticable."

Impracticable no doubt it was, if the condition of the ice seen by our expedition in that awful sea be its normal condition. All that it was possible for men to dare and achieve, England will feel that her officers and sailors dared and achieved under the circumstances they encountered. It may be, that later experience will show, that even that Sea may present to future explorers an aspect less tremendous; yea, that in some seasons, which science may yet predict, when her theories of the sun-spots are matured and formulated, open water will be found, as perhaps it was found in the year of the expedition of the *Polaris*, where the heroic sledging parties from the *Alert* and *Discovery* saw nothing and found nothing, but piled-up barriers of ice rising to the height of 150 feet.

It would be idle to predict, in the face of these results, that the Pole shall yet be reached. Any confident prediction in this spirit would, at the present moment, be singularly inopportune, as well as unwise. But despair would be equally unjustifiable, while its influence would be most hurtful and depressing, especially if Arctic exploration and the attainment of the Pole were supposed to be identical propositions. There are two things: reaching the North Pole, and the exploration of the Polar region. If the former appeals more to the imagination, and readily calls forth the emotions which are fed by the love of the marvellous, the latter enlists the sympathies of those who take a broader view of the necessities of Arctic exploration. These have found a powerful representative in one whose services entitle him to speak with authority, in the naval chief of the *Tegetthoff* expedition. At a meeting of the German Scientific and Medical Association held at Gratz in September of 1875, Weyprecht read a paper on the principles of Arctic exploration, in which, according to the summary of its contents, which appeared in *Nature*, October 11, 1875, he maintains, that the Polar regions offer, in certain important respects, greater advantages than any other part of the globe for the observation of natural phenomena—Magnetism, the Aurora, Meteorology, Geology, Zoology, and Botany. He deploras, that while large sums have been spent and much hardship endured for geographical knowledge,

strictly scientific observations have been regarded as holding a secondary place. Though not denying the importance of geographical discovery, he maintains, that the main purpose of future Arctic expeditions should be the extension of our knowledge of the various natural phenomena which may be studied with so great advantage in those regions. He insists in that paper on the following propositions:—“ 1. Arctic exploration is of the highest importance to a knowledge of the laws of nature. 2. Geographical discovery in those regions is of superior importance only in so far as it extends the field of scientific investigation in its strict sense. 3. Minute Arctic topography is of secondary importance. 4. The geographical Pole has for science no greater significance than any other point in high latitude. 5. Observation stations should be selected without reference to the latitude, but for the advantages they offer for the investigation of the phenomena to be studied. 6. Interrupted series of observations have only a relative value.” The suggestions thrown out by Lieutenant Weyprecht have been taken up by one whose mind seems to rise instinctively to all high aims and objects. Prince Bismarck forthwith appointed a German Commission of Arctic Exploration, consisting of some of the most eminent men of science of whom Germany can boast, who reported to the Bundesrath in a memoir, the recommendations of which were unanimously adopted. From *Nature*, November 11, 1875, which we have already quoted, we borrow the following *résumé* of that report:—

“ 1. The exploration of the Arctic regions is of great importance for all branches of science. The Commission recommends for such exploration the establishment of fixed observing stations. From the principal station, and supported by it, exploring expeditions are to be made by sea and by land.

“ The Commission is of opinion that the region to be explored by organised German Arctic explorers is the great inlet to the higher Arctic regions situated between the eastern shore of Greenland and the western shore of Spitzbergen.

“3. It appears desirable, and, so far as scientific preparations are concerned, possible, to commence these Arctic expeditions in 1877.

“4. The Commission is convinced that an exploration of the Arctic regions, based on such principles, will furnish valuable results, even if limited to the region between Greenland and Spitzbergen ; but it is also of opinion, that an exhaustive solution of the problems to be solved can only be expected when exploration is extended over the whole Arctic zone, and when other countries take their share in the undertaking.

“The Commission recommends, therefore, that the principles adopted for the German undertaking be commended to the governments of the states which take interest in Arctic inquiry, in order to establish, if possible, a complete circle of observing stations in the Arctic zones.”

Thus we are brought face to face with two different purposes, which may be termed, respectively, the romantic and the scientific purposes of Arctic discovery. To the former the attainment of the Pole has hitherto been the all in all of a geographical discovery. “The Pole impracticable,” telegraphed by Captain Nares, as the result of the expedition which has returned baffled to our shores, is a stern reproof to all who would still advocate a dash at the Pole as the worthiest purpose of Arctic discovery. Aims and endeavours not so glaring, nor appealing in the same degree to the love of the marvellous, are suggested in the sagacious proposals of Lieutenant Weyprecht, to whom science will not refuse her calmer and more measured respect, and in whom, as Captain of the *Tegetthoff*, all who love deeds of daring and energy will find a congenial spirit.

To Lieutenant Payer has fallen the distinguished honour of being not only the colleague in command and friend of Weyprecht, but the historian of their common sufferings and common glory in an enterprise, the fame of which the world, we believe, will not willingly let die.

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Explanation.

— Course of the "Isbjörn" 1871

- - - D° "Tegethoff" 1872-3

— Home voyage to Europe 1874

The figures underlined denote the depth of the sea, in Metres.

Voyage of the "Tegethoff"

Voyage of the "Isbjörn"

June 26
Fugto

North Cape
Vandø 5 Sept. 1874

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AUSTRIAN ARCTIC VOYAGES.

INTRODUCTION.

CHAPTER I.

THE FROZEN OCEAN.

1. THE ice-sheet spread over the Arctic region is the effect and sign of the low temperature which prevails within it. During nine or ten months of the year this congealing force continues to act, and if the frozen mass were not broken up by the effects of sun and wind, of rain, waves, and currents, and by the rents produced in it from the sudden increase of cold, the result would necessarily be an absolutely impenetrable covering of ice. The parts of this enormous envelope of ice sundered by these various causes now become capable of movement, and are widely dispersed in the form of ice-fields and floes.

2. The water-ways which separate these parts are called "leads," or, when their extent is considerable, "ice-holes." The meshes of this vast net, which is constantly in motion, open and close under the action of winds and currents in summer; and it is only in its southern parts that the action of waves, rain, and thaw produces any considerable detachments. Towards the end of autumn, the ice, forming anew, consolidates the interior portions, while its outer edge pushes forward, like the end of a glacier, into lower regions, until

about the end of February the culminating point of congelation is attained. Motionless adhesion of the fields, which naturally reach their greatest size in winter, does not, however, exist even then; for during this period they are incessantly exposed to displacement and pressure from the currents of the sea and the air.

3. When the ice is more or less closed, so as to render navigation impossible, it is called "pack-ice," and "drift-ice" when it appears in detached pieces amid predominating water. Since there are forces operating which promote the loosening process at its outer edge, and its consolidation within, it is self-evident, that the interior portions tend to the character of "pack-ice," and its outer margin to that of "drift-ice." This general rule, however, is so modified in many places, by local causes, currents, and winds, that we find not unfrequently at the outer margin of the ice thick barriers of pack-ice, and in the inner ice, ice-holes (*polynia*¹) and drift-ice.

4. Ice navigation, during its course of three hundred years, has created a number of terms to designate the external forms of ice, the meaning of which must be clearly defined. Ice formed from salt-water is called "field-ice;" that from the waters of rivers and lakes "sweet-water ice." The latter is as hard as iron, and so transparent that it is scarcely to be distinguished from water. Icebergs are masses detached from glaciers. The words "patch," "floe," "field," express relative magnitude, descriptive of the smallest ice-table up to the ice-field of many miles in diameter. The term "floe," however, is generally applied to every kind of field-ice, without reference to its size. The ice which lies along coasts, or which adheres to a group of islands within a sound, is called "land-ice." Sledge expeditions depend on its existence and character. Along the coast-edge land-ice is broken by the waves and tide, and the forms of its upheaval and deposition on the shore constitute the so-called "ice-foot." Broken ice, or "brash," is an accumulation of the smaller fragments of ice which are found only on the extreme edge of the ice-belt. "Bay-ice" is ice of recent formation, and its vertical depth is inconsiderable.

¹ *Polynia*, a Russian term for an open water space.—Glossary in Kane's *Arctic Explorations*, vol. i., p. 14.

5. Land-ice is less exposed to powerful disturbances, and its surface, therefore, is comparatively level, and is only here and there traversed by small hillocks called "hummocks" or "torrosy." These are the results of former pressures, and they are gradually reduced to the common level by evaporation, by thawing, and by the snow drifting over them.

6. But ice-floes exposed to constant motion from winds and currents, and to reciprocal pressure, have a more or less undulating character. On these are found piles of ice heaped one upon another, rising to a height of twenty or even fifty feet, alternating with depressions, which collect the thawed water in clear ice-lakes during the few weeks of summer in which the temperature rises above the freezing point. The specific gravity of this water, where it does not communicate with the sea by cracks, is in all cases the same with the specific gravity of pure sweet water; and as the salt is gradually eliminated from the ice, the water produced is perfectly drinkable. In the East Greenland Sea ice-floes frequently measure more than twelve nautical miles across—these are ice-fields properly so called.¹ In the Spitzbergen and Novaya Zemlya Seas, they are much smaller, as Parry also found.

7. The thickness which ice acquires in the course of a winter, when its formation is not disturbed, is about eight feet. In the Gulf of Boothia, Sir John Ross found the greatest thickness about the end of May; it was then ten feet on the sea and eleven feet on the lakes. In his winter harbour in Melville Island, Parry met with ice seven or seven-and-a-half feet thick; and Wrangel gives the thickness of a floe on the Siberian coast, which had been formed in the course of a winter, at nine-and-a-half feet. According to the observations of Hayes the ice measured nine feet two inches in thickness in Port Foulke. He estimates it, however, by implication, far higher in Smith's Sound: "I have never seen," he says, "an ice-table formed by direct freezing which exceeded the depth of eighteen feet."

8. The rate at which ice is formed decreases as the thickness of the floe increases, and it ceases to be formed as soon as the floe becomes a non-conductor of the temperature of

¹ Ice-fields have been seen there equal to the superficial extent of a German principality, or even to the Duchy of Salzburg.

the air by the increase of its mass, or when the driving of the ice-tables one over the other, or the enormous and constantly accumulating covering of snow, places limits to the penetration of the cold.

9. While therefore the thickness which ice in free formation attains is comparatively small, fields of ice from thirty to forty feet high are met with in the Arctic Seas; but these are the result of the forcing of ice-tables one over the other by pressure, and are designated by the name of "old ice," which differs from young ice by its greater density, and has a still greater affinity with the ice of the glacier when it exhibits coloured veins.

10. When the cold is excessive a sheet of ice several inches thick is formed on open water in a few hours; this, however, is not pure ice, but contains a considerable amount of sea-salt not yet eliminated; complete elimination of the saline matter takes place only after continuous additions of ice to its under surface. A newly-formed sheet of ice is flexible like leather, and as it becomes harder by the continued cold, its saline contents come to the surface in a white frosty efflorescence.

11. Hayes mentions that he met with fields of ice from twenty to a hundred feet thick in Smith's Sound. But if it is difficult in many cases to distinguish glacier-ice, when found in small fragments, from detached portions of field-ice, it is often still more difficult to distinguish between old and new ice, and the attempt to do so is merely arbitrary, because their masses depend not on their age alone, but on other processes to which they are exposed. A floe of normal thickness is never more than two or three years old; and if it is to exist and preserve its size for a longer period, it must somewhere attach itself to land-ice, so as to escape destruction from mechanical causes, and dissolution from drifting southwards. Many floes run their course from freezing to melting within a year.

12. The perpetual unrest in the Arctic Sea, which continues undiminished even in the severest winter, and the incessant change in the "leads" and "ice-holes," are the main causes of the increase of the ice, both in its area and in its vertical depth. Were this constant movement to cease, the result would be the formation of a sheet of ice of the

uniform thickness of about eight feet over the whole Polar region.

13. A layer of snow, which, like the ice itself, is at a minimum in autumn, covers the whole surface of all the ice-fields. This snow, which in winter is sometimes as hard as a rock, sometimes as fine as dust, takes, towards the end of summer, more and more the character of the glacier snow of our lofty Alpine ranges. Its grains, in a humid state, exceed the size of beans, and when in motion they make a rustling noise like sand. This granular snow is the residuum of the incomplete evaporation of what fell in the winter, and of the surface of the ice which has become "rotten" and porous. Its crystals are frequently from a third to a sixth of an inch in length, and firm ice is found even in autumn only at the depth of one or two feet. In the North of Spitzbergen, Parry observed that the surface of the ice was frequently cut up into ice-needles of more than a foot long by the drops of rain, which in summer fall upon it, and in some places he found it overspread with red snow. We ourselves never saw the phenomenon observed by Parry, and the ice-crystals we met with seldom exceeded the length given above.

14. Field-ice is of a delicate azure-blue colour, and of great density, and there is, in these respects, no difference between that of the Arctic and Antarctic regions. Cook, indeed, calls the South Polar ice colourless, though Sir James Clark Ross speaks expressly of the blueness of its ice-masses. Sea-ice surpasses the ice of the Alps both in the beauty of its colour and in its density. The glorious blue of the fissures is due to the incidence of light, the blue rays of which only are reflected, while the other rays are absorbed. A spectrum observation made in 1869 on a Greenland ice-field gave brownish red, yellow, green and blue. The yellowish spots observed in ice are due to the presence of innumerable microscopic animalculæ.

15. Sea-ice, which, when the cold is intense, is hard and brittle, loses this quality with the increase of temperature till it acquires an incredible toughness, far exceeding that of glaciers; and floes several feet thick bend under mutual pressure before they split. Hence the fruitlessness, especially

in summer, of all attempts to loosen the connexion of its parts by blasting with gunpowder.

16. The specific gravity of sea-ice is 0.91, and accordingly about nine parts of a cubical block of ice are under water, while one part only rises above the surface. If, however, the ice of a floe be irregularly formed and full of bubbles, the specific gravity will be correspondingly reduced, and the volume submerged may diminish to two-thirds of the whole mass.

17. The irregularity of the forms of ice is so great, that no deduction can safely be drawn from them; cases may occur where a recently-formed ice-floe, which has been attached to old ice, is forced by its neighbour to sink under the normal level; hence the submergence of floes beneath the level of the sea is often overstated.

18. The temperature of the Arctic Sea at the surface is generally below the freezing point, and then increases slightly with the depth. Sir James Ross observed that the temperature in all oceans does not alter at great depths, and placed this constant temperature at 39° F. In summer the temperature of the atmosphere rises little above freezing point, and, according to Sir James Ross, it is still less at the South Pole, because he saw no thaw-water streaming down from the icebergs there as he did in the North. It was first observed in Forster's days, that is about a century ago, that the salt was gradually eliminated from frozen sea-water. Of this fact Cook knew nothing; and even Sir James Ross endorses Davis's remark that "the deep sea freezes not." But the fact that ice is formed on the open sea, and far from the vicinity of land, was first asserted by Scoresby, and has been confirmed by all subsequent observers, though it was long disputed.

19. The crackling sound so commonly heard along the outer edge of the ice exposed to the action of the waves, is a consequence of the penetration of its pores by the sea-water, which is then immediately frozen, and disruption follows at once. But disruption on a far grander scale is due to a cause the very opposite of this, the sudden contraction and splitting of the ice, even in the great ice-fields, which is produced usually in winter by the sudden fall of the temperature.

20. When light falls on a field of pack-ice, it is reflected in the stratum of air above it, and this span of light, called the "ice-blink," just above the horizon, warns the navigator of the impossibility of penetrating further. This phenomenon is often observed also over drift-ice, although not so intense nor so yellow in colour as over pack-ice.

21. Water spaces, on the other hand, show their presence by dark spots on the horizon, produced by the formation of clouds from ascending mists. These are the so-called "water-sky," and faithfully indicate the "leads" beneath them. Above the larger "ice-holes," they assume the dark colours of a thunder-sky, though they are never so strongly defined.

22. The annual evaporation from the surface of the ice, which even in winter is never entirely interrupted during the severest frost, and the destruction of ice by the action of rain and waves, are balanced, to speak generally, by its re-formation by frost. The maximum accumulation of ice takes place in spring, its minimum in the beginning of autumn. We observed in the autumn of 1873 not only the evaporation of the snow of the preceding winter, but also a vertical decrease of ice of about four feet. Evaporation is, therefore, the most potent regulator of the balance between waste and growth in the accumulation of ice; and next in importance is the drifting of its masses towards the south through all those openings by which the Polar waters mingle with the waters of lower latitudes.

23. However great the agitation of the sea may be in the open ocean, and though it may dash its waves with wild fury on the edge of the ice, within the icy girdle it is undisturbed, in consequence of the enormous weight of the superincumbent masses. It is only in the large "ice-holes," and when the winds are very high, that the action of waves is discernible. An isolated accumulation of floes in a circular form, suffices to produce a calm interior sea, and its outer edge only encounters the beat of the ocean.

24. The ceaseless attack to which the ice is exposed on its outer edge is the cause of its excavation and undermining. Hence its centre of gravity is constantly displaced; and the overturning of its masses and its strange transformations

are the consequences of this instability. The smaller the masses of the ice, the more fantastic are the shapes they assume.

25. Change of colour in the sea as we enter the ice-region is frequently, though not invariably, observed. Almost immediately on entering the ice, its normal dull green colour gives place to a deep ultramarine blue, especially in the East Greenland seas, and this colour is maintained under all changes of the weather, and is only modified by local currents. Two hundred and fifty years ago it appeared to Hudson, on the coast of Spitzbergen, that the sea, whenever it was free from ice, was green, and that its being covered with ice and its blueness of colour were intimately connected. Sir James Ross states that in both Polar oceans the colour of the sea changes in the neighbourhood of ice, and that the dull brownish colour sometimes seen near pack-ice in the Antarctic Ocean is owing to an infinite number of animalculæ. The rapid fall of the temperature of the water to the zero point is another indication that ice is near.

26. Of all the ice-formations in the Arctic Seas, icebergs are the most enormous. "It is well known that ice is not by any means so heavy as water, but readily floats upon its surface. Consequently whenever a glacier enters the sea, the dense salt water tends to buoy it up. But the great tenacity of the frozen mass enables it to resist the pressure for a time. By and by, however, as the glacier reaches deeper water, its cohesion is overcome, and large fragments are forced from its terminal front and floated up from the bed of the sea to sail away as icebergs."¹ This process is sometimes called "the calving" of the glaciers; and the direction of the cleavage is a pre-indication of the forms of the masses when detached. The characteristic features of icebergs are their simple outline, differing widely from the fantastic shapes which the fragments of sea-ice tend to assume; their great height as compared with their breadth—their greenish-blue colour—their distinct stratification—their slight transparency—and the roughly-granulated character of their ice. Icebergs with long, sharp-pointed peaks, like those exhibited in numerous illustrations, have no

¹ Geikie's *Great Ice Age*, pp. 38, 39.

real existence. It is only fragments of field-ice, raised up by pressure, exposed to the action of waves and the process of evaporation which are transformed into fantastic shapes. Icebergs are generally of a pyramidal or tabular shape, and in time they are usually rounded off into irregular cones. They vary in height from 20 to 300 feet. Sir John Ross (1818) mentions an iceberg of 51 feet; Baffin (1615) of 240 feet; Parry (1819) of 258 feet; Kane (1853) of 300 feet; and Hayes (1861) one 315 feet high, the depth of which below the water-line he estimated at half a mile. On the coast of East Greenland, Scoresby once counted 500 icebergs, some of which reached the height of 200 feet; and during the second German North-Pole expedition, we saw many at the mouth of the Kaiser Franz-Josef fiord which measured 220 feet in height. In Austria Sound, and on the east coast of Kron-Prinz Rudolph's land, their altitude varied from 80 to 200 feet. From the covering of mist which envelops them, icebergs generally appear much higher than they really are, and their depth below the surface is not so considerable as is generally supposed. In an iceberg 200 feet above the water, a total height of 600 to 800 feet may, as a mean, be inferred. It is only glaciers of a very great size which shed icebergs; smaller glaciers, like those of Novaya Zemlya, only strew the sea with a multitude of fragments which resemble broken sea-ice. Hence the appearance of icebergs is connected with the proximity to glacier-covered lands, and with the currents which prevail along their coasts. Baffin's Bay, Smith's Sound, East Greenland, the South-East of Greenland, Austria Sound, are the principal places where they collect together and lie like fleets before the entrances of bays and gulfs. Under-currents of the sea take them not unfrequently in directions contrary to the drift of the field-ice, which depends only on upper-currents; and abnormal winds may sometimes carry them out to seas where they have been seldom or never seen.¹ This appears to be the case even with those met with on the north-west coast of Novaya Zemlya. On the other hand, they have never been seen on the coasts of Siberia, which have no glaciers.

¹ In the North Atlantic Ocean down to 40° N. L.

27. The constant displacement of the centre of gravity of an iceberg, resulting from the unsymmetrical decrease of its form, causes its periodical oversetting; and the different temperature of the internal and external ice is the principal cause of its rending asunder with a noise like thunder; a process which occurs generally in the height of summer.

CHAPTER II.

NAVIGATION IN THE FROZEN OCEAN.

1. ALTHOUGH it be impossible to give any one, who has not with his own eyes seen the Arctic Sea, a perfectly clear conception of its character, the phenomena described in the preceding chapter are sufficient to indicate the difficulties and dangers to which its navigation is necessarily exposed. And to these difficulties and dangers, formidable enough in themselves, are often added the evil influences of preconceived theories and exaggerated expectations, usually followed by bitter disillusion. The calm judgment, which, to all the bold plans of navigation within the Polar basin, opposes distrust in their feasibility, while it points to the hundred expeditions which have at last returned home after penetrating but a little way into the frozen sea, is an attainment of slow growth. Years, too, must be devoted to the theoretical study of the Polar question, to the examination of all that predecessors have experienced and recorded. But this study is very important to Polar navigators; for the discoveries which they too readily regard as exclusively their own prove sometimes to have been made centuries before them.

2. A most essential element of success is the choice of a favourable ice year; and the commander of an expedition must possess sufficient self-control to return, as soon as he becomes convinced of the existence of conditions unfavourable for navigation. It is better to repeat the same attempt on a second or even a third summer, than with conscious impotence to fight against the supremacy of the ice.

3. Polar navigators have learnt in the school of experience to distinguish between navigation in the frozen seas remote

from the land, and navigation in the so called coast-waters. The former is far more dangerous, entirely dependent on accident, exposed to grave catastrophes, and without any definite goal. It affords no certainty of finding a winter harbour for the long period when cold and darkness render navigation impossible. On the other hand, a strip of open water, which retreats before the growth of the land-ice only in winter, forms itself along coasts, and especially under the lee of those exposed to marine currents running parallel to them; and this coast-water does not arise from the thawing of the ice through the greater heat of the land, but from the land being an immovable barrier against wind, and therefore against ice-currents. The inconstancy of the wind, however, may baffle all the calculations of navigation; for coast-water, open as far as the eye can reach, may be filled with ice in a short time by a change of the wind. Land-ice often remains on the coasts even during summer, and in this case there is nothing to be done but to find the open navigable water between the extreme edge of the fast-ice and the drift-ice. Should the drift become pack-ice, the moment must be awaited when winds setting in from the land carry off the masses of ice blocking the navigation, and open a passage free from ice, or at least only partially covered with drift-ice. It is evident that navigation in coast-waters must be slow and gradual, though it has always been attended with the greatest advantages. Barentz was the first who tested its value; but it was Parry, the most distinguished of all Polar navigators, who discovered its full importance, and from his day it has been accepted as an incontrovertible canon of ice-navigation. On this point he himself says: "Our experience, I think, has clearly shown, that the navigation of the Polar Seas can never be performed with any degree of certainty without a continuity of land. It was only by watching the openings between the ice and the shore that our late progress to the westward was effected; and had the land continued in the desired direction, there can be no question that we should have continued to advance, however slowly, towards the completion of our enterprise."¹

¹ Parry's *Journal of a Voyage for the Discovery of a North-West Passage*, 1819-20, p. 298. 4to. London, 1821.

4. The successes of the English in the North American Archipelago were the result of this mode of navigation. Its principle is to search for and sail along the network of narrow channels when the main passage is blocked by pack-ice, and to turn to account the narrowest opening between the ice and the land. In the Siberian coast expeditions also this method of constantly following the coast-waters has been successfully observed. Where coast-water does not exist, or only to a limited extent, as on the East Coast of Greenland, this method is of course impracticable. The fate of the second German North Pole expedition is an illustration of this; it was ordered to penetrate in this direction, and its failure was inevitable. On the other hand, all the unsuccessful attempts of expeditions to penetrate northward from Spitzbergen—expeditions whose course and termination resemble each other as one egg resembles another—may be reckoned among those in seas remote from land. To the same category belong the expeditions for the discovery of a north-east passage, and simply because of the great extent of frozen sea between Novaya Zemlya and Cape Tcheljuskin.

5. In the frozen sea remote from the land, from 200 to 300, or at the most 400, nautical miles must, according to all past experience, be regarded as the greatest distance which a vessel is able to compass, under the most favourable conditions, during the few weeks of summer in which navigation is possible. The fact that Sir James Ross at the South Pole, and Norwegian fishermen in the Sea of Kara, accomplished still greater distances, only proves that they were little or not at all impeded by ice. Ross observed that the ice-floes of the Southern Arctic Seas are smaller than those of the Northern: "The cause of this is explained by the circumstance of the ice of the southern regions being so much more exposed to violent agitations of the ocean, whereas the northern sea is one of comparative tranquillity."¹ The rarer occurrence of land at the South Pole permits freer scope to the currents of the sea, diminishes the opportunity for the growth of ice on the coasts, tends to widen the passages in the network of water-ways, and thus facilitates navigation. Even the swell of the sea within the ice is observed in the

¹ Sir J. C. Ross's *Southern Antarctic Voyage*, vol. ii., p. 151.

South Polar Ocean, while it is never seen in the North. Besides the greater hindrances peculiar to the whole North Polar Sea, there is the specially unfavourable circumstance, in the case of the North-East passage, that the shallowness of the Siberian Sea prevents a close navigation of its coasts.

6. The choice of the most appropriate season is another important consideration in ice-navigation ; for this period does not fall at the same time in all seas, and the disregard of season was a common cause of the failures of the expeditions of earlier centuries. Since the frozen sea remains unbroken and almost unaffected by the action of the sun even in June, and at that time extends far to the south, it is evident that all attempts to force a passage in that month are labour thrown away. The ice-barrier retreating northward, or the transformation of pack into drift-ice, leaves free navigable water four or five weeks later. The month of August is the best time for ice-navigation in Baffin's Bay ; the end of July or beginning of August on the East Greenland coasts ; the second half of August and the beginning of September in the Spitzbergen waters ; and in the region of the Parry Islands the favourable opportunity ends about the beginning of September. In general, it seems that the time most propitious for all the coast-water routes, begins some weeks earlier than the corresponding period in the frozen seas remote from land. But since, even in the first weeks of September, the most promising conditions are often succeeded by a sudden reaction due to storms, to cold setting in rapidly, or to excessive falls of snow, navigation in the land-remote frozen seas, in itself so extremely hazardous, becomes specially critical, just when the ice-sheet at its minimum appears to promise the greatest results.

7. The help of steam power is an indispensable requisite, as by it a vessel is able to defy the capricious changes of the wind. The movements of a ship amid the ice are made in interminable curves, and the power to describe an arc with the least radius enables a vessel to follow up narrow and often blocked water-ways. As it is incessantly exposed to severe shocks from the ice, a paddle-wheel steamer is useless ; and even in screw-steamers care must be taken to protect the propeller by a special construction.

8. The rate of speed of a vessel in the ice must necessarily be moderate. From three to six miles an hour are sufficient : and a rate of eight or ten miles would soon render her not seaworthy. But even with this reduced rate, her whole framework is shaken and loosened at last by the incessant shocks she sustains ; and this condition of the ship becomes apparent when concussion with the ice is followed not by a noise as of thunder, but by a low, dull, groaning sound. The larger a vessel, the less her capacity to withstand these shocks, and the sooner will these signs of her diminished strength betray themselves.

9. An Arctic ship should be built with sharp rather than with full lines, so that when pressed by the ice, she may more easily escape being nipped and crushed. A ship built with what is called—in England—full lines, a full, round ship, is not easily raised but is liable to be crushed by ice-pressure. The *Hansa* was built in this manner, and was crushed by the first squeeze from the ice ; the *Germania* and the *Tegetthoff* were both of them sharp-built ships, and stood the test of the ice excellently well. To protect it from the effects of grinding on ragged “ice-tongues,” the hull is generally iron-plated for some feet under water, and the bows are strengthened as much as possible, because this part of the ship is exposed to the greatest shocks.

10. The tactics of a ship in the ice are guided entirely by the character of the hindrances to be overcome. If the ice-fields be large and heavy, they are then generally separated by broader water-ways and “leads,” and a ship may often amid such ice follow her course for hours with few deviations subject always to the danger of being “beset” and crushed. When the passage is blocked by a barrier of ice, the situation becomes grave and serious ; for such fields are not to be displaced by any force which the ship may exert, and nothing is left to the navigator but to await their parting asunder in a position as sheltered as possible. When the ice is loose and the floes comparatively small, the impeding barriers may be charged by the ship. She may then force asunder some of these floes or separate them by the continuous pressure of steam-power. In cases of this kind, large vessels have the advantage, and can bring to bear a greater amount of pressure,

whereas smaller ones stick fast and remain immovable. These accumulations of ice, while they make a "besetment" more likely, diminish the danger of pressure.

11. Hence it is clear that small are to be preferred to large vessels for ice-navigation, except under circumstances of rare occurrence; first, because they are more readily handled, and next, because of their greater power of resistance and of their being more easily raised under pressure from the ice. Their one disadvantage of lesser momentum is of comparatively slight consequence. The experience of all the North Pole expeditions of this century shows, that ships of 150, or at the most of 300 tons, are best suited for all purposes.

12. Iron ships have often been employed, but with no success; they are far less able to bear pressure than wooden ships, as was proved, among other things, by the fate of the *River Tay* in 1868, in Baffin's Bay, and of the *Sophia*, a Swedish ship of discovery in the north of Spitzbergen.

13. It admits of no question, that two vessels should be employed in preference to one, and this should be accepted as a first principle whenever the means at our disposal admit of it. Both ships should also be provided with steam-power, for otherwise their separation is almost inevitable,—a danger, however, for which, under all circumstances, they must be prepared.

14. All that is commonly understood about piercing the ice by sawing and boring through it is a delusion, and arises from the misunderstanding of technical expressions. Where there is navigable water, there any one can sail—where there is none, no one. In 1869 and 1870, after coming on a *cul-de-sac* of ice in Greenland to the east of Shannon Island, we could not penetrate a yard further; in 1871, in loose, but solid ice, we drew away only by warping on the smaller floes, without being able to make the slightest progress, and in 1872 we were twice "beset," in heavy ice, in spite of our steam power. The penetration of close pack-ice is an impossibility: in this case patient endurance is alone of any avail, and hence Sir John Ross so emphatically recommends the Polar navigator "never to lose sight of the two words caution and patience."¹ If a

¹ Sir John Ross—*Second Voyage of Discovery to the Arctic Ocean*, p. 180. 4to. London, 1835.

vessel, therefore, is arrested by impenetrable masses barring its way, the breaking up of the ice must be patiently awaited, and this, generally, is effected by calms, although the ebb and flow of the tide appear to have an influence on the solidity of the ice. It is then usual with sailing ships to seek the larger "ice-holes," or keep in the freest water-ways, in order to guard against the danger of being completely inclosed. These precautions, however, are not so requisite for steam-vessels, as their power to escape quickly and in any direction secures them against this danger. A steam-vessel may even venture to fasten on to an ice-floe by means of an ice-anchor, and of course under its lee, the fires being banked up, so that by getting up steam she may shift her place as soon as the ice moves nearer. As a principle, and so far as it is possible without the exhaustion of her powers, a ship in the ice should endeavour to be in constant motion, even though this entail many changes of her course and the temporary return to a position which had been abandoned. The making fast to a floe, however, should never be attempted, except when every hope of navigating in the surrounding waters has been proved fruitless. The fastening a vessel to an iceberg diminishes, indeed, its drifting, but is, if possible, to be avoided, because of the danger of the iceberg overturning or rending asunder, things which occur far more frequently than we should be led to expect from their great appearance of stability. When a ship, notwithstanding every possible caution, is "beset," it is then advisable to "ship" the rudder in order to protect it from injury, to which it is peculiarly liable from its unusual weight and size. A ship is exposed to considerable danger when she finds herself among icebergs in a calm; but since these are over-spread by a dazzling sheen, even in the thickest mist, the peril of the position is to be avoided at the last moment by warping.

15. As the happy choice of a sea-way is one of the essential conditions of success in ice-navigation, the ability to determine the ship's position and to ascertain whether a surface covered with ice to the horizon, admits of being penetrated, is most desirable. Hence the employment of a balloon would be of the last importance in Arctic navigation. The advantage of being able to ascend from the ship in a balloon secured by a

rope, to the height of a few hundred feet, is self-evident; and, undoubtedly, the first vessel which avails herself of this great resource will derive extraordinary benefit from it.

16. From the deck of a ship even drift-ice appears to be of such solidity at a little distance as to defy navigation, while from the mast-head more water than ice may be descried. In order then to extend the horizon, a look-out, called "the crow's nest," is fixed on the mast-head, in which an officer is always on the watch, and from which all the operations of the vessel are directed. In a ship of the size and height of the *Tegetthoff*, the horizon visible from "the crow's nest" extends to about eleven miles,¹ but at the distance of even five miles the possibility of penetrating cannot be determined with sufficient exactness. It is the business of the officer in "the crow's nest" to observe the passages through the ice and distant objects generally, as he is in the best position to fulfil this most important duty. It is the special business of the watch on the fore-castle to mark what lies in the immediate neighbourhood of the vessel, and his constant care is demanded to avoid isolated ice-floes and prevent collision with them. The seaman at the helm steers the ship by the signs and calls which come to him from "the crow's nest," and modifies them according to those of the watch on the fore-castle. The rest of the crew remove the smaller fragments of ice from the vessel's course, special care being taken to prevent their damaging the screw.

17. While sea-currents move the ice in close and continuous lines, winds produce great disturbances in their movement, and open long "leads" in the direction of their course, which often alternate with strips of the thickest pack-ice. This movement of the ice varies with each accumulation of floes, as its rate of motion depends on the height of the ice-field, which then acts as a sail. It is ascertained by experience that calms, on the other hand, have the remarkable property of breaking up the ice. The knowledge and application of these circumstances are essential to the Arctic navigator. If the course of a ship lies across or against a current, it is constantly deflected. The deflection on the coast of East Green-

¹ The nautical mile or "knot," which is about an ordinary mile and a sixth, is meant.

land, for example, amounted to five, even ten miles, within twenty-four hours; hence the importance of choosing routes with and not against the course of currents.

18. Lastly, it is of the greatest moment to choose betimes an appropriate winter harbour, and it is therefore necessary to keep near the coast towards the close of the season for navigation. To find one suitable for shelter during the winter in an unknown Arctic region is a matter of great difficulty, for it very often happens, that the ice drifts out from these "docks"¹ in the storms which constantly occur, or perhaps the "dock" is so sheltered, that the ice, if it breaks up at all, breaks up only in the following summer. Shallow bays which freeze almost to the bottom, lying under the lee of a current or within a fiord, are the most appropriate spots in which to winter.

¹ *Dock*, an opening in the ice, artificial or natural, offering protection. Kane's *Glossary of Arctic Terms*, vol. i., p. 13.

CHAPTER III.

THE PENETRATION OF THE REGIONS WITHIN THE POLAR CIRCLE; THE PERIOD OF THE NORTH-WEST AND NORTH-EAST PASSAGES.

1. AROUND the lonely apex of the Pole stand cairns of stone which serve to mark the points to which the restless spirit of human enterprise and discovery has penetrated. In its zenith wheels the sea-gull in its flight, and the harpoon-persecuted seal finds on its ice-floes an unapproachable asylum; but the Pole itself remains the goal which no human effort has yet reached.

2. As all knowledge is perfected slowly and gradually, so man's knowledge of the earth and its configuration forms no exception to this general rule. Of the few attempts of early antiquity to enlarge the domain of geographical knowledge, tradition tells us only of the Argonautic expedition of the Greeks, of the voyage of the Phœnicians to Ophir, and their bolder circumnavigation of Africa. With the conception of the spherical form of the earth the still vague notion of climatal zones makes its appearance, and to this, four centuries before Christ, Pytheas of Marseilles gave the first scientific elucidation and the first approximation to modern theories by his doctrine of the Polar Circle. Almost contemporaneously Alexander's expedition to the wonder-land of India created a paradise for commerce and navigation, to secure which a shortened route, *the route through the ice*—the most perverse notion that ever entered into the mind of man to conceive—was one thousand eight hundred years afterwards eagerly and passionately sought.

3. Rome had extended her knowledge to Scandinavia, and Seneca's prophetic mind foresaw the discovery of new

worlds. But the deluge of religious strifes, the migrations of nations in the earlier part of the Middle Ages, the holy zeal for destruction in the apostles to the heathen, proved formidable barriers to the extension of geographical knowledge, which were broken through only by the piratical hordes of Normans so renowned in story. While the Romans boasted that Britain had never been circumnavigated, the Normans, throwing the deeds of the Phœnicians into the shade, discovered Greenland, and became *the first Polar Navigators*.

4. Travels by land were the principal means by which the geographical knowledge of the world was enriched; but during the Middle Ages the information which travellers communicated, uncertain and superficial even for Europe, served only to supply food for the fancies of map-makers, as far as the distant parts of the world were concerned.

5. But the grand moment at length arrived in the history of mankind when the civilization of the West, looking beyond the narrow horizon of the Old World, and awaking from the geographical dreams of centuries, burst the fetters of tradition, and within three hundred years perfected the knowledge of our planet up to the Pole.

6. When by his famous line of partition, Pope Alexander VI. granted to Spain and Portugal the new countries discovered in the East and West, the brigantines of these nations spread themselves over all seas in search of new lands and fresh glory. To the other maritime nations, to the English and the Dutch, nothing remained, if they meant to acquire gold-yielding lands, but to drive the Spaniards and Portuguese from their conquests, or to seek new Eldorados—yea, by the discovery of sea routes on the north of Asia and America, to aspire to India itself. This was the conception first entertained by both the English and the Dutch, and Geography at any rate profited by their delusions. These nations were not to blame if those routes, known afterwards as the *North-West* and *North-East passages*, degenerated into chimeras, if passages had to be sought in higher and still higher latitudes,—ultimately in the ice itself, although the Dutch geographer, Plancius, struck out the consoling theory of the *open Polar Sea*.

7. But who in those days could presuppose that the

continents of Asia and America, just where those passages were attempted, symmetrically developed the most enormous longitudinal dimensions? Even the actual discovery of the vast extent of Siberia exerted but little influence on the question of the North-East passage, for the achievements of individuals were not then so quickly disseminated as at present. A succession of men in vessels poorly equipped now struggled against the supremacy of the ice, avoiding at first the dreaded wintering, while they attempted sometimes the North-East, sometimes the North-West, sometimes the passage over the Pole itself. In these attempts many lost their lives; many returned, despairing of but still hoping for the solution of the problems—*but no one reached the goal.*

8. The amazing simplicity of the first adventurers is seen in Frobisher's project to erect forts, duly provided with canons and men, on the commanding points of the passage, in the letters of recommendation given by kings of England to the leaders of the expedition for the small Saracenic states which were supposed to exist beyond the river Obi; but these old navigators carried no letter of recommendation to the great potentate—the ice. Gold, too, they hoped to find in the North, because the book of Job speaks of gold coming from thence, and the North-East passage was considered as free from danger, because Pliny mentions some Indians who had been driven towards Norway!

9. When another century and a half had elapsed, a series of unsuccessful attempts to force the North-East passage put a decisive check to material interests in Polar expeditions. The North-East passage belonged henceforward to the history of the past. The English and Dutch withdrew from the Novaya Zemlya seas; and after Wood's retreat no scientific expedition entered those seas for two hundred years, *until the days of the Austrian Expeditions.*

10. Among the maritime nations of Europe, it was England, and especially her merchants, who had hitherto largely invested in the costs and risks of these Argonautic expeditions "for the glory of God and the good of the country." The Dutch soon contented themselves, after Barentz's death, with the capture of whales in the Arctic seas; France remained an unconcerned spectator, while the sylphs of Versailles

consumed the whalebone of whole fleets of whalers ; and Spain and Portugal early withdrew from seas in which, instead of ingots of gold, ice-floes only were to be found. But even for England the days of the prophets had now passed away—the days of a Cabot, a Mercator,¹ a Wolstenholme, and a Walsingham. Men of weight raised their voices against the chimeras of Arctic commercial routes, and Chillingworth contemptuously compared an expedition for the discovery of the North-East passage to the study of the Fathers.

11. It may be asked why nations struggled with dauntless ambition for the lost cause of the barren North-West and North-East passages, while for a century they stretched forth timid hands after the rich treasures of lands lying in the more favoured zones? *The mighty stimulus of the love of the marvellous* explains this series of efforts taken up by generation after generation. Frobisher, Davis, Baffin, and the Novaya Zemlya adventurers, told on their return of goldlands far within the domains of the icy Hydra. Their tales of single combats with spear or matchlock against polar bears, of the dreadful snow-storms and fearful cold of the Arctic winter, were heard with grim delight by listeners on whom no hardships were imposed. Or they spoke of a darkness that continued for months, of the flaming arches of the northern lights, of the sun remaining visible for many weeks in the heavens, of a race of dwarfs, of unheard-of animals, of fish as big as ships of war, of monsters with long teeth which precisely resembled the Sphinxes of the plains of the Pyramids, of white and blue foxes, of floating mountains of dazzling crystal, of ships seen upside down in the air—when had ever the mind of man more food to nourish the love of the marvellous or greater incentives to stimulate the love of distinction? But besides these appeals to the imagination, every generation desires new confirmations of its convictions ; and hence geographical questions, after being shelved for a time, come again to the front as by an inward necessity.

12. If the earlier Polar expeditions pursued exclusively material ends, a decided change appears in those of the present century—the Polar world itself became an object of scientific investigation. With Sir John Ross (1818) began a

¹ Mercator was not an Englishman ; he was a Dutchman, born 1512, died 1594.

series of expeditions, at first subservient to the idea of a North-West passage, but which ultimately derived all their importance from their attempt—ineffectual as it proved—to rescue the lives of 139 men, who had fallen far from the fields and scenes where earthly fame is commonly achieved. It was these expeditions, still fresh in the memory of this generation, which, summoning to their aid the modern power of steam against the ice, succeeded in drawing on our Arctic maps a circle whose mean distance was 200 (German) miles from the Pole. Parry on the frozen sea of Spitzbergen had approached it within 100 miles (German); Kane, Hayes and Hall on the coast of the Kennedy Channel, the former to within 116, and the two latter to within 108 miles, and the Austro-Hungarian expedition to within 109 miles

13. M'Clintock, who returned with the relics of the Franklin expedition, succeeded in perfecting a mode of discovery independent of the ship—that by means of sledging—admirably adapted for future Arctic expeditions. But the North-West passage for which six generations had toiled, though discovered, was shown to be utterly worthless for all material purposes—a dreary web of coast lines.

CHAPTER IV.

THE INNER POLAR SEA.

1. THE Arctic Sea, in some of its features, forcibly impresses us with its resemblance to the glaciers of the Alps. In both cases, the ice presses from a region, colder and less favoured by climate, towards one warmer and more favoured. In the Alpine glaciers, the movement is from above downwards; in the Frozen Ocean, the movement is from a higher to a lower geographical latitude. In both cases, the tongues and spurs of the masses of ice formed by the configuration of the land or by currents of the sea, terminate, whenever they reach an isothermal curve of altitude or latitude, the mean temperature of which suffices to dissolve them or prevent their formation. Moraines also have their equivalent in the Arctic Sea; for it is an established fact that icebergs and ice-fields laden with the *débris* and rubbish of Arctic lands, deposit these burdens round the outer edge of the Frozen Ocean, and to this process, partially at least, the origin of the Newfoundland Banks is ascribed. If this comparison between the phenomena of high latitudes and great altitudes be just, then we should have as much reason to believe in the existence of the so-called open Polar Sea, as we should have to maintain, that in our glacier ranges ice ceases to be formed above a certain altitude.

2. The belief of past times¹ in such a sea shows how unsatisfactory is the simple to man's mind, and how old is his tendency to clothe the remote and the uncommon with

¹ Three centuries ago, Plancius, the Dutch geographer, devised this for the North Pole, while Barros, the Portuguese historiographer, did the same for the South Pole.

a garment of the marvellous. What was the open Polar Sea but the "Harz Sea" of the North, or the legendary zone of the ever-sunny Eden of the Hyperboreans, far beyond the land of the Anthropophagi over which was spread an atmosphere veiled in snow, and through which no light could penetrate! Who has ever seen this open Polar Sea? Do the accounts of navigators confirm its existence? Nay—their accounts are rather a series of counter-statements: Hudson, Baffin, Phipps, Tschitschagoff, Buchan, Franklin, Parry, Collinson, Scoresby, M'Clintock, Koldewey, Torell, Nordenskjöld, have all expressed their disbelief in its existence. If some have pretended that they have seen it, how strange it is that they never sailed on it! It has recently been attempted to make the great champion of the Polar question, Dr. Pefermann, a supporter of this conception; but in the "Mittheilungen" of this highly meritorious geographer, there are many passages which most emphatically protest against it. His views extend only to an inner Polar Sea navigable under certain circumstances, and every one acquainted with those regions may adopt his point of view, though he refuses to admit the existence of the open Polar Sea.

3. In those centuries when the Natural Sciences were little cultivated, when the theories of the Trade Winds, of Equatorial and Polar sea-currents, were still unknown, and when as yet the processes in the Frozen Ocean had not been submitted to scientific investigation, we cannot be surprised at the preconceptions which were formed concerning its phenomena. In those times all beyond Norway was a chaos of ice-filled darkness; the necessity of a scientific investigation of those wastes was not felt; and down to the time of Sir John Ross, Polar navigators on their return home brought with them no kind of scientific knowledge of Nature in the Arctic regions. To reach India was the main if not the only end they had in view. The instructions which Willoughby, the first Polar navigator, received, give us an insight into the delusions of earlier times. These, for example, warned adventurers against men-eaters who swam naked in the sea, and in the rivers. It was the period of fables long since forgotten. Maldonado, de Fuca, Bernarda, Yelmer, Andrejew,

Martinière, and the whale-fishers, brought home tales of passages to India discovered, of new continents, of the ascertained connexion of Novaya Zemlya with the northernmost point of Siberia (Yelmerland) or even with Greenland. Two centuries ago the failure of all attempts at a North-East passage was attributed to Russia's commercial policy, inasmuch as it had been proved to the satisfaction of all, that the heat was greater in the north, that the seas there ceased to freeze, and that the country was covered with a luxuriant green!

4. There was, indeed, a certain logical consequence in the belief of an inner Polar Sea, as long as it was unknown that ice is formed on the open sea as well as on the coasts. There was also one argument, which made the existence of such a sea not altogether improbable. It might be assumed, that the formation of ice renewed every year in the Arctic regions, would necessarily produce eternal bulwarks of congelation and destroy all organic life, unless sea-currents modified these extremes of climate. The ice which is formed round the Pole—it was argued—is not of an unlimited but of a definite quantity. Since, then, this quantity of ice must be brought with tolerable uniformity from the innermost Polar region to lower latitudes by the action of sea-currents, there are at least one or two months of the summer when the ice is at a minimum, when no new formation takes place, and when a sea relatively ice-free may appear in the place of the sea which had been covered with ice. This sea would be the more open and navigable, just in proportion as less land might be found at the Pole. But in this assumption it is implied, that the ice moves with perfect regularity and in radial lines from a given point without any disturbance from winds, or counter-currents, or land, consequently with a quiet simplicity of hydrography, for which Nature, neither there nor elsewhere, shows any predilection. Dove makes the mean annual temperature of the North Pole, 2.5° F.; but it is probably still less. What, then, is the probability of an open Polar Sea, if this annual mean only be considered? All the accounts too of animal life increasing in exuberance as we advance northwards—from which a more favourable climate within the innermost Polar region and an open Polar Sea have been inferred—must be received with caution, for the

appearance of numerous flocks of birds proves only that the remain where open water prevails for a time and that the change their abode with its change of place.

5. In more recent times great influence has been attributed to the Gulf Stream as a power influencing all the seas, known and unknown, of the whole Arctic region. Dr. Petermann, however, in a lately published work, endeavours to show that its effects are discernible only on the northern seas of Spitzbergen and Novaya Zemlya. Its action on the coasts of Spitzbergen has been indisputably established by the Swedes, who discovered there certain tropical plants (*Entada gigalobium*); but the penetration of the warmer waters of this current to the northern coasts of Novaya Zemlya has not been so positively ascertained. In the Austrian Expedition of 1873-4, we discovered no proofs of its existence. We found neither the constant current, nor the water of a higher temperature, which characterizes that renowned stream.

6. For a long time the "ice-holes," seen by Wrangel and Morton, were regarded as indications of an ice-free Polar Sea. With regard to those seen by Morton in $81^{\circ} 22'$, Richardson very justly remarks: "The open water of the Kennedy Channel is not of greater extent in the month of June than the open spaces which have occasionally been seen in summer on the north of Spitzbergen by whale-fishers." Wrangel, when he describes the "Polynjii," which he saw on the east of the New Siberian Islands, accounts for them by the action of a local coast-wind; and yet Wrangel would have been the first to favour the notion of an inner Polar Sea, for he still thought, in opposition to Scoresby, that ice could not be formed on the open sea, because of the absence of land as a support for the ice in its formation.

7. The first practical application of the theory of an open Polar Sea was long ago devised by Plancius; the discovery, namely, of a route in high latitudes to China. But the expeditions to the North Pole, properly so termed, sprang also from this theory, which was held with the greatest pertinacity. The evidence of unsuccessful undertakings was always met and outweighed by the counter-experience of one favourable year in the ice. Thus Barentz, in the exceedingly propitious summer of 1594, advanced without difficulty one

degree of latitude beyond the northern extremity of Novaya Zemlya, while his successors frequently encountered insurmountable difficulties at Cape Nassau, and he himself in the following year, 1595, found the state of the ice changed much for the worse. In the years 1871, 1874, Mack, Carlsen, and the two Austro-Hungarian expeditions came upon an open sea in the very places where very few, if any, water-ways were to be seen in 1872 and 1873. In the summers of 1816, 1817, the mighty stream of ice on the coast of East Greenland had decreased to such an extent that Scoresby met with little ice between 74° and 80° N.L., but since then whalers have constantly seen the heaviest ice there, heavier than anywhere else. In 1753 and 1754, the Sea of Kara and the Novaya Zemlya Sea were free from ice. But in subsequent years the whale-fishers knocked in vain at their ice-barred entrances. In 1823 Lütke from a point on the west coast of the Sea of Kara saw that sea without ice; but, in the middle of August, 1833, Pachtussow found the western side of that sea open, while in the previous year he himself could not pass the Karian Gates. Again in 1743 and 1773, the North Spitzbergen Sea held out promises the most inviting, which might possibly have permitted the reaching of a still higher degree of latitude than that which Nordenskjöld and Koldewey attained in 1868. Sir John Ross, in the first year of his second voyage, found all things most favourable for navigation; but in the following year the very reverse; and Sir James C. Ross experienced the same alternation of circumstances in the Southern Polar Sea. In 1850, Penny found the Wellington Channel free from ice, but in 1852, Belcher, although he penetrated far further than Penny, was confronted in the same channel by pack- and drift-ice. Scoresby the younger, to whose profound faculty of observation we owe the most significant hints on the nature of the Polar Sea, although he had navigated the Greenland ice-ocean for twenty years, landed only once on its coast. The Swedish expedition (1861) could approach the north-east of Spitzbergen only in boats; Smith sailed over the sea there (1871) as far as Cape Smith. The walrus-hunter, Matilas, sailed round (1864) the north-east island completely, and Carlsen, an ice navigator, as successful as he was skilful, in

1863 circumnavigated Spitzbergen, and in 1871 Novaya Zemlya, and discovered there the relics of Barentz's winter quarters. In 1872, King Karl Land was circumnavigated, although both Koldewey and Nordenskjöld (1868) as well as the first Austrian expedition (1871) had in vain attempted to approach it. How greatly also, in the same year, the state of the ice varies in different places, is proved by the fact, that Franklin learnt from the whalers that they never saw the ice so thick and so strong in Davis Straits as at the end of July 1819, while Parry, more to the north by some degrees of latitude, pursued his path of discovery even to Melville Island, and in the following year returned to England without meeting any special obstacles. These examples, to which many more might be added, show how variable are the chances of ice-navigation from one year to another. But however variable the conditions of the ice may be, the impediments, even under the most favourable circumstances, are so very great, that we have never been able to penetrate the innermost Polar regions,—*penetrate*, that is, *to where, according to the views of an earlier time, the open Polar Sea should be found.*

8. Those propitious ice-years amount therefore to nothing more than a greater recession of the outer ice-barrier—trifling when compared with the mighty whole—or to an increased navigability of certain coast-waters, or to a local loosening of the inner Polar ice-net. In reality the whole Arctic Sea, with its countless ice-fields and floes, and its web of fine interlacing water-ways, is nothing but a net constantly in motion from local, terrestrial, or cosmical causes. All the changes and phenomena of this mighty network lead us to infer the existence of frozen seas up to the Pole itself; and according to my own experience, gained in three expeditions, I consider *that the states of the ice between 82° and 90° N.L. will not essentially differ from those which have been observed south of latitude 82°; I incline rather to the belief that they will be found worse instead of better.*

9. If this view be correct, it will remain an insuperable difficulty to reach the Pole with a ship. The penetrating to 82° or 83° exhausts, according to all past experience, the disposable time for navigation, and presupposes moreover the most favourable conditions for the attaining of such high

latitudes. A ship which reaches 82° N.L. by the beginning of autumn must risk nothing more, should only navigate really open water, and the expediency of securing a winter harbour should then outweigh every other consideration.

10. He who expects with a ship of the present construction to reach the Pole in a single summer, necessarily believes in an ocean at the Pole. But even if an expedition should penetrate to 84° in Smith's Sound, or should reach Cape Tcheluskin on the north-east route, it would not follow that such an ocean exists, but only that the Polar Sea presents at different times and in different places open water-ways, which may enable a ship to advance beyond a point hitherto reached; but it is improbable that the circumstances which favoured this will be repeated the next summer, so as to permit the ships to penetrate still further—or to return. The last American expedition returned without being able to speak decisively as to the possibility of navigating Lincoln Sea, and since this has not yet been verified by fact, we must suspend our judgment on the matter. To the English expedition, which has taken this route to the Pole, is reserved the great work of throwing light on the region of Upper Smith's Sound, and the whole civilized world will hail with joy any successes which a nation, so long conspicuous for its perseverance in the cause of discovery, may happily achieve.

CHAPTER V.

THE FUTURE OF THE POLAR QUESTION.

I. THE eagerness of human nature for gain and material prosperity is so great, that we are wont to estimate the value of all undertakings by the standard of utility; and too often it is forgotten, that each generation is destined to fulfil the task of acquiring and collecting the knowledge which is to benefit only a later generation. If, then, the Polar question be valueless for our material interests, is it therefore valueless for science? and assuming that it is for the present worthless as far as gain and wealth are concerned, must it continue so for all time? Not that we are entitled, even from this narrower point of view, to deny the usefulness of Polar exploration, as Cook seems to have done when he said, "Never from those regions will any advantage accrue to our race;" but rather bear in mind what Sir James Ross tells us: "The profit which accrued to England, in each year after the voyage (1818) of my uncle (Sir John Ross) in North Baffin's Bay, from those rediscovered parts of the Arctic seas, was more than enough to defray all the expenses of the voyages of discovery undertaken from 1818 to 1838." Scoresby with his single ship made a million thalers by the capture of whales, and the Americans had for many years a clear profit of eight million dollars from the fisheries of the frozen seas of Behring's Straits. There were also, it is true, very considerable losses; for, in 1830, nineteen English ships engaged in the whale fishery were "beset" in the ice of Melville Bay, and nearly all destroyed; in 1871, twenty-six American ships were crushed to pieces in Behring's Straits, and as many as seventy-

three Dutch vessels sank in one year in the seventeenth century from the pressure of the ice.

2. We do not, however, mean to assert, that the progress of Polar discovery is always followed by a corresponding increase in the capture of fish in the Arctic seas. On the contrary, the take of oil-yielding animals is steadily decreasing, and even if an open sea should be discovered in 82° N.L., in which whales should be found in as great abundance as ice-floes unhappily are, the whaler with his poor equipment would never be able to follow them thither. The fur countries, once as productive as the mines of Peru, are incapable of further extension; even the treasures of mammoths' tusks have become rare, and in order to bring thirty tons of lignite from the north-east of Greenland, a ship must expend seventy tons of sound coal in the transit, besides passing the winter there. That the teas of China, the silks of Japan, the spices of the Moluccas will never descend to us from the ice-fields has long been settled. No one at the present day thinks any longer of the commercial value of the North-West and North-East passages. Modes of escape from the perils and caprices of the ice have grown out of the endeavour to discover routes of commerce, which lay beyond the reach of the cannon of the Spaniards at the time when they aspired to the monopoly of the trade of the world. The reward of 25,000 gulden, offered by the Dutch government for the discovery of a North-East passage, and that of £20,000 by the English parliament for the North-West passage, have never been paid, because never claimed, nor are they, in the least degree, likely to be claimed.¹

3. Yet, quite independent of material results, Polar exploration presents no unworthy object for scientific investigation—a region of the globe 120,000 square miles in extent never yet entered by man. The Polar question, as a *problem of science*, aims at determining the limits of land and water, at the perfecting of that network of lines with which comparative science seeks to surround our planet, even to its Poles. The completion of this labour will serve to discover those physical laws which regulate climates, the currents of the

¹ As a corrective to this rather extreme statement, see Clement Markham's *Threshold of the Unknown Region*, 4th Edition, pp. 383—393.

atmosphere and sea, and the analogies of geology with the earth as we see it.

4. But how is this to be attained? At first it would appear as if the methods of ice-navigation had been followed by such success, that their continued application guaranteed still greater results. The gradual advance by means of ships, from the Polar Circle to 73° , 75° , 79° , or even to 82° N.L., has been the result and is the reward of the labours of three centuries. But to reach higher degrees, from 82° to 90° , depends on other conditions than mere time. That increased experience and boldness have removed many of the inconveniences and dangers attendant on Arctic navigation is undoubtedly true, but it is also as true, that, upon the whole, *the safety and convenience of ice-navigation have more steadily increased than its successes.* Hudson, Baffin, and especially Scoresby, and even some whalers of the seventeenth century, reached latitudes which have scarcely been exceeded since, and in many cases this progress was due, not to greater boldness and experience, but rather to chance and the caprices of the ice, which "to the whaler often permitted glances into its interior, which were denied to the scientific explorer."

5. The greater perfection of our means enables us to conduct Polar expeditions with greater facility. Instead of dissipating our strength by sending out several ships, even small fleets, amounting sometimes to fifteen ships (often not larger than the boats of a modern Polar ship), since the days of Sir John Ross, we equip one or two ships only, strongly built for their special purpose, provided with steam-power, and with all that is desirable or requisite; and instead of despatching them for short summer cruises, we provision them, send them out for several years, and, by appropriate nourishment and the aid of medical science, protect the crews from the scourge of scurvy. In those days, when even the wealthy lived during the winter on salt beef, and English squires were obliged at the beginning of winter, on account of the scarcity of food for the cattle, to kill and salt a portion of their herd, preserved and antiscorbutic victuals were an impossibility to a Hudson, a James, a Fox, in their winters amid the ice. Those introduced by Ross—then called "Donkin's meat"—have been greatly improved since, and through them the scurvy,

which used to carry off whole crews of ships, has lost its former terrors.

6. In this power to extend our expeditions without danger, and especially in sledge journeys during the autumn and spring, which are possible only to expeditions prepared to winter in the ice, are the grounds why we have not halted at the barriers "of the bulwarks built for eternity;" in the Rennselaer harbour, in the Lancaster-Barrow route, or at the Pendulum islands. It is only sledge expeditions, as Midden-dorf says, which have been able to effect results of any magnitude on the inaccessible coasts of the extreme north; and the great extent to which the Russians had used sledge expeditions evidently served as an example both to the English and to Kane.

7. In Polar expeditions, therefore, we have probably reached, so far as the exploration of the highest latitudes by means of ships is concerned, the limits of possibility. The extraordinary success which fell to the lot of Hall's expedition *teaches us only the possibility of encroaching but a little beyond that limit*, even under the most favourable circumstances.

8. In all cases where the attempt shall be made to reach the highest latitudes with a ship, I would again recommend the route through Smith's Sound, because, in the first place, I believe that any considerable advance is only to be expected in coast-water; and in the second place, because the Grant Coast offers facilities for sledge expeditions on a large scale. East Greenland in the higher latitudes, 73° — 75° , may be regarded as inaccessible; and the attempt to penetrate northwards in its coast-water was a delusion of the second German North-Pole expedition. In the north of Spitzbergen, and in Behring's Straits, fifty expeditions and countless whalers have heard from the ice an imperious *ne plus ultra*; and the same prohibition has been uttered to as many expeditions on the North-East passage. In both these routes the cause of failure was the disproportion between what could be reached in one or two summers, and the vast extent of sea blocked by impenetrable ice. In like manner, the probability of reaching the Pole itself with our present resources is so small, and the attempt to do it is so utterly disproportionate to the sacrifices exacted and the results achieved, that it would be advisable

to exclude it from Arctic exploration, until, instead of the impotent vessels of the sea, we can send thither those of the air.

9. Be this as it may, the present English North-Pole Expedition will essentially contribute to solve the question, whether the Pole can be reached by the route through Upper Smith's Sound. This, according to the views of almost all Polar navigators, holds out the greatest chances for further advance by sea. Should this expedition, equipped in so effective a manner, and sent out by a nation of such great experience, not come nearer to the goal, or, if nearer, only through sledging—which may very probably be the case—the conviction will then be strengthened, that all efforts to reach the Pole by navigation in the Frozen Ocean are hopeless, and witness only to the glorious persistency of human endeavour.

10. But until aërial navigation to the Pole shall be attempted, it would be advisable to follow the example of the Swedes, and, in the service of Natural History and Geography, content ourselves with the exploration of those Arctic lands of which, up to the present moment, we know only the coast-line, or which, situated on the outermost verge of our Polar charts, are still untrodden by man; we mean specially Gillis', Grinnell's, Wrangel's Land, and above all, the interior of Greenland. The Polar question, hitherto regarded chiefly as a geographical problem, would thus, for a considerable time, be taken up in the interest of Natural Science. Lieutenant Weyprecht, after dwelling on the predominance of exploration in Polar expeditions, expresses a wish, that the great civilized nations would unite in contemporaneous Arctic expeditions for magnetical, electrical, and meteorological investigations: "In order to attain decisive scientific results, a number of expeditions should be sent to different places in the Arctic regions to make observations, at the same time, with similar instruments, and in accordance with similar instructions." They who think such results too insignificant for the energies and sacrifices which are expended to achieve them, and who would rather that such efforts should be transferred to those still unknown regions of the earth, which may become the dwelling-places of man, will, of course, give their veto against the further agitation of the Arctic question.

CHAPTER VI.

POLAR EQUIPMENTS.

1. EVERY Arctic expedition should be guided by the experience of its predecessors, both in its plan and its equipment ; and hence we have often to deplore the negligence of almost all Polar navigators in failing to inform those who follow them of what they actually saw, of their modes of procedure, or of the mistakes which they committed. It will not, therefore, be labour thrown away, if we state our own experience and record our own observations for the guidance of others, in order to show, with the utmost possible clearness, what future explorers have before them, and how best to meet it.

2. Undivided command in an expedition is the first of all rules ; but if there be any division of command in a subordinate expedition by sea or land, the duties and rights of its commander must be clearly and exactly defined. In recent times the command of a Polar expedition has sometimes been conferred not on a seaman, but on a man of science, as in the cases of Kane, Hayes, Nordenskjöld, and Torell. Where the investigation of questions connected with Natural History is the aim and object, this precedent is admissible, but it should never be observed where the commander has an important part to fulfil as a navigator. The command of an expedition has never been conferred on a man of science by the English government. In the very commencement, indeed, of Polar discovery, an English expedition was placed under the command of Sir Hugh Willoughby, who was not bred a sailor, but down to the seventeenth century, even in their naval campaigns, such men were appointed to naval commands. The Dutch expeditions of the sixteenth century

generally adopted a destructive division of command, under supercargoes and pilots, representing the mercantile and nautical elements: confusion and discord were the inevitable consequences.

3. Next to the selection of a commander, the selection of the crew demands the greatest care. This ought to be made some time before the expedition starts, in order that those unfit for the service may be discovered, and their places supplied by others; this cautious mode of procedure, and not a preference for any particular nationality, will secure the most effective crew. Although seamanlike qualities do not belong in the same degree to every nation, time and pains only are needed to secure a picked crew for a North-Pole expedition from almost any nation. Endurance of cold is not the only test of effectiveness, although this is a very common assumption; but a sense of duty, perseverance, and resolution are the virtues of a seaman. Habit soon teaches men to conquer cold, and inexorable necessity often hardens weaklings into heroes for Arctic discovery. A certain degree of intelligence is of high importance in the crew. In many cases resolution in the midst of dangers depends on their capacity to observe and think, even on their possessing certain branches of knowledge. The greater part of the crew of the *Tegetthoff* had these advantages. But men who, in a heavily-laded sledge, leave the old and take to recently-formed ice, without noticing the difference,—who observe a frost-bitten foot several hours after the mischief has been done,—who lose their cartridges, know nothing of their rifle, and little more of their compass, or who pass on without observing the configurations of the land, possess an indifference indeed, but of a kind very dangerous to themselves and to the whole party, though they may despise death as much as Achilles is said to have done.

4. An intelligent crew, from their greater feeling of independence, is, however, more difficult to command than an ignorant one. Devotion and blind confidence are more rarely found in an educated crew; their amenability to discipline is dependent on the good example, the kindness and unalterable calmness of those who may command them. The law of a Polar expedition is obedience, and its basis morality. Punish-

ments are in such situations a miserable and depressing means for the preservation of order, and then employment, especially in a private undertaking, will tend rather to loosen than to maintain the bonds of discipline. If Parry, in 1820, caused corporal punishments to be inflicted, this proves the greater facility with which discipline is maintained on board of a man-of-war, but not its appropriateness generally. Coercion and threats produce no effect ; and hence the folly of attempting to secure success by sending out again those who returned without having achieved anything, which was done last century by the authorities of St. Petersburg with every unsuccessful enterprise on the Arctic coasts of Siberia. The regulation that the most meritorious among the crew shall be specially rewarded, after the return of the expedition, provides for the recognition of merit, without exciting ill feeling in the less worthy. For the officers scientific success may be a perfect reward of their toils, but for the crew the reward should consist of more material advantages. Money, indeed, seems a feeble motive of action to men destined to withstand for years the inclemency of Arctic winters, and uncertain whether they shall ever return ; but, notwithstanding, it is the only form by which men without sympathy for the aims of science can be gained for the attainment of such objects. The crews of Sir John Ross received for a martyrdom of four years passed in the ice about £100 a head ; in the second German expedition from eight to twelve thalers were the monthly pay of each sailor. The pay of the sledgers in the *Tegetthoff* was, however, nearly four times as much ; in some sledge journeys it amounted to 3,000 gulden a man.

5. Contrary to what might be expected, the re-employment of those who have served before is not to be recommended as a rule. The very best only should be re-enlisted. The others are too much disposed to place their experience on a level with that of their commanders ; and in all cases, where their opinions differ from those of their officers, they damage by a kind of passive opposition the fundamental law of an expedition—obedience. Those who enter the Arctic regions for the first time are wont to receive the orders of an experienced commander with an attention as unquestioning as it is

respectful. Married men also should be excluded, as they were by Barentz in his second (1596) expedition.

6. Some of the crew should be good shots, good pedestrians and mountaineers, but all must be of the same nationality, and in perfect health. The least symptom of rheumatism, of diseases of the lungs and the eyes, and of certain chronic maladies only too common among seamen, unfit them for the endurance of the Polar climate, and especially for sledge expeditions. Those who are addicted to drink are peculiarly liable to the scurvy.

7. The medical man of an expedition, besides professional skill and experience, must possess the most imperturbable patience, for to many of his patients he is not less a physician of the mind than of the body. He should convince himself of the sanitary condition of the crew before the expedition starts, although it may have been previously investigated by medical authorities and declared satisfactory.

8. Since an expedition, in addition to its scientific functions, should take up the illustration of Nature at the Pole, the employment of a photographer, but still better of an artist, is very desirable, for the former is too much confined to the immediate neighbourhood of the ship in his operations.

9. The records of Arctic adventure in former days tell us of equipments strangely incompatible with the object pursued. Their commercial purpose constrained them to fill the hold with bales of silk, instead of provisions for years; but the letters of recommendation which were given to the explorers of the North-East passage for the Saracen princes on the route to Chatai seem peculiarly ludicrous. Some justification may be discovered for Owczyn taking a priest with him on his Siberian expedition (1734), but hardly for his wanting fifty-seven men in a vessel only seventy feet long, and arming it with eight falconets. The employment of a drummer, twelve privates and a corporal, on Gmelin's scientific Siberian expedition, is still more unintelligible; more so than Davis's band of music, which was intended to charm the feelings of the Eskimos and dispose them to peaceful proceedings, his predecessor Frobisher having had the saddest experience of their barbarism. Other expeditions by the too plentiful distribution of knives and hatchets among the Eskimos placed them in a

position seriously to threaten the white man, and even at the present day the so-called "Wilden-kiste" often contains articles little calculated to inspire the natives with a high opinion of our moral superiority.

10. In fitting out a Polar expedition, all respect should be paid to the principle of bestowing on those who are for a time banished, the greatest possible amount of comfort. The proportions of a ship, and the space at its disposal, narrow the limits available for this end; and since the return to the employment, as at the first, of small vessels, even these limits have been considerably diminished.

11. The following table shows that the employment of small vessels was the principle at first followed, although the English undertakings even of this present century never thoroughly adopted the example of a Fotherby, a Baffin, and a Ross:—

THE EXPEDITIONS OF		TONNAGE OF THE SHIPS.				PROVISIONED FOR	CREW.
Willoughby . . .	A.D. 1553	120	90	160	...	18 months	...
Frobisher . . .	1576	25	25	10	...	...	...
" . . .	1577	180	30	30	...	.....	15
Pett Jackman . . .	1580	40	20	...	...	.....	42
Davis . . .	1585	50	35	...	...	.....	...
" . . .	2nd expedn.	10	50	53	120	.....	...
Weymouth . . .	1604	70	60	...	...	Mostly for one year only. }	...
Knight . . .	1606	40	...	...	...		10
Hudson . . .	1607	...	...	...	...		15
" . . .	1608	...	...	...	...		15
James Poole . . .	1609	70	...	...	...	.....	...
Hudson . . .	1610	55	...	...	...	.....	...
Smith . . .	1610	50	...	...	...	.....	...
James Poole . . .	1611	50	...	...	...	.....	...
Fotherby . . .	1615	20	...	...	...	.....	...
Baffin . . .	1616	58	...	...	...	.....	...
Fox . . .	1631	80	...	...	...	18 months	20
James . . .	1631	70	...	...	...	18 "	...
Wood . . .	1676	...	...	...	...	16 "	19
Moor . . .	1746	180	140	...	...	...	...
Ross . . .	1818	385	252	...	...	...	...
Parry . . .	1819	375	180	...	...	2½ years	...
Lütke . . .	1821	200	...	...	...	...	45
Hayes . . .	1860	133	...	...	...	1½	15
Koldewey . . .	1869	180	200	...	...	2	29

12. The inspection of this table shows that it was the practice of the sixteenth century to send out fleets of ships

of a very small size, that in the seventeenth one small ship was commissioned, and that the employment of two vessels has been the rule since ; and this would have been still more evident, if the various Franklin expeditions had been included in the above table. In 1829 Sir John Ross started with a ship drawing eighteen feet, but changed afterwards to one drawing eight feet ; and from eight to twelve feet is now the recognised draught in Polar ships. Large vessels require a numerous crew, and if they have not been built exclusively for the purpose of Polar exploration, their small economy of space prevents their being fitted out for more than two years and a half. In 1819 Parry's ship, the large *Fury*, had, with a draught of eighteen feet, provisions for only two and a half years, whereas the *Victory* (1829) of Ross with only seven feet draught had on board, besides stores for the same period, a steam-engine and coals for a thousand hours' steaming. The Russian *Novaya Zemlya* navigators of this century have adopted vessels of a size which must be destructive of all comfort and convenience. These vessels are thirty or forty feet long, with a draught of five or six feet, and a crew of nine or ten men. But Arctic ships must have a crew above the ordinary strength and be provided with steam-power ; so that, allowing for the necessary space for the quarters of the crew, for the engines and the coalbunkers, little room will be left for the stowage of stores. But this little should be reserved for well-chosen provisions stowed away so as to avoid all empty spaces, and secure the greatest amount of resistance to lateral pressure. The weakest parts of a ship are always the spaces left for air in the quarters of the men. A crew, which is exposed to threatening dangers from the ice, will never regret the strengthening of these void spaces by heavy horizontal tie-beams, removable when the ship is in the winter harbour, and so adjusted as not to impede communication. The mere suspension of heavy beams against the hull of a ship does not always answer the purpose of protection, since the pressure of the ice frequently drives away these protecting timbers. The practice, however, is not absolutely to be rejected.

13. The daily allowance of solid food for the effectives in an Arctic expedition amounts to about two pounds, and in

sledge expeditions to $2\frac{3}{4}$ pounds, of which half a pound is bread and one pound preserved meat. Besides the usual provisions, large supplies of preserved vegetables, of cocoa, of extract of meat, of rice, of preserved peas, of dried farinaceous food (such as macaroni), are very desirable. Salted meat is to be avoided as much as possible. The luxury of fresh bread twice a week instead of the hard ship's biscuit is an essential means of promoting health, and the want of yeast for its preparation may be supplied by "baking powder." Once a day a ration of lemon-juice should be served out as a preservative against scurvy, and anti-scorbutic victuals should be laid in abundantly. Plenty of tea and tobacco is indispensable; the want of these is painfully felt, especially by the sailors. Cases have actually occurred, where crews have ground the wooden blocks of the rigging to powder, to serve as tea, and have used the hoops of casks for tobacco.

14. The moderate enjoyment of spirituous liquors is much to be recommended, as their influence on health and sociality is of great importance. The preservation, however, of a sufficient stock of wine, especially in winter, is a matter of much difficulty, since most kinds freeze at 21° F. or 14° F. As long as the ship is afloat, as it generally is when winters are passed in the ice, it is advisable to preserve the supply of wine at the bottom of the hold, and to place all other things most liable to be frozen in layers above it. But if a ship be nearly or entirely out of water, it is advisable to keep the wine, and other indispensable liquids, in the empty spaces of the cabin, under the cabin table, near the stove, below the berths, and under the sky-light after it has been closed for the winter. Only absolute want of space justifies the preparation of *chemical wine*,¹ since the volume of its constituent parts without water is only a fifth of real wine; and under all circumstances *chemical wine* is but a miserable shift, and the beer (even the spruce beer of Sir John Ross) which the English used to manufacture on board ship from the essence of malt and hops is far preferable. The rum and cognac, especially for sledge expeditions, in order to save weight should contain the greatest possible amount of alcohol, for its dilution before use is a matter of no difficulty.

¹ A decoction prepared by Dr. Kepes, the physician of the *Tegetthoff*.

15. During the winter, residence in the ship itself is preferable to living in log-houses, because the ship can be more easily heated and suffers less from the accumulation of ice. But since a ship in the Arctic Sea ceases for ten months of the year to be a ship and becomes in fact a house, this should be kept in view when she is being fitted out.

16. The place where the men live is always in the fore-part of the ship, but their berths should be changed in a certain rotation, because of the inequality of the condensation. It is not advisable to place the kitchen in the quarters of the crew in order to diminish the consumption of coals, because an accumulation of moisture is thereby increased. The officers and *savans* occupy a common messroom in the after-part of the ship, and sleep in little cabins ranged round it. The power to withdraw occasionally from the presence of those who must be together for years is an important element of harmony. Sir John Ross and his officers in 1833, even in the miserable hut built on the Fury coast, did not occupy the common messroom heated by a stove, but preferred separate cabins, the temperature of which seldom rose above the freezing point, and in which they had to suffer much from the accumulation of ice. All the living rooms should be provided with water-proof carpets. Their heating by means of the common stoves is objectionable, because of the unequal distribution of warmth. An even temperature is best maintained by the use of the Meidinger "Fullofen," which has the further advantage of consuming only a small quantity of coals. Hot-air flues are, perhaps, preferable even to these, because they better prevent the freezing of the moisture in the cabins, and indeed in every part of the ship.

17. An Arctic ship should be provided with an iron-plated washing and drying closet, without which the washing of linen would be restricted to the few weeks of summer weather. This closet may also be used as a bath-room, an important means of promoting health. The lighting of the living rooms by petroleum sufficiently answers all purposes; in the cabins, however, stearine candles are to be preferred either to it or any other oil. The construction of the lamps used in making observations in the open air during the long Arctic darkness is a matter of the greatest importance. Those used

in the second German North-Pole Expedition were of peculiar excellence, and never failed in their difficult service. Massive lamps, with glass globes protected with wire, and burning petroleum in preference to common oil, should be used on deck, and as they are employed for so many purposes and exposed to so many risks, a plentiful supply of them should be provided. In the huts on the deck, built over the hatchways, train-oil may be used with advantage, if the lamps are so constructed that the flame may heat the reservoir containing the oil.

18. So long as the crew remains on board the ship, their clothing, even in the severest winter, needs but little attention. Thick close-fitting woollen under-garments, knitted woollen gloves, outer-garments of strong cloth, are in all cases sufficient on deck, and in all those parts of the ship which are kept at a certain temperature. Leather boots lined with fur were long considered an indispensable requisite for Polar expeditions, but they have not maintained their character, as they are very heavy, become unpliant in frost, and soon quite useless through its action and the wearing off of the fur.

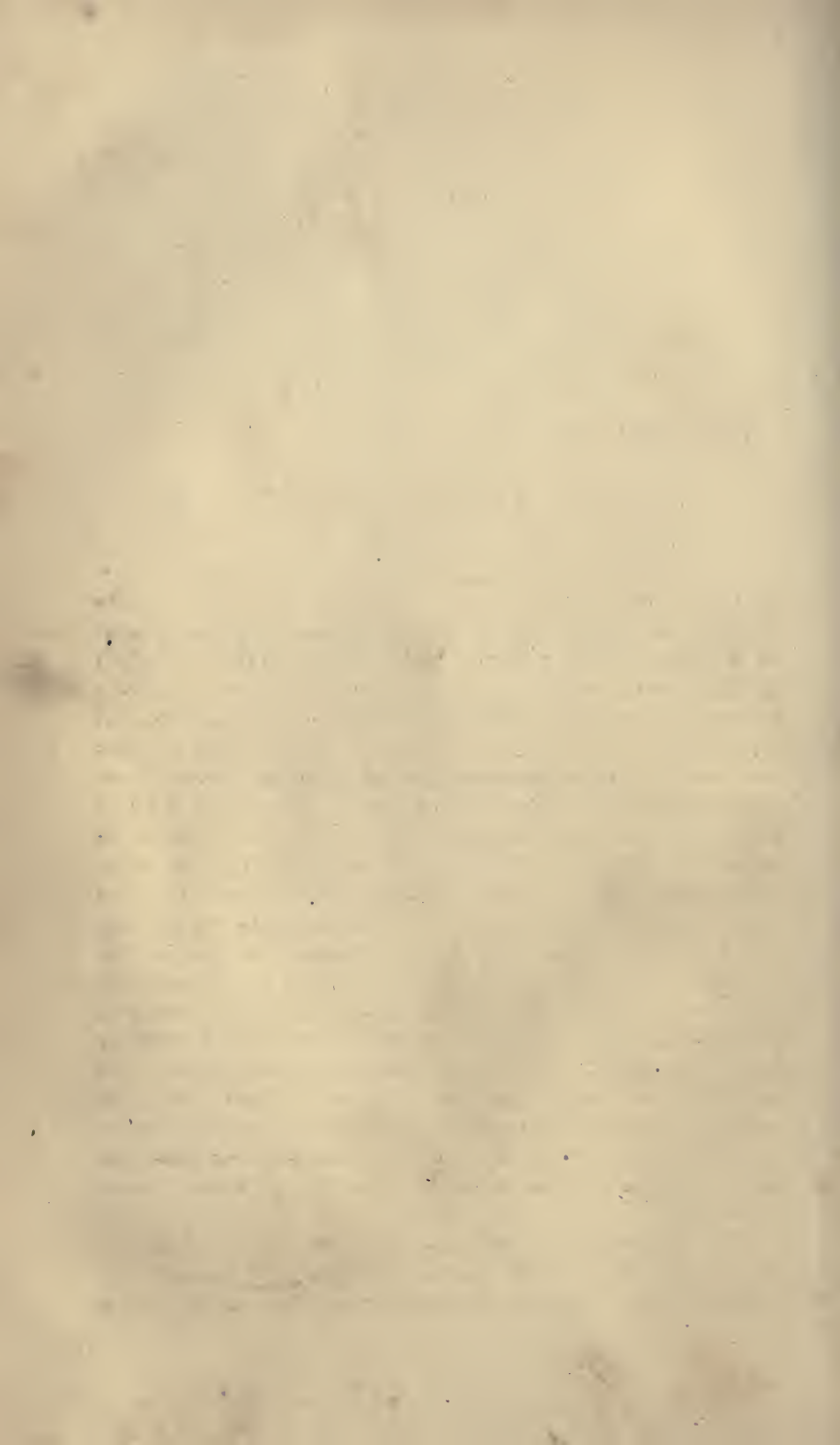
19. Before the departure of the expedition, all the instruments should be thoroughly cleansed from oil by a practical optician, and the fire-arms should undergo a like operation at the hands of the gunmaker, and their barrels should be browned to protect them better from rust. The ammunition, powder and matches to blast the ice, alcohol and petroleum, should be stowed in the after-part of the ship, and the two latter should be reached only through a closely-fitting pump. A very ample supply of alcohol, flannel, buffalo-skins, strong cloth, water-proof canvas, felt, leather, reindeer shoes, snow boots, shovels, cramp irons, poles, &c., articles which are too often overlooked, should be taken, both from their usefulness on board ship and also on land expeditions.

20. The costs of Polar expeditions have relatively rather diminished than increased. The expenses of Willoughby's expedition 300 years ago amounted to the sum—quite enormous for that day—of £6,000; Moor's (1746) cost £10,000; while Back's difficult but successful undertaking to explore the great Fish-river (1833—1835), only £5,000. The Siberian

expedition of Middendorf (1844)—costing only 13,300 rubles (£1,717)—was a matchless example of extraordinary achievements with little expenditure. The costs of the various Franklin Expeditions from 1848 to 1854 amounted, according to the statement of the English Admiralty, to twenty million francs (£833,333); those of the second German North-Pole Expedition to 120,000 thalers (£11,000), and the expenses of our own Austrian-Hungarian North Pole Expedition to 220,000 gulden (£18,333).

THE PIONEER VOYAGE OF THE
ISBJÖRN.

JUNE 20—OCTOBER 4, 1871.



THE PIONEER VOYAGE OF THE "ISBJÖRN."

1. THE failure of the second German Arctic expedition directed the future efforts of Polar exploration to the seas of Novaya Zemlya. Although the geographical position and political relations of Austria prevented its Government from taking any active part in the great geographical problems and questions of our times, an interest in Polar discovery had been excited in her statesmen, which gradually ripened into a determination to send its flag, renowned for its military fame, to consecrate struggles on the peaceful domain of scientific exploration. The magnanimous act of Graf Wilczek, contributing 40,000 florins towards the equipment of an Austro-Hungarian expedition, not only strengthened but also endowed the resolve. In order, however, to obviate the possibility of spending large sums on a plan which might be unfeasible, or if feasible, of little value, it was determined to despatch a pioneer expedition to the seas of Novaya Zemlya under the joint command of Lieutenant Weyprecht and myself. The knowledge and experience gained in that voyage—which is described in the following pages—induced the Austrian Government to send another and more powerful vessel to those seas, equipped to pass two or more winters in the ice.

2. It seemed to be established as the result of many expeditions, that almost invincible difficulties opposed the reaching of the central Arctic regions by the routes through

Baffin's Bay, Behring's Straits, along the coast of Greenland, and from Spitzbergen, mainly because on them all we are met by the great Arctic currents, which act as channels to carry off the ice of the Polar basin. These currents carry with them vast masses of ice, which they deposit on all the coasts which they strike. On the results of many Norwegian, Russian, and German voyages, partly in the interests of science, partly in the interests of commerce, many geographers maintained that the traces of the Gulf Stream did not disappear at the North Cape, but rather that it exercised a considerable influence on places and in latitudes not before imagined, as, for instance, on the north-east coasts of Novaya Zemlya. An expedition, therefore, which followed the course of the warmer waters of the Gulf Stream would find fewer and less formidable obstacles, than on the routes exposed to the Arctic currents, carrying with them colossal masses of ice towards the south. On the east of Spitzbergen there is a land which has, indeed, been often seen, but never reached, or even attempted to be reached—Gillis' Land—lying in the course of the Gulf Stream; and it is a probable assumption, that navigable water would be found under its western coast, as at Spitzbergen, where 80° N. Lat. can be reached every year without any difficulty. If, then, this stream extends still further to the north—which is probable according to the soundings taken by the Swedes—it is reasonable to expect that higher latitudes may be reached on this than on any other route.

3. It is remarkable, that the seas between Spitzbergen and Novaya Zemlya were utterly unknown to science. No expedition had ever been sent thither, though many things seemed to invite and favour the venture, and Dr. Petermann had long endeavoured to organize a powerful and well-equipped expedition to explore higher latitudes on this route. At length Lieutenant Weyprecht and I undertook a voyage of reconnaissance to those waters, in order to ascertain whether the climate and the state of the ice were as favourable in reality, as they seemed to be in theory. No attempt was to be made to reach high latitudes or to make important geographical discoveries. The small means at our command forbade either. Our aims were more limited; they referred to the

temperature of the water and the air, to the currents, to the state of the ice, to the probability of success in the following year (1872), and lastly, to opportunities for extended sledge journeys. We were to sail from Tromsøe about the middle of June, and return thither by the middle of September.

4. In order to diminish expenses, we chartered at Tromsøe a small sailing ship. A steamer would, indeed, have been more serviceable, but the cost would have been quadrupled, without any adequate advantage. The *Isbjörn* (i.e., Ice-bear) was a vessel of fifty tons, cutter-rigged, 55 feet long, 17 feet broad, with a draught of 6 feet. Her bows were protected with sheet-iron, two feet above, and two feet under, water. She was new and strong, and made with us her first voyage. We had also two small boats, and a so-called "Fang-boat"—whale-boat. She was commanded by Captain Kjelsen, and had as a crew a harpooner, four sailors, a carpenter, and a cook—all Norwegians. We were provided with the requisite instruments by the Imperial Geographical Institute, and were provisioned for four or five months. The Austrian Consul Aagaard aided us to the utmost of his ability in the equipment of the vessel. It must be observed, that we had no direct command or control over the vessel and its crew; the responsibility for the ship, and the immediate command over its crew, belonged to the skipper Kjelsen. Weyprecht was, however, the real commander.

5. The information we gathered concerning the state of the ice in the region of our projected exploration, was exceedingly contradictory. While, for example, Dr. Bessels, in the steamer *Albert*, of Rosendal, discovered a branch of the Gulf Stream with a temperature of 41° F. at the ice-barrier on the south of Gillis' Land, Dr. Petermann sent us a letter of Lamont, in which he said: "Every year the ice appears to me more formidable." The whalers of Tromsøe, who knew the ice of that region only from hearsay, and could give no positive information as to its limits, uttered many unfavourable prognostications as to the possibility of penetrating that frozen sea, or of approaching Gillis' Land from the south. The region was utterly unknown, even to many skippers who sailed from Spitzbergen to Novaya Zemlya. The few attempts to penetrate to that land, first seen in 1707, and regarded by the

Swedes as a continent, had been unsuccessful. So also their efforts to reach it from the south-west in 1864 and 1868. Captain Koldewey's attempt also, which was made from the "Thousand Isles" three months before the last-named voyage, had been attended with the same want of success. None of these expeditions had passed beyond the ice-barrier, and their failures contributed greatly to strengthen the opinion, that the *Novaya Zemlya* seas were unnavigable.

6. All our inquiries were met also with the prediction of an exceedingly unfavourable year for the ice. The spring of 1871 had been unusually severe, and even to the middle of June the northern parts of Norway were covered with a mantle of snow reaching down to the sea. It was inferred, therefore, that there would be an excessive accumulation of ice in the seas further north. We heard even, that there was ice at the distance of about twenty (Norwegian) miles from North Cape. And it was certainly true, that the north winds, which prevailed for some weeks, kept a number of Norwegian fishing and seal-hunting vessels weatherbound off the "Scheeren." All this notwithstanding, we determined to keep to our plan of sailing to Hope Island, and of following from thence the ice-barrier towards the east, our progress, of course, being dependent on favourable conditions of the ice, and perhaps on the influences of the Gulf Stream. As it was within the verge of possibility to make Gillis' Land during the season of our operations, we considered it advisable not to pass beyond 40° E. Long. while we penetrated northward.

7. On the 20th of June we left Tromsøe during a drizzling snow-storm, and while we were sailing up the "Qualsund" without a pilot, we touched the ground—a danger we incurred from the desire of our married sailors to put their wives ashore, after leave-taking, as near the land as possible. At Rysoe we fell in with the fleet of the Tromsøe fishing-boats at anchor, waiting for a change of weather, and with them some vessels which, we thought, would have been by this time in the ice, having left Tromsøe four weeks before.

8. The rocky islands off the coast of Finnmark are surrounded by bleak cliffs, rising to the height of 2,500 feet, and upwards. Trees cease to grow there; occasionally the birch appears, but never in sufficient numbers to form a wood. The



THE FIRST ICEB

numerous islands of a gneiss formation show the same landscape which characterizes Norway—indescribably bleak tablelands, deep secluded valleys and gorges, interspersed with lonely mountain lakes. The bold, picturesque outlines of these islands are exceedingly striking, though their fertility is meagre in the extreme. The solitary rocky shores are inhabited by poor families, secluded from the world, and having little intercourse with each other. They live for the most part on the fish which they catch. The remains of fish round these settlements render their approach exceedingly disagreeable; on the Loffoden Islands a guano manufactory has been established, which turns this refuse to good account. Tromsøe or Hammerfest appears in their eyes as the glory and pride of the world. We were detained two days—June 24 and 25—by contrary winds, at Sandøe, an island covered with sea-sand full of small mussel shells, to the height of 600 feet. Ascending an elevated peak of this island, 2,000 feet high, we saw a panorama of countless cliffs of all sizes stretching down to Andenes, and opposite to us, the gloomy, rugged wastes of Norway, which show iron-bound walls, waterfalls, and bleak headlands, without woods, meadows, or habitations. For many hours we were mocked by an eagle, which, now soaring high, now darting down with rapid flight, gave his unwieldy pursuers a stiff and exhausting climb. We at last put to sea on the 26th of June, and passed the enormous rocky pile of Fugløe, down the precipitous face of which the inhabitants descend by means of ropes to get the down of the Eider-geese. Next day we were out of sight of land. The breeze freshened, and, as we sailed further to the north, we saw many whales. On the 28th of June we came on the *first ice*—a sight which reminds the Polar navigator that he has reached his home! Driven down by the north wind, its fragments lay thickly on the misty horizon like gleaming points. We were now south-east of Bear Island in $73^{\circ} 40'$ N. Lat. and 21° E. Long., and found the ice so broken up that we did not hesitate to penetrate it, in order to find out the latitude in which its closed masses would appear. We passed through forty miles of this loose drift-ice, and then came on the pack in $74^{\circ} 30'$ N. Lat. and 23° E. Long. Already, on the 30th of June, we had experienced the powerlessness of a small sailing

vessel in such circumstances. The calms which had set in rendered it impossible to steer the ship, just when the ice was drifting in wild confusion. In spite of all our efforts to warp, the ship was inclosed by ice—in fact, *beset*. During our captivity of ten days, there was an alternation of fogs and gales with heavy sea-swells. The neighbourhood of floes sometimes small, sometimes large, which constantly shifted their places, kept us in a state of continual watchfulness. The *Isbjörn*, on some of these days, sustained such severe pressures from the ice, that her safety was imperilled. On the 4th of July we had heavy storms from the south-east, which packed the ice still closer, and, though the sea is generally quite calm within the ice, it was otherwise on this occasion. In the afternoon we heard through the dense fog the thunder of the ocean breaking on the outer edge of the ice, and the roar increased as the sea rose. Our attempts to haul further into the ice and still-water were fruitless; the ship was pressed too firmly, and was not to be moved from its place. Our position became more and more critical as the sea continued to rise. During the whole night the waves roared and boiled around us. The rudder groaned under the pressure of the floes, and had to be made fast to prevent its being broken off. A mass of ice grazing past the davits utterly destroyed one of our boats. The critical nature of such a situation is simply the uncertainty as to the amount of pressure which a ship can sustain. Towards evening the fog lifted and rolled away, presenting a spectacle of fearful grandeur. All round us lay the open sea dashing against the ice, which was itself in wild motion. Floes and icebergs were driven about by the waves, and their fragments strewed in all directions. At midnight our little ship sustained shock after shock, and her timbers strained and creaked. The "brash" of the crushed ice, which had gathered round the ship, prevented her destruction. As the storm abated, the larger masses of ice moved off to the edge of the horizon, so that in the morning we could not see open water from the deck. The day broke: what a change in the ice! The sea was calm, and a long swell died out on its outer edge. Piles of ice all round us,—a weird and deathlike calm! The heavens were cloudless; the countless blocks and masses of ice stood

out against the sky in blue neutral shadow, and the more level fields between them sparkled like silver as they shone in the sun. The movement of the sea beyond the ice abated, "leads" within the floes, hitherto scarcely perceptible, widened out. But again the sky was overcast, the sea assumed the colour of lead, though it continued quite calm and the "ice-blink" appeared on the northern horizon.

9. On the 10th of July the ship under full sail forced her way through the floes, which were still somewhat close, and reached open water. The masses of ice through which we pressed were of considerable size. We now continued our course, which had been interrupted in the manner described, along the ice-barrier in a north-easterly direction. After leaving the Norwegian coast, the depth of the sea decreased considerably. We were now on the bank of Bear Island, and we found bottom at 90 metres (49·213 fathoms). Our course was impeded by calms, currents and winds from the east, and even in the middle of July by severe storms. We were sometimes in drift-ice and sometimes outside of it. We soon discovered that the ice of these seas was not to be compared with the vast masses of the Greenland seas. The floes we saw were not more than one year old. As we sailed eastward, the icebergs were neither so numerous nor so large, and disappeared almost entirely at 40° E. Long., which we reached on the 21st of July, after we had followed the ice-barriers from 74° to 75° 30' N. Lat. Here we penetrated within them. Though drift-ice lay on every side, a steamer would have found nothing to arrest her progress. But the prevalence sometimes of east winds, sometimes of calms, the constant occurrence of fogs, the defects of our vessel, the little authority we had over the crew when extraordinary labour was demanded, the great extent of the region to be explored,—all these difficulties prevented our pressing on in this direction. We therefore turned, July 22, in a westerly direction, in order to explore another opening in the ice, into which we advanced for about fifteen miles, and found floes not more than a year old lying so loosely together, that our ship under full sail seemed to pass over them, much in the same fashion as a sledge glides over a snow-covered plain. But again our course had to be altered, and Weyprecht steered the vessel in a south-westerly

direction to the ice-barrier. In $76^{\circ} 30'$ N. Lat. and 29° E. Long. we came on high and close masses of ice, and escaped with much difficulty (July 29) the danger of being again "beset."

10. We had meantime been convinced that, though the state of the ice was on the whole so favourable, we could not, with the means at our command and with a crew not trained to habits of obedience, do more than carry out our original intention. We could not make up for the defects of our sailing craft by any special exertion on the part of the crew. Could we have done this, we might have penetrated further in a northerly direction; though at this late period of the summer we could not calculate on being able to return, and by the end of October our provisions would have been exhausted. We could only, therefore, attempt to reach Gillis' Land, and ascertain whether it possessed the importance attributed to it by the Swedes. A safe harbour had therefore to be sought, in which the ship might be left, while a party in a boat should make for the mysterious land. Such a harbour we expected to find at Cape Leigh-Smith. We therefore held to the westward, towards the Stor-Fiord. It is an extremely hazardous thing, demanding incessant attention, to tack and cruise at the ice-barrier during the continuance of fogs and with heavy seas and unfavourable winds. Not unfrequently, the ice-blink is seen all round the horizon, and we discover that we have come into a great "ice-hole," or a calm makes it impossible to steer the ship, just when a strong current is bearing her into the thickest of the ice-masses. We had our share of these and other risks till we suddenly beheld, while sailing in a fog among icebergs a hundred feet high, the long stretching plateau of Hope Island. According to Weyprecht's observations, there is an error of $40'$ in latitude in the position of this island on the Swedish maps. The real position of the south-west cape of Hope Island is $76^{\circ} 29'$ N. Lat., and 25° E. Long. Seduced by a great opening in the ice, and deviating from our course for a short time, we advanced in a northerly direction to the east of the island, in the hope of reaching Gillis' Land from thence. But after sailing in a fog for a whole day among icebergs lying close to the cliffs of the island, we were driven further westward, and coming suddenly

on the ice—Lat. $76^{\circ} 30'$ —with an exceedingly high sea, escaped being dashed to pieces as by a miracle. To penetrate here was an impossibility. We therefore altered our course again for Walter-Thymen's Straits. A dense girdle of ice several miles deep, and a strong current setting towards the south-west, frustrated every attempt to land on Hope Island. To the west of this we found the ice-barrier in 76° N. Lat., formed of heavy pack-ice, and small icebergs. Our passage to the South Cape (Cape Look-out) of Spitzbergen ($76^{\circ} 30'$ N. Lat.) was comparatively quick. Numerous cliffs and rocks on which the waves were breaking, not marked on any chart, rose in the night of August 4 out of the fog at the distance of a few ships' lengths from us, and it was with the utmost difficulty that we could tack with the heavy sea and strong north-east wind.

11. The day after, when the heavy storm-clouds lifted from the table-land of Cape Look-out, we made the unpleasant discovery, that we were to the south-west of it. Hitherto we had been sailing in dense fog, but after passing this Cape we had almost unbroken sunshine, which illuminated the whole western side of Spitzbergen up to Prince Charles's foreland. A current one or two miles wide, which flows southward, turns at Cape Look-out and flows in a northerly direction. At this Cape, which is the apex of the current, besides many rocks on which the waves break, there are twenty islands, some of them of considerable size. This promontory, which has been of great importance to navigators for more than 200 years, is erroneously represented in the charts I have seen. Many ships, therefore, have been wrecked at this place, chiefly those of the Spitzbergen whalers and sealers, who base their sailing on making this headland, though they are ignorant of its exact geographical position. Thrice we tried at the beginning of August to reach the Stor-Fiord from the western side of Cape Look-out, and thrice we were driven back by this current, though the wind was in our favour. This, however, gave us an opportunity we had not expected, of seeing something of the west coast of Spitzbergen with its fiords and glaciers as far as Horn Sound. A fog, as dense as coal smoke, floats almost always over "Hornsundstind" (4,500 ft. high) and the pyramid of Haytand. The slopes, clothed in dull green, running down

to the coast, make Spitzbergen seem scarcely an Arctic land when compared with the cold grandeur of Greenland. The rocky shores of the northern parts of Norway are more dreary, and wear more the aspect of Arctic regions than Spitzbergen. Hence General Sabine, comparing Spitzbergen with Greenland, called it "a true paradise."

12. On the 10th of August the ice began to move out from the Stor-Fiord. It pushed on with great velocity from the north-east, turned round Cape Look-out, and deposited itself along the west coast, covering it with thick layers in sixteen hours. On the 12th of the month, in consequence of the fog and strong current, we found ourselves between the heavy drift-ice and the reefs of Cape Look-out. According to our reckoning we should have been twenty-five miles to the east of it. It was only by boldly charging the drift-ice, with the vessel under full sail, that the *Isbjörn* escaped the danger of being beset. On the 13th the wind chopped round, and, standing away to the south, we succeeded, after cruising about for ten days, in running into Wyde-Jans Water. Our involuntary detention off Cape Look-out enabled us to land twice. During one of these visits we built a cairn, in which we deposited a notice of the course we had steered. The hasty survey we made enabled us to correct some very gross errors in the maps. On the evening of the 14th we sighted Edge Island, and cruised in the drift-ice, which was becoming gradually more dense in that direction. Here we fell in with two ships from Finland, engaged in the capture of the walrus, and learnt from their skippers some particulars concerning the state of the ice, which induced us to give up the direct course to Cape Leigh-Smith, and to prefer coasting along the west side of the Fiord.

13. The ice was now more packed. The ship, weakened by numerous ice-pressures and countless shocks, and making much water, was in so bad a condition, that part of the bows under the water-line was shattered, and some timbers of the hull were forced in. In order to give some notion of the force of the shocks to which we had been exposed in forcing our course through the ice, let it suffice to say, that the iron plating an inch thick, with which the bows had been strengthened at Tromsø, had been broken off like so many chips.

14. Tacking up against the north wind we came, in the night of August 16, on broken ice off Whale's Bay, in $77^{\circ} 30'$ N. Lat. The expected free coast-water was not to be found, reaching Cape Leigh-Smith in less than a week. Our plan of and the prevailing winds from the north took away any hope of a boat expedition, for which three weeks would have been necessary, from Cape Leigh-Smith to explore Gillis' Land, had now to be renounced; and as the southern extremity of Stor-Fiord is generally blocked up at the end of August by an accumulation of ice brought from the east, we were constrained to leave the fiord at once, and return to the ice-barrier we had left.

15. The geological formation of the western coast of this fiord has never been explored. From a visit to the land and the ascent of a mountain 2,000 feet high, we learnt some interesting facts concerning its Jurassic formation, which appeared to extend far to the south. We found traces, at some distance apart, of the more recent brown coal, and fossil remains (Bivalves in ferruginous chalk-marl); we gathered also some plants still in flower, and brought away some red snow. This excursion enabled us also to examine the beautifully-developed glaciers of Spitzbergen. Hornsundstind (4,500 feet high) is a most imposing mountain, and viewed from the east resembles a sugar-loaf. The other mountains on the coast of the fiord rise to heights varying from 2,000 to 4,000 feet. Noble glaciers slope down both sides of the main ridge, which runs in a southerly direction through the island. Some of these, when they reach the sea, are three or four miles wide, and their terminal fronts are about 80 feet high. The snow-line of those which debouch on the Stor-Fiord is at an altitude of 1,000 feet, and their surface is little broken by crevasses. None of these glaciers are of sufficient size to shed icebergs, properly speaking. The sea close to the coast is shallow, and the detachments from the glaciers are merely larger or smaller blocks of ice.

16. On the evening of August 16, sailing before the wind, we forced our way through the ice of the Stor-Fiord, and two days afterwards arrived at Hope Island, the steep, rocky walls of which rose out of the fog just as we were close under it.

We found the icebergs still firmly grounded, precisely as we had observed them three weeks before. As an unusually strong current was running towards the south-west at the rate of two miles an hour, great caution was needed when we landed in the whale-boat amid rocks and cliffs not marked on any chart. The geological formation of the island was identical with that of the mountainous region on the south of Whale's Bay. We found brown coal, but the shortness of our visit did not permit us to inspect the beds of it. Drift-wood of Siberian larch and pine lay in great quantities on the shore.

17. It was surprising to observe the change which meanwhile had taken place; the ice both to the west and east of us had disappeared. We were eager to find it, and again penetrated as far as possible into it. We tacked about on the 19th, 20th, and 21st of August—the weather being stormy—with little success against the north wind, which had prevailed for some weeks. A current from the north drove us constantly southwards. After leaving the Stor-Fiord the temperature of the water exceeded the temperature of the air. On the 22nd of August, in $76^{\circ} 45'$ N. Lat. and $28^{\circ} 30'$ E. Long. we found very little drift-ice, which standing out but a few inches above the water-level presented no impediment to navigation. Nothing but contrary winds stood in the way of our penetrating in a northerly direction, except, indeed, the doubts and fears raised by our skipper and his crew at our attempting higher latitudes at so late a period of the year. König Karl's Land lay only forty miles to the north—still invisible on account of the mists. Fresh traces of Polar bears announced the neighbourhood of land. We therefore bore away to the east in 32° E. Long. on the 24th of August—the day on which the sun set for the first time. The number of icebergs constantly increased from this date, while some weeks previously, in the same region, we had scarcely seen one. This, perhaps, is to be explained from the fact, that their appearance is irregular, depending on the varying movement of the glaciers, and also on the time and manner in which the icebergs clear out from the bays and fiords. On the 26th we had stormy weather, rain, and snow. On the 27th, amid a dense fog, and with the sea running high, we came

close to an iceberg, against which the sea was dashing itself in foam and spray, just in time to avert a collision. On the 29th of August we perceived that the ship had been carried $1^{\circ} 30'$ eastward in a short time by a current. The further we sailed in this easterly direction, the further northward the ice retreated, and we began to hope that we should come nearer the Pole than any ship ever had in this sea. The southern limit of the ice-barrier in the Novaya Zemlya seas, towards the end of summer, is usually placed at 76° N. Lat., but we had reached 78° N. Lat., with 42° E. Long., without seeing (August 30th) a fragment of ice. The *Isbjörn* had, therefore, penetrated 100 miles in seas hitherto unknown. There was still a long heavy swell from the north, but the temperature of the water had fallen $4\frac{1}{2}^{\circ}$ within twenty-four hours, and it was no longer of an ultramarine, but of a dirty green colour; so that, notwithstanding the sanguine expectations we had cherished, we expected every moment to come on pack-ice. Already, too, the "ice-blink" was visible here and there on the horizon.

18. Whales, secure from persecution in this remote sea, seemed to abound; we saw many "blowing" and spouting. They came sometimes in pairs close to the ship. Their chase and capture might have been carried on here with every hope of success. On the morning of the 31st of August we saw six Eider-geese, the precursors of near land. A blue shadow on the eastern sky arrested the attention of us all for a long time. We felt as if we were on the brink of great discoveries. But, alas! the supposed land dissolved into mist. The poverty of our equipment prevented us from penetrating further. We might easily have been driven onwards by unknown currents, and the ice closing behind us might have cut off return to Europe. We could not be assured that we had not come upon a bight, or *cul-de-sac*, stretching far to the north, and which might quickly change its character. On the night of August 31, in 78° N. Lat., the ice lay in some places loose and widely dispersed, in others it was more compact, but nowhere was it in great masses; it scarcely rose above the horizon, and it was entirely without icebergs. There was nothing to prevent a vessel with steam power from penetrating further.

19. Still following the ice-barrier as it retreated northwards, we passed beyond $78^{\circ} 30'$ N. Lat. in the night of August 31. The influence of the high latitudes we had reached, on the duration of light, was unmistakable. For some days, however, the temperature had fallen below 32° F., a coating of snow lay on the deck, and the rigging was covered with ice like glass. The morning of the 1st of September broke; about half-past three o'clock fresh breezes from the north drove off the mist, and revealed one of those pictures peculiar to the high north from its dazzling effects of colour—the beams of the sun in glowing splendour were piercing through heavy masses of clouds, while the moon shone on the opposite side of the heavens. An ice-blink resembling an Aurora lay on the north.

20. We had reached $78^{\circ} 38'$ N. Lat., and yet the ice around us presented no serious impediment—none at least as far as we could see. Should we then venture further with our ship in its weakened condition? We might still follow up an opening within the ice running northward, though, in doing this, we should expend the time needed for the exploration of the eastward-lying Novaya Zemlya seas. We determined therefore to bear away to the east before some currents of loose drift-ice. But fog and a high sea from the north-west caused us to alter our course more and more to the south-east. For the first time in these high latitudes we observed drift-wood, and we found ourselves in a sea, the temperature of which at the surface did not materially exceed the temperature of the air. Whenever, however, the temperature of the air rose, a thaw suddenly set in. The colour of the sea alternated between blue and a dull green. A few days previously we had passed over a sea extraordinarily rich in the ribbed Medusæ (Beroë), and where the Rorqual (whale) abounded.

21. The great question now arose, whether the open water found in these high latitudes were only an accidental bight in the ice or a connected sea. It seemed bold to assume the latter, since $76^{\circ} 30'$ N. Lat. had never before been passed in that region. In order, therefore, to arrive at some positive conclusion on this point, we stood away from the ice at noon of the 1st of September, and ran down in open water to

75° 52' N. Lat. and 51° 44' E. Long., intending to return to the north again, in order to explore the state of the ice to the north-east. Overcoming with much difficulty the opposition of our skipper, we returned to the edge of the ice, which we found, September 5th, in 78° 5' N. Lat. and 56° E. Long. Though there was not much wind, a high sea running on the ice compelled us to leave it. In our course to the south-east we crossed 77° 30' N. Lat. and 59° E. Long.; here, also, to the south of 78°, there was no ice. To penetrate further to the east formed no part of our plan, and since another attempt to return to the ice would have been objectless, for the reasons above stated, we proposed to run into a bight on the west coast of Novaya Zemlya to take in fuel and water, which we urgently needed. The longer nights now made it almost impossible to manœuvre a ship in the ice when the winds were high, though a good steamer might have persisted for some time longer. The temperature of the sea on the 5th of September was 39° F. in Lat. 77° 30', and on the 8th of the month, when we were in sight of Cape Nassau, it reached 41° F.

22. Storms compelled us to keep to sea. As a current constantly set us to the north-east, we found it not possible to land on Novaya Zemlya, scarcely even to see it. On the night of September 12th we came into the region where the equatorial and Polar air-currents meet, and had an opportunity of observing the hurricane-like effects of their conjunction. The barometer fell about two inches, and the sea was so broken that the ship could hardly be steered, even with a fresh wind. On September 14th we were off Matoschkin Schar, and could not anchor, a snow-storm from the north-east completely hiding the coast. The change, which meantime had taken place in the sky, was strange and remarkable. Heavy thunder-clouds lay over our heads, just as they do in the region of the trade-winds, and every moment threatened to discharge themselves. On the 13th of September we saw the first Aurora, in the shape of an arch, passing through our zenith. The want of fuel and water, from which we began to suffer, and the end of the season for navigation, compelled us to avail ourselves of the favourable wind which had set in, and begin our voyage home, without landing on Novaya

Zemlya. On this same day three of our crew of seven men fell ill, one of them with scurvy. A heavy storm from the north-east compelling us to heave to, we lay close under the coast of Lapland for a whole day. On the 20th of September we ran into Tana Fiord on the east of North Cape, the most northerly point of Europe, and took in water. The gloomy cliffs of Tanahorn and the rocky iron-bound coasts were not at all behind the lands we had left in their terrible desolation. On the 24th of August the *Isbjörn* passed North Cape; on the 4th of October she anchored in Tromsøe. Weyprecht had remained on board while, with a Lapland sailor who could speak Norwegian, I left the ship in Tana Fiord and went on to Tromsøe through Lapland, sometimes by means of a small boat on the shallow rivers and sometimes by means of reindeer sledges.

23. It had formed no part of our plan, either to make discoveries, or to reach high latitudes. Our object was to investigate whether the Novaya Zemlya seas offered greater facilities, either from the influence of the Gulf Stream, or from any other causes, for penetrating the unexplored Polar regions. Many arguments, derived from the scientific results of our voyage, would seem to favour this idea, and in contradiction to the discouraging views of our predecessors, whose failures are explained by their defective equipment and the choice of the most unfavourable season for navigation, we ventured to draw the following inferences:

(1.) The Novaya Zemlya Sea is not filled with impenetrable ice, rendering navigation impossible; on the contrary, it is open every year, probably up to 78° of N. Lat., and is connected with the Sea of Kara, which is also free from ice in autumn, and even, it may be, with the "Polynjii," in the North of Asia. If this inference should not be admitted, the following remarks of Lieutenant Weyprecht, in anticipation of objections, are put forward as worthy of consideration:—"In all probability the open condition of the ice in 1871 will be ascribed to chance, or to an especially favourable ice-year. With respect to the latter alternative, the accounts given by the walrus-hunters of Spitzbergen and Novaya Zemlya should convince us, that the year 1871 was not only not a favourable, but a most unfavourable year in the ice. It was

almost impossible to navigate Wyde-Jans Water, and the Sea of Kara could only be reached through the most southerly straits—the Jugorsky Straits. There remains, therefore, only the other objection, that the accident of favourable winds was the cause of our penetrating so far. But our meteorological journal shows North, or at any rate Northerly winds, and often, too, blowing freshly, from August 4th to September 5th, with the exception of twelve watches, *i.e.* two days. But in no case could these winds have driven the ice to the north. With respect to the loose character of the ice we encountered, it might be said, that we saw only the outer ice. But, in the first place, we were often so far within the barrier that it would be inadmissible to speak of it as the outer ice; and, in the second place, the ice-barrier shows the state of the ice behind it. Whenever the wind lies against the ice, there the ice is always the most dense and packed, and we find open places only when we have worked our way through the outer ice.”

(2.) The time most favourable for navigation in this sea falls at the end of August, and lasts—though rendered hazardous by storms, the formation of young ice, and the darkness which supervenes at that season—till the end of September, and during this period the ice may be said to be at its minimum.

(3.) The Novaya Zemlya Sea is a shallow sea—a connection and continuation of the great plains of Siberia. In the extreme north, its depth was 600 feet, and south-east of Gillis' Land about 300 feet.

(4.) Gillis' Land is not a continent, but either an island or a group of islands. Whereas, from the circumstance that in the highest latitudes—in 79° N. Lat.—we found drift-wood covered with mud, sea-weed, creatures which live only near the land, decreasing depths of the sea, sweet-water ice and icebergs laden with dirt, it may be inferred, with great probability, that there exist masses of land to the north-east of Gillis' Land.

(5.) The appearance of Siberian drift-wood, only in the most northern seas reached in our voyage, seems to point to an easterly current there.

(6.) The Russian expeditions in the past and present

centuries, which attempted to penetrate by the north-west coast of Novaya Zemlya, miscarried, because they sailed before the favourable season for navigation, and also because they had not the advantage of steam.

↓ (7.) How far the Gulf Stream has any share or influence in the favourable conditions for the navigation of the Eastern Polar Sea which have been described, cannot as yet be positively determined. The state of the ice, the observations which were made on the temperature of the sea, its colour and the animal life found in it, seem to speak in favour of the action of this current in that region. It is possible that the Gulf Stream may exercise its culminating influence on the west coast of Novaya Zemlya only at the beginning of September; for while the temperature of the sea in the months of July and August gradually fell from 45° F. to 36° F. in Lat. 75° N., and to zero and below it, still more to the north, we observed 39° F., September 6, in Lat. 78° , and 41° F., September 10, in Lat. $75^{\circ} 30'$. The temperature of the air was in all these cases considerably less than that of the water. If the unusually favourable state of the ice on the east of Spitzbergen should be ascribed to warm southerly currents of air, it may be replied that our observations specify the almost uninterrupted occurrence of north winds. It is also possible, that at the beginning and middle of summer the Gulf Stream may move slowly in a northerly direction along the coasts of Novaya Zemlya, and that towards autumn it spreads itself more and more to the west. Our observations proved the existence, in the eastern Novaya Zemlya seas, of a band of warm water, from thirty-six to forty feet deep, beneath which lies, without gradation, a colder stratum. It is evident that the unequal density of these strata prevents their mingling. This band of warmer water near North Cape is about 150 feet deep, with a temperature of nearly 45° F., but diminishes as it flows northward. The frequency of fogs and mists in the Novaya Zemlya Sea, and the squalls unknown to other Arctic regions, which are characteristic of a more southerly region, indicate also a current of warm water. How this warm current gradually cools towards the north, and becomes shallower, and how distinctly it divides into those strata of water of equal temperature, so characteristic

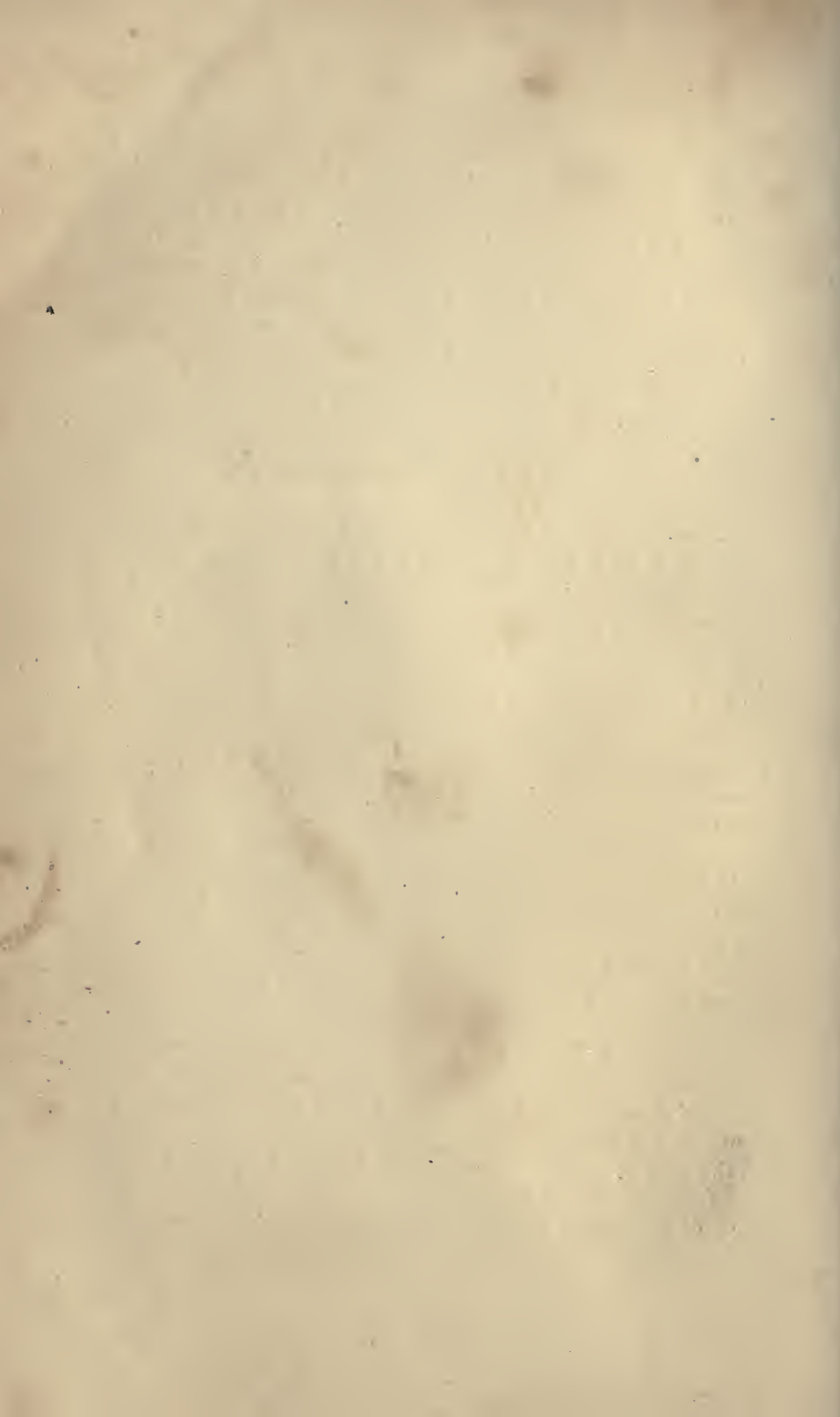
of the Gulf Stream, is shown by three series of observations taken by Weyprecht at different latitudes, with the maximum and minimum thermometer of Casella:—

72° 30' lat., 44° long. 12 to 114' + 4·8° C.	77° 26' lat., 44° long. 6' to 30' + 2·2° C.	76° 40' lat., 55° long. 6' to 39' + 2·5° C.
144 + 2·5	36 + 1·8	48 + 1·0
174 + 2·0	45 + 0·3	60 — 0·0
204 + 1·5	60 + 0·3	72 — 0·6
234 + 1·3	75 — 0·9	90 — 0·6
264 + 1·0	90 — 0·8	120 — 1·3
294 + 0·5	120 — 1·6	180 — 1·2
360 + 0·5	180 — 1·8	300 — 1·2
450 + 0·0	360 — 1·6	
600 — 0·4		
800 — 1·3		

24. These inferences rendered the despatch of a well-equipped expedition to the Novaya Zemlya seas very desirable, either to penetrate towards the north, or to pursue the direction of the north-east passage. To this idea a most gracious reception was given by the Emperor of Austria. Hence arose the Austro-Hungarian expedition of 1872. The promoters of this undertaking assumed neither the existence of an open Polar Sea, nor the possibility of reaching the Pole by sledge or boat expeditions. Their object, simply and broadly stated, was the exploration of the still unknown Arctic regions, and it was their belief, that a vessel could penetrate further into this region by the route between Novaya Zemlya and Spitzbergen, where the *Isbjörn* in her pioneer voyage found the ice more loose and navigable than had been imagined possible. But in addition to the causes already specified, the influence of the warm currents, produced by the great rivers of Siberia discharging themselves into a shallow sea, was also supposed to co-operate in producing this phenomenon. Of these rivers, the Obi and Jenisej alone discharge into that shallow sea a body of water as great as the waters of the Mediterranean or the waters of the Mississippi. The course of the current produced by these mighty rivers is as yet unknown; but it was natural to suppose, that old and heavy pack-ice could not be formed on a coast submitted to such an influence. This is confirmed by the observations of the Russians, who in the coldest period of

the year always find open water in the Siberian seas. Middendorf, August 26, 1844, found the Gulf of Taimyr quite free from ice; our own observations, made in 60° E. Long., and those of the Norwegian Mack, who advanced to 81° E. Long. (75° 45' N. Lat.), support the supposition of a still navigable sea. Of the region between Cape Tscheljuskin and the ice-free spaces asserted to exist by Wrangel, and others, we know but little; but it is probable that the character of the ice in those seas does not greatly differ from the character of the ice in contiguous seas. Of the seas between Novaya Zemlya and Behring's Straits, at the distance of a few miles from the Asiatic coast, nothing is known. No ship has ever navigated this enormous Eastern Polar Sea.

25. It was the plan of the Austro-Hungarian expedition to penetrate in an E.N.E. direction, in the latter half of August, when the north coast of Novaya Zemlya is generally free from ice. The places at which the expedition was to winter were left undetermined; these might, possibly, be Cape Tscheljuskin, the new Siberian islands, or any lands which might be discovered. A return to Europe through Behring's Straits, however improbable it might be, lay among the possibilities of the venture. Minor details were left to circumstances. In the event of the loss of the ship, the expedition was to endeavour to reach the coast of Siberia by boats, and, on one of the gigantic water-courses of Northern Asia, penetrate into more southern regions. The depot of provisions and coals which it was Graf Wilczek's intention to deposit on the north coast of Novaya Zemlya, was to be the nearest refuge for the crew in the event of disaster to the ship. Stone cairns were to be erected on all prominent localities, and in these were to be laid accounts of the course of the expedition. Till its return at the end of the autumn of 1874, its members were to be cut off from all intercourse with Europe. The motives of an undertaking so long and so laborious cannot be found in the mere love of distinction or of adventure. Next to the wish to serve the interests of science by going beyond the footsteps of our predecessors, we were influenced by the duty of confirming and fulfilling the hopes which we ourselves had excited.



VOYAGE OF THE "TEGETTHOFF."

JUNE, 1872—SEPTEMBER, 1874.

I.

FROM BREMERHAVEN TO KAISER FRANZ-
JOSEF LAND.

CHAPTER I.

FROM BREMERHAVEN TO TROMSOE.

1. HE who seeks to penetrate the recesses of the Polar world chooses a path beset with toils and dangers. The explorer of that region has to devote every energy of mind and body to extort a slender fragment of knowledge from the silence and mystery of the realm of ice. He must be prepared to confront disappointments and disasters with inexhaustible patience, and pursue devotedly his object, even when he himself becomes the sport of accident. That object must not be the admiration of men, but the extension of the domain of knowledge. He spends long years in the most dreadful of all banishments, far from his friends, from all the enjoyments of life, surrounded by manifold perils, and bearing the burden of utter loneliness. The grandeur therefore of his object can alone support him,—for otherwise the dreary void of things without can only be an image of the void within. How many are the preconceptions with which the novice begins the voyage to the rugged, inclement north! Books can tell him little of the stern life to which he dooms himself, as soon as he crosses the threshold of the ice, thinking perhaps to measure the evils that await him by the physical miseries of cold instead of by the moral deprivations in store for him.

2. In the year 1868, while employed on the survey of the Orteler Alps, a newspaper with an account of Koldewey's first expedition one day found its way into my tent on the mountain side. In the evening I held forth on the North Pole to the herdsmen and *Jägers* of my party as we sat round the fire, no one more filled with astonishment than myself, that there should be men endued with such capacity

to endure cold and darkness. No presentiment had I then that the very next year I should myself have joined an expedition to the North Pole ; and as little could Haller, one of my *Jägers* at that time, foresee that he would accompany me on my third expedition. And much the same was it with the three-and-twenty men who early in the morning of June 13, 1872, came on board the vessel in Bremerhaven, to cast in their lot with the ship *Tegetthoff*, whatever that lot might be ; for we had all bound ourselves by a formal deed, renouncing every claim to an expedition for our rescue, in case we should be unable to return. Our ideal aim was the north-east passage, our immediate and definite object was the exploration of the seas and lands on the north-east of Novaya Zemlya.

3. A bright day rose with us, and no augur's voice could have heightened the glad hopes which animated every one of us. Friends from Austria and Germany had come to bid us a last farewell ; but, as every venture should be, so our departure that morning was, quiet and without pretension. About six o'clock in the morning the *Tegetthoff* lifted her anchor and dropped down the Schleusen and the Weser, towed by a steamer. Down the broad stream we calmly glided, full of satisfaction at the fulfilment of long-cherished plans. There lay the same pastures, the same trees and meadows which had so delighted us on our return from Greenland. Yet unmoved we saw all the charms of nature grow young under the morning sun and then fade away in the evening twilight—as the land gradually disappeared behind us, and the coasts of Germany were lost to view. With the feeling that we were leaving them for so long a time, our thoughts turned to our new life in the narrow limits of a ship, and the resolve to live and labour in harmony animated each breast. How often we should be liable to casualties which no eye could foresee, we were soon to find out, when in almost dead calm and without steam we came on the shallow waters of Heligoland. What would have become of the expedition, had we not discovered in time, that we had only a few feet of water under the keel !

4. The vessel, 220 tons burden, was fitted out for two years and a half, but was over-freighted by about thirty tons, so that our available space was much curtailed. Yet the cabin, which Weyprecht, Brosch, Orel, Kepes, Krisch, and I occupied,

was far more commodious than the miserable hole in which eight of us had been crowded together on our Greenland expedition. Our supply of coals, 130 tons, was large in proportion to the size of the ship, being calculated not only for our daily wants, but to enable us to keep up steam for about sixty days. But to economise this store we used our sails, as much as possible, even in the ice. Both ship and engine—of 100 horse power—tested in the trial trip of June 8, sustained their character during the expedition, and did great credit to the Tecklenborg firm.

5. The wind being unfavourable, it took us some time to cross the North Sea and reach the coast of Norway. My journal describes this part of our voyage. "Light winds from the south carried the *Tegetthoff* on her lonely course over the North Sea. In undimmed brightness the blue sky stretched overhead, the air was balmy and mild. In the grey distance frowns the iron rampart of countless cliffs encircling the barren wastes of Norway. Occasionally a sea-gull comes near us, or some bird rests on the mast-head; now and then a sail is seen on the horizon,—but save this, no life—no event. Every one feels, though no one utters it, that a grave future lies before him; each may hope what he wishes, for over the future there is drawn an impenetrable veil. All, however, are animated with the consciousness, that while serving science, we are also serving our Fatherland, and that all our doings will be watched at home with the liveliest sympathy.

"6. On board the *Tegetthoff* are heard all the languages of our country, German, Italian, Slavonic, and Hungarian; Italian, however, is the language in which all orders are given. The crew is lighthearted and merry: in the evening a gentle breeze carries the lively songs of the Italians over the blue sea, glowing under the midnight sun, or the monotonous cadence of the *Ludro* of the Dalmatians recalls the sunny home which they are so soon to exchange for its very opposite, which remains a sort of mystery to all their powers of fancy. Thus begins so peacefully our long voyage into the frozen ocean of the north. In a few weeks the ice will grate on the bows of the *Tegetthoff*, the crystal icebergs will surround her, and with many a strain will the good ship force her way through the icy wastes, sometimes inclosed on every side,

sometimes free in coast-water, or threatened by the 'ice-blink' foreboding danger."

7. The officers and crew of the *Tegetthoff* amounted in all to twenty-four souls.

Lieutenant Carl Weyprecht,	} <i>Commanders of the Expedition.</i>
Lieutenant Julius Payer,	
Lieutenant Gustav Brosch,*	} <i>Officers of the Ship.</i>
Midshipman Edward Orel,	
Dr. Julius Kepes,	<i>Physician to the Expedition.</i>
Otto Krisch,	<i>Engineer.</i>
Pietro Lusina,	† <i>Boatswain.</i>
Antonio Vecerina,	<i>Carpenter.</i>
Josef Pospischill,	<i>Stoker.</i>
Johann Orasch,	<i>Cook.</i>
Johann Haller,	} <i>Jägers, from Tyrol.</i>
Alexander Klotz,	
Antonio Zaninovich,	<i>Seaman.</i>
Antonio Catarinich,	ditto.
Antonio Scarpa,	ditto.
Antonio Lukinovich,	ditto.
Giuseppe Latkovich,	ditto.
Pietro Fallesich,	ditto.
George Stiglich,	ditto.
Vincenzo Palmich,	ditto.
Lorenzo Marola,	ditto.
Francesco Lettis,	ditto.
Giacomo Sussich,	ditto.
Captain Olaf Carlsen,	<i>Icemaster and Harpooner.</i>

We had eight dogs on board ; two we got in Lapland, the rest were brought from Vienna.

8. Stormy weather detained us for some time among the Loffoden Isles, so that we made Tromsø only on July 3. Here we were received most courteously by the Austro-Hungarian Consul, Aagaard, who invited us to a banquet. We remained here a week, in order to complete our equipment. The ship, which had leaked considerably ever since we left Bremerhaven, was thoroughly examined by divers, the stores were landed, the ship repaired and reladen. Our supply of coals was replenished, a Norwegian whale-boat added to our equipment, and, lastly, the harpooner, Captain Olaf

* Lieutenant Brosch had the entire care of the victualling department, and deserved our heartiest thanks for the skill and self-sacrifice with which he performed his duty.

† Formerly Captain in the Austrian Merchant Service.

Carlsen, was taken on board. On July 6 we received our last news from Austria, letters and newspapers. The Ukase granted by the Russian Government also arrived, drawn up both for Weyprecht and myself in case of our being separated, a document of great importance, if the ship should be lost and we had to return through Siberia ; an issue only too probable when the vast length and enormous difficulties of the north-east passage were considered. While Lieutenant Weyprecht was engaged in stopping the leak of the ship, some of us ascended—a Lapp of the name of Dilkoa being our guide—a pinnacle of rock, 4,000 feet high, towering over Tromsøe's labyrinth of fiords, in order to compare our aneroid and mercurial barometers. From the summit we beheld an enormous dark column of smoke rising perpendicularly to the height of about 1,500 feet in the still air—the northern extremity of Tromsøe was in flames. Most gladly would we have learned something of the state of the ice this year ; but as yet this was impracticable, for none of the walrus hunters had returned from their grounds in the north.

9. On the morning of Saturday, July 13, officers and crew heard mass from a French priest, and bidding adieu to our Tromsøe friends, we left the quiet little city, the most northerly of Europe, early on Sunday morning. The passengers of the Hamburg mail steamer, entering the harbour as we left it, greeted us with loud and long cheers, and steaming through the narrow Grøtsound, close under the cliffs of Sandoe and Rysøe we came into the open sea, Captain Carlsen acting as our pilot. As we issued from the *Scheeren*, a mist arose which covered and obscured the huge rock of Fingloe. Here the engine fires were put out and the sails set, and the first and last voyage, which the *Tegetthoff* was destined to make, began. On July 15 we steered towards the north, the Norwegian coast with its many glaciers in full view, and on the 16th we sighted the North Cape in the blue distance.

CHAPTER II.

ON THE FROZEN OCEAN.

I. UNFAVOURABLE winds had hindered our progress for some days ; we now encountered heavy seas. On July 23 a sudden fall of the temperature and dirty rainy weather told us that we were close to the ice, which we expected to find later and much more to the northward, and on the evening of July 25, lat. $74^{\circ} 0' 15''$ N., we actually sighted it, the thermometer marking 32.5° F., and 34.5° F. in the sea. The northerly winds, which had prevailed for some time had broken up the ice, and it lay before us in long loose lines. Its outer boundary was consequently the very opposite of those solid walls of ice which we met with in Greenland in 1869, and two years afterwards on the east of Spitzbergen. Though surprised at finding the ice so far to the south, we never imagined that this was anything but a collection of floes, which had drifted out perhaps from the Sea of Kara through the Straits of Matotschkin. But only too soon the conviction was forced upon us that we were already within the Frozen Ocean, and that navigation in the year 1872 was to differ widely from that of the preceding year. Lieutenant Weyprecht had the day before fastened "the crow's nest" to the mainmast of the *Tegetthoff*, and henceforth it became the abode of the officer of the watch. On July 26, while steering in a north-easterly direction, the ice became closer, though it was still navigable ; but we nowhere saw the heavy fields which had astonished us on the east coast of Greenland, and which Lütke found to be so dangerous to navigation. The temperature of the air and the sea fell rapidly, and during the two following weeks it



STILL LIFE IN THE FROZEN OCEAN.

remained below the freezing point almost uniformly, and without any essential difference between day and night.

2. The frozen sea of Novaya Zemlya is characterized by that inconstancy of weather which in our lower latitudes we attribute to the month of April; the same variability is met with, though in lesser degree, in the Greenland seas during the summer months. Snowstorms now alternated with the most glorious blue skies. The black-bulbed thermometer showed 113° F. in the sun, with 39° F. in the shade. The hunting season began, and the kitchen was well provided with auks and seals. Our Dalmatians soon learnt to like the dark flesh of the latter.

3. The ice gradually became closer; July 29 ($74^{\circ} 44'$ N. Lat., $52^{\circ} 8'$ E. Long.) we were able to continue our course only under steam, and heavy shocks were henceforward inevitable; in many cases the vessel could not force a passage except by charging the ice. In the night a vast, apparently impenetrable barrier stopped our progress; but the tactics of charging under steam again cleared a passage, and we penetrated into a larger "ice-hole." We now glided along over the shining surface of its waters, as if we were navigating an inland lake, save that no copsewood clothed the shores, but pale blocks of ice, which the mist, that now fell and enveloped us, transformed into the most fantastic shapes, and at last into mere shapelessness itself. In all that surrounded us neither form nor colour was discernible; faint shadows floated within the veil of mist, and our path seemed to lead no whither. A few hours before the glowing fire of the noonday sun had lain on the mountain wastes of Novaya Zemlya, while refraction raised its long coast high above the icy horizon. Nowhere does a sudden change in Nature exercise so immediate an effect on the mind as in the Frozen Ocean, where, too, all that brings delight proceeds from the sun.

4. For some days we had entered into a world utterly strange to most of us on board the *Tegetthoff*. Dense mists frequently enveloped us, and from out of the mantle of snow of the distant land the rocks, like decayed battlements, frowned on us inhospitably. There is no more melancholy sound than that which accompanies the decay and waste of

the ice, as it is constantly acted on by the sea and thaw, and no picture more sad and solemn than the continuous procession of icebergs floating like huge white biers towards the south. Ever and anon there rises the noise of the ocean swell breaking amongst the excavations of the ice-floes, while the water oozing out from their icy walls falls with monotonous sound into the sea ; or perhaps a mass of snow, deprived of its support, drops into the waves, to disappear in them with a hissing sound as of a flame. Never for a moment ceases the crackling and snapping sound produced by the bursting of the external portions of the ice. Magnificent cascades of thaw-water precipitate themselves down the sides of the icebergs, which sometimes rend with a noise as of thunder as the beams of the sun play on them. The fall of the titanic mass raises huge volumes of foam, and the sea-birds, which had rested on its summit in peaceful confidence, rise with terrified screams, soon to gather again on another ice-colossus.

5. But what a change, when the sun, surrounded by glowing cirrus clouds, breaks through the mist, and the blue of the heavens gradually widens out ! The masses of vapour, as they well up, recede to the horizon, and the cold ice-floes become in the sunlight dark borders to the "leads" which gleam between them, on the trembling surface of which the midnight sun is mirrored. Where the rays of the sun do not directly fall on it, the ice is suffused with a faint rosy haze, which deepens more and more as the source of light nears the horizon. Then the sunbeams fall drowsily and softly, as through a veil of orange gauze, all forms lose at a little distance their definition, the shadows become fainter and fainter, and all nature assumes a dreamy aspect. In calm nights the air is so mild that we forget we are in the home of ice and snow. A deep ultramarine sky stretches over all, and the outlines of the ice and the land tremble on the glassy surface of the water. If we pull in a boat over the unmoved mirror of the "ice-holes," close beside us a whale may emerge from its depths, like a black shining mountain ; if a ship penetrates into the waste, it looks as weird as the "Flying Dutchman," and the dense columns of smoke, which rise in eddies from her funnel, remain fixed for hours until they

gradually melt away. When the sun sinks at midnight to the edge of the horizon, then all life becomes dumb, and the icebergs, the rocks, the glaciers of the land glow in a rosy effulgence, so that we are hardly conscious of the desolation. The sun has reached its lowest point,—after a pause it begins to rise, and gradually its paler beams are transformed into a dazzling brightness. Its softly warming light dissolves the ban under which congelation has placed nature, the icy streams, which had ceased to run, pour down their crystal walls. The animal creation only still enjoys its rest; the polar-bear continues to repose behind some wall of ice, and flocks of sea-gulls and divers sit round the edge of a floe, calmly sleeping, with their heads under their wings. Not a sound is to be heard, save, perhaps, the measured flapping of the sails of the ship in the dying breeze. At length the head of a seal rises stealthily for some moments from out the smooth waters; lines of auks, with the short quick beat of their wings, whiz over the islands of ice. The mighty whale again emerges from the depths, far and wide is heard his snorting and blowing, which sounds like the murmurs of a waterfall when it is distant, and like a torrent when it is near. Day reigns once more with its brilliant light, and the dreamy character of the spectacle is dissolved.

6. We had sailed over one "ice-hole," and again a dense barrier of ice frowned on us; as we forced our way into it, the ice closed in all round us—we were "beset." The ship was made fast to a floe, the steam blown off, its hot breath rushing with a loud noise through the cold mist; every open mesh in the net of water-ways was closed by the ice, which soon lay in such thick masses around us, that any one provided with a plank might have wandered for miles in any direction he liked. July 30, the *Tegetthoff* remained fast in her prison; no current of water, nor any movement among the floes lying close to us was discernible; a dead calm prevailed, and mist hung on every side. On the following day we made vain efforts to break through a floe which lay on our bows. The calm still prevailed, Aug. 1 (74° 39' N. L. 53° E. L.), and no change was to be seen in the ice. Aug. 2, the crew began with hearty good-will the toilsome work of warping, but with no success, the smallness of the floes hardly

admitting of this manœuvre. In the evening of the same day it seemed as if a fresh breeze would set us free; but after we had gone on for a few cable-lengths, a great floe once more barred the route, while at the same time the wind fell. At length, when the ice became somewhat looser, we got up the engine fires, and in the following night broke through, under steam, a broad barrier of ice, which separated us from the open coast-water of Novaya Zemlya. In the morning of Aug. 3, we forced our way into coast-water, twenty miles broad, to the north of Matotschkin Schar, and steered due north, the mountainous coasts still in sight. A belt of ice 105 miles broad lay behind us. The country greatly resembled Spitzbergen, and we observed with pleasure its picturesque glaciers and mountains rising to the height of nearly 3,000 feet, though inconsiderable compared with the mountains of Greenland. Far and wide not a fragment of ice was to be seen; there was a heavy swell on, the air was unusually warm (41° F.), in the evening rain fell, and on Aug. 4 we had dense mists and driving snow-storms, which forced us to keep to the west of Admiralty Peninsula. During the night of Aug. 6, the snow-storms were heavier than before, and the deck was quite covered. Towards the north and west very close ice was seen, and since the temperature of the air, even with the winds in the south-west, remained constantly below zero, it was evident that the ice must stretch far in that direction also. Aug. 7, we ran on the white barriers to the west of Admiralty Peninsula, and far to the north, beyond a broad field of ice, refraction indicated open water and showed the forms of "Tschorny Nos" floating in the air. In the afternoon of Aug. 8 the ice in 75° 22' N. L. became so thick around us that we were compelled to have recourse to steam-power; but the *Tegetthoff*, even with this auxiliary was unable against a head-wind to penetrate a broad strip of close ice, and banking up our fires, we determined to wait its breaking up. Close under the coast open water was again observed, and in it—a Schooner! Every one now hastened to write letters to his friends and relations, but the schooner, to which we meant to give our letters and despatches, by running into the heart of Gwosdarew Bay escaped the duty we had in store for it. About half-past ten P.M. the wind had fallen and

the ice began to open out, and we were able to continue our voyage under steam in a north-westerly direction. The sun lay before us, the clear mirror of distant "leads" glowed with a glorious carmine, the barriers of ice which lay between these "leads" appeared as stripes of violet, and only our immediate neighbourhood was pale and cold. The *Tegetthoff* laboured through the dense accumulation of floes and about midnight reached open water, and the steam was again blown off. Aug. 9, we sailed in coast-water perfectly free from ice,



GWOSDAREW INLET.

excepting the icebergs we encountered, some about forty feet high. These, generally, were so numerous and so small in size, that they were at once seen to be offshoots from the small glaciers of Novaya Zemlya as they plunge into the sea. Their surface was frequently covered with débris. Loose drift-ice showed itself, Aug. 10, but the ship continued to steer between the floes towards the north. In the forenoon of that day we were again nearly "beset," but happily escaped that fate after four hours' warping. Aug. 11, our course was continued without impediment in a northerly direction through the loose drift-ice. The land, from which

we had hitherto remained distant about eight or twelve nautical miles, now declined in height from three thousand to fifteen hundred or a thousand feet, and quickly lost its picturesque character. On the noon of August 12, on account of a thick mist, we made fast to a great floe, and were able to commence on it the training of the dogs to drag the sledges.

7. In the neighbourhood of the Pankratjew Islands, a ship suddenly and unexpectedly appeared on the horizon, and endeavoured to gain our attention by discharges from a mortar, and by the hoisting of flags. How great was our astonishment and our joy when we beheld the Austro-Hungarian flag at the peak of the *Isbjörn*, and were able to greet Count Wilczek, Commodore Baron Sterneck, Dr. Höfer, and Mr. Burger half an hour afterwards on board the *Tegetthoff*. Coming from Spitzbergen in the *Isbjörn* (the ship of our precursory expedition of 1871) they had sighted us two days before. That in a sailing vessel, and without any sufficient equipment, they had succeeded in following and overtaking the *Tegetthoff*, which had penetrated so far with difficulty and by the aid of steam was a proof both of skill and resolution. Their object was to establish a depôt of provisions at Cape Nassau, at whatever personal risk to themselves. About two o'clock in the morning our guests returned to the *Isbjörn*, and both ships now sailed in company, and without meeting any hindrance in the ice-free coast-water, in a northerly direction. In the forenoon of Aug. 13, in $76^{\circ} 18' N.$ Lat. and $61^{\circ} 17' E.$ Long., we came upon closer ice, amid mist and stormy weather, and the two ships anchored to some firm land-ice two cable-lengths from each other, about a mile from the land. Close to the south of us lay the Barentz Isles with their singularly formed hills, which the walrus-hunters call by the somewhat gloomy name of "The Three Coffins." On our north an enormous iceberg rose in dazzling whiteness above a faintly glimmering field of ice, a harbinger of new countries—for its size forbade us to think that it owed its origin to the glaciers of Novaya Zemlya. Continuous winds from the W.S.W., close ice, mist, downfalls of snow, the necessity of determining the geographical position of the depôt of provisions which we had established, compelled us to lie for eight days before the

Barentz Islands. The opportunity we thus had of putting our feet once more on the land was exceedingly agreeable. We made repeated visits to the shore with two dog-sledges, in company with Professor Höfer; and as his observations on the phenomena of the country are those of a distinguished geologist, I here insert those he has kindly placed at my disposal.

8. "The Barentz Isles are flat, girt with cliffs, and separated by narrow straits from the coast, which rises up terrace on terrace. Its rocks consist of a black, very friable slate, frequently alternating with strata of mountain limestone of the carboniferous period, varying in breadth from one to ten *metres*. These strata are filled with a countless number of fossilized inhabitants of the sea, trilobites, mussels, brachiopodes, crinoides, corals, &c., which are utterly foreign to the Frozen Ocean as it now is, and whose cognates live only in warm seas.

9. "The animal world, therefore, buried in the limestone of these islands, is an indisputable proof that there was once, in these high latitudes, a warm sea, which could not possibly co-exist with such great glaciers as those which now immerse themselves in the seas of Novaya Zemlya. That portion of the earth, now completely dead and buried in ice, once knew a *period of luxuriant life*. In its sea there revelled a world of life, manifold and beautiful in its forms, while the land, as the discoveries on Bear Island and Spitzbergen prove, was crowded with gigantic palm-like ferns. This age of the earth's history is called the carboniferous period; it was the rich and fertile youth of the high north, which lived out its time more rapidly than the southern zones, now in all their vigour and variety. If we compare the Fauna buried in the chalk formations of the Barentz Isles, with the contemporaneous Fauna which we know from the carboniferous formation of Russia, specially that of the Ural, we find a very remarkable agreement, not only in their general character, but also in particular organisms. Many of the fossils of the carboniferous limestone of these high degrees of latitude (76° – 77°) are found in analogous strata of the Ural, and are proved by the researches of Russian geologists to exist there as far as the fiftieth degree of latitude. Without stopping to

insist on the great similarity between the stratification of Novaya Zemlya and the Ural—the former being the real continuation of the latter—we dwell here on the fact that in the carboniferous period there was a sea which stretched from the fiftieth to the seventy-seventh degree of north latitude, *i.e.* twenty-seven degrees, or 405 geographical miles, which was animated by the same Fauna, and which consequently must have presented the same relations, especially a like warm temperature. From these signs it would appear that the zones of climate now so decisively marked on the surface of the earth did not exist at the carboniferous period. The horizontal surface of the land leads us at the first to infer horizontal stratification; but we find the contrary to be the case; the marine deposits once horizontal, have been so raised at a later period that they are now vertical. Since the friable slate degrades rapidly, and the limestone layers very gradually, it may be assumed that the former wasting away leaves the limestone layers standing like walls between them—a thing which, in a small scale, may often be elsewhere observed. If a glance at these buried fossils awakens in us an image, as in a dream, of a creation rich in organic forms, a glance at the present state of the Barentz Isles impresses us with the gloomiest feelings.

10. "Before us lies this small greyish brown fragment of the earth. The cold, level ground is covered with sharp-edged pieces of rock, which appear to be as it were macadamised, so closely are they rammed together. Here and there, about a fathom's length from each other, lie brownish green masses like mole-hills. When we examine them more closely, each mass resolves itself into a vast number of small plants of the same species (*Saxifraga oppositifolia*), whose little stalks are covered with dark green leaves, which are alive, and also with brown leaves, which have been dead for years and years, but wither in the cold much more gradually than with us. From this small heap, tender rosy blooms raise their little heads, bidding defiance to the bitter snowy weather which sweeps over the miserable plain. Another species of saxifrage (*Saxifraga cæspitosa*), with shorter stalks and yellowish-white flowers, growing in thick clumps, forms, together with the first-named variety and the more rarely appearing *Saxifraga*

rivularis, the hardiest representatives of this family of plants so frequently found in the Polar regions. If to these we add *Draba arctica* with its little yellow flowers, forming in valleys large patches of sward, the yellow flowering poppy (*Papaver nudicaule*), and a rare willow (*Salix polaris*), which with some few leaves peeps forth from the soil, we have described the whole Flora of that desolate waste, in which a mere passing glance would scarce detect the existence of vegetable life among the débris of rocks and the heaps of snow. Mosses are found here and there in the moister fissures of rocks, and especially on the coast, where old drift-wood, or the bones of whales or other animals, afford the nourishment they need, and in some places the mosses spread themselves out into small carpets. Lichens love to shelter under the clusters of the different kinds of saxifrage, though sometimes they are found by themselves. Of this class we will mention merely the so-called Iceland moss (*Cetraria islandica*), and a reindeer lichen (*Cladonia pyxidata*); the few other forms are nearly related to those mentioned, and belong to the so-called creeping lichens. One peculiarity of the Flora of the far north, which we have already mentioned, is their growth in clumps. Only thus can these tender organisms maintain their existence against the stern elements; and this indeed is a characteristic of all Arctic creation, which is seen in the animal world also, when its means of nourishment are hard to find. We will point only to the herds of reindeer, of lemmings, of walruses, of seals, &c., lastly to the vast flocks of birds; all of which illustrate the principle: *common danger begets common defence.*"

II. Our involuntary leisure at the Barentz Isles enabled us to make some precautionary preparations for our future contests with the ice; for a ship may be crushed by the ice and sink in a few minutes, as had happened some days previously, not far from us, to the yachts *Valborg* and *Iceland*. Provisions and ammunition for four weeks were got ready, and each man was entrusted with a special service, if it should ever come to this extremity. To guard against the dreaded pressures of the ice, heavy beams were hung round the hull of the vessel, so that the pressure on the ship might be distributed over a larger surface, and the vessel itself be raised instead of crushed.

Our space on deck, somewhat limited at first, had been considerably enlarged, although our numerous sledges, our stock of drift-wood, and the rudder which had been unshipped, formed inconvenient obstacles, while the chained-up dogs occasioned some unpleasant surprises to those who had not succeeded in gaining their affections. These poor animals, without protection, suffered much from the cold rough weather which now prevailed, though subsequently some provision was made for their comfort. Sumbu and Pekel, the two Lapland dogs, were the most hardy, and slept without stirring, even when they were completely covered with snow. It was only after a long and stout resistance that the dogs became accustomed to the flesh of seals; at first they growled at every one who offered it to them.



FORMATION OF THE DEPOT AT "THE THREE COFFINS."

12. Aug. 14, we were threatened by the advance of an enormous line of pack-ice, which inclosed us in the little "docks" of the land-ice, and caused the *Isbjörn* to heel over. In the evening a bear came near this vessel, which was shot by Professor Höfer and Captain Kjelsen. On the following day, with the help of the dogs and sledges, we removed over the land-ice to "The Three Coffins" the provisions which were to form the depot: 2,000 lbs. of rye-bread in casks, 1,000 lbs. of pease-sausages in tin cases. These were deposited in the crevice of a rock and secured against the depredations of

bears. We felt assured of the conscientiousness of Russian or Norwegian fishermen, that they would make use of these provisions only under the pressure of urgent necessity. This depot was intended to be the first place of refuge, in the event of the ship being lost.

13. Both ships were dressed with flags, and round one common table we celebrated the birthday, Aug. 18, of the Emperor and King, Francis Joseph I. On Aug. 19 we fetched some drift-wood from the land, and saw from a height an



THE "TEGETTHOFF" AND "ISBJÖRN" SEPARATE.

"ice-hole" stretching to the north at no great distance from the coast. As we returned to the ship we came across a bear, which, being assailed by so many hunters at once, took to flight. Aug. 20, some changes in the ice seemed to make navigation possible, and we forthwith went on board the *Isbjörn* to bid adieu to our friends. It was no common farewell. A separation to those who are themselves separated from the world moves the heart to its depths. But besides this, in bidding adieu to Count Wilczek, we felt how much we

were indebted to him, as the man who had fostered the work we were about to undertake, who dreaded no danger while providing for our safety in the event of a catastrophe to the expedition. Our high-minded friend was at this moment the embodiment of our country, which, honouring us with its confidence and trust, demanded that we should devote all our energies to the high objects of the expedition. Often afterwards did this adieu return to our memories. With a fresh wind from the north-east we passed the *Isbjörn* as we steamed towards the north, while this vessel, veiled in mist, soon disappeared from our eyes.



THE "TEGETTHOFF" FINALLY BESET.

14. Our prospects, so far as the object of our expedition was concerned, had meantime not improved. To cross the Frozen Sea to Cape Tscheljuskin in the present year was not to be dreamt of, and yet the thought of wintering in the north of Novaya Zemlya was positively intolerable. The navigable water was becoming narrower every day, and the ice seemed to increase in solidity, especially in the neighbourhood of the coast. In the afternoon of this day we ran into an "ice-hole," but in the night barriers of ice stopped our

further progress. As usual, the ship was made fast to a floe, the steam blown off, and we awaited the parting asunder of the ice.¹ Five walruses who had been watching us from a rock as we entered that ill-starred "ice-hole," sprang into the water and disappeared.

15. Ominous were the events of that day, for immediately after we had made fast the *Tegetthoff* to that floe, the ice closed in upon us from all sides and we became close prisoners in its grasp. No water was to be seen around us, and *never again were we destined to see our vessel in water.* Happy is it for men that inextinguishable hope enables them to endure all the vicissitudes of fate, which are to test their powers of endurance, and that they can never see, as at a glance, the long series of disappointments in store for them! We must have been filled with despair, had we known that evening that we were henceforward doomed to obey the caprices of the ice, that the ship would never again float on the waters of the sea, that all the expectations with which our friends, but a few hours before, saw the *Tegetthoff* steam away to the north, were now crushed; *that we were in fact no longer discoverers, but passengers against our will on the ice.* From day to day we hoped for the hour of our deliverance! At first we expected it hourly, then daily, then from week to week; then at the seasons of the year and changes of the weather, then in the chances of new years! *But that hour never came,* yet the light of hope, which supports man in all his sufferings, and raises him above them all, never forsook us, amid all the depressing influence of expectations cherished only to be disappointed.

¹ Our position was then in 76° 22' N. Lat., 63° 3' E. Long.

CHAPTER III.

DRIFTING IN THE NOVAYA ZEMLYA SEAS.

1. AT the end of August the temperature in the Frozen Ocean is generally at the freezing point of the Centigrade thermometer, but this year (1872) it was constantly six degrees below it. A cold bleak air enveloped us, there was abundance of snow, the sun showed himself rarely, and for some days he had sunk, at midnight, under the horizon. The ship and her rigging were stiff with ice, and everything indicated that for us winter had begun. As the masses of ice which inclosed us consisted only of small floes, we were led to hope that the strong east winds would soon disperse them. But the very contrary really happened, for the low temperatures, the calms, and falls of snow, bound the floes of ice only the more closely together, and within a few days congealed them into one single field, in the midst of which the ship remained fast and immovable. Our surroundings were monotonous beyond description,—one vast unattractive white surface, and even the high-lands of Novaya Zemlya were covered with freshy fallen snow.

2. To reach the coast of Siberia under these circumstances had become an impossibility, and even in the event of our being liberated, the search for a winter harbour in Novaya Zemlya would be a matter of peril and difficulty. Yet we calculated confidently on this contingency and employed our enforced inactivity in completing our preparations for sledge journeys during the autumn, although we could not but feel, that their importance must be of secondary interest and value in a country so well known as Novaya Zemlya. Meantime we drifted slowly along the coast in a northerly direction and

apparently under the influence of a current, which has been often observed on the northern coasts of Novaya Zemlya. But the gloom of our situation, as we became conscious of our captivity, was more distinctly and painfully felt. On the 1st of September the temperature sank nine degrees below zero (12° F.), and the few and limited spaces of open water round our floe disappeared. The sun now remained six hours below the horizon, and the formation of young ice in a single night often reached such a thickness, that we soon perceived that our last hope for this year lay in the setting-in of heavy equinoctial storms to break up the ice-fields.



ATTEMPTS TO GET FREE IN SEPTEMBER.

3. On the 2nd of September a fissure running through our floe reached the after-part of the *Tegetthoff* and opened into a "lead," and even our floe partially broke up; but this availed us nothing, for the ship itself remained fast on a huge fragment. During the night of Sept. 3, the after-part of the *Tegetthoff* was gently raised for the first time by the pressure and driving from beneath of the ice; yet of the formidable nature of such pressure we had as yet no presentiment.

Though our situation seemed desperate, it was not attended by immediate danger, and, condemned as we were to inactivity, we found the amusement and occupation we needed in skating on the young ice, which covered many of the newly-formed ice-holes between the ice-floes. Besides the duty of making and recording meteorological observations, the training of the dogs, the bringing ice to the kitchen to be transformed into water, the manufacture of oil, expeditions on foot to explore the country, were the only forms in which our energies could be exerted. Absolute loneliness surrounded us; even the Arctic sea-gull (*Larus glaucus*) and the grey stormy petrel (*Procellaria glacialis*, L.) of the polar regions, were but rarely seen, and a bear, which, Sept. 5, came within forty paces of the ship, was driven away by the awkwardness of our hunters. The cold became more and more intense and the weather more gloomy. Sept. 2, the cabin lamp had to be lit for the first time about half-past nine o'clock, and on the 3rd we began to heat the interior parts of the ship, the temperature of which had been for some time at zero; and on the 11th, the first fiery belts of the Aurora flamed in the northern heavens. On the 9th and 10th, there was a very heavy storm from the north-east, which drove us back for a short time towards the west, and partially broke up our floe, but all the efforts of the next week to destroy the connection of what remained by sawing and blasting proved unsuccessful. Blasting with powder, whether above or below the surface-ice, proved ineffectual. Even old fissures in the ice appeared to defy further disruption, segments which had been laboriously made by sawing, froze again almost immediately, and even the application of steam was powerless to set our floe in motion and force the breaking-up of the parts which had been sawn through. It was of no avail that, up to Oct. 7, we kept open a trench round the ship, by destroying in the day the ice which had been formed during the night: the expected disruption of our ice-field never happened. Dark streaks in the heavens still proclaimed that we were in the neighbourhood of open water, and though they seemed only to indicate "leads" of no great breadth or extent, they helped to sustain our hopes. But these were soon doomed to be disappointed, for even these "leads" closed up, and *at the same time the*

temperature fell to an unusually low degree. On the 15th of September we had 15 degrees of cold, and on the 19th the temperature fell 18·6 degrees below zero (C.). To add to this, there were frequent falls of drifting snow. As long as fissures remained we had opportunities of seal-hunting, but by the end of the month the "ice-holes" were overspread with spongy ice, which hindered the movements of our boats within them. The alternate openings and closings of the water-ways around us seemed in our monotonous life a harmless spectacle, for the lofty walls of piled-up ice had not as yet for us the language of imminent and threatening dangers.



SEAL-HUNTING—SEPTEMBER 1872.

4. Sept. 22, there was a fissure in the ice about thirty paces from the ship, and we quickly put on board all the materials which were lying on the floe, believing that the moment of our deliverance had come. But no such moment came, nor did the equinoctial storms which we expected set in; *we continued to drift still further to the north*; and on Oct. 2, we had passed the seventy-seventh degree of north latitude. In the beginning of this month a storm, which lasted but a short time, opened up a large "ice-hole" near the after-part of the

ship, and forthwith we set to work to open a passage through our floe in order to reach it, but two days afterwards this "ice-hole" also closed up. Yet amid all our mishaps we forgot not on October the 4th—the name-day of his Majesty the Emperor Francis Joseph I.—the homage which was due to our noble and gracious Sovereign. The ship was gaily dressed with flags, and a rifle-match, in which watches and pipes were the prizes, scared away for a short afternoon the sad impressions of the moment.



SHOOTING AT A TARGET, OCTOBER 1872.

5. Encounters with polar bears afforded us much excitement. On the 6th of October our first bear was killed and divided among the dogs, for as yet we had not learnt to regard the flesh of these animals as the most precious part of our provisions. A fox also, the first seen during this expedition, showed himself during the previous night. He had evidently come from Novaya Zemlya, and his curiosity had led him close to the ship, from whence he was driven by the dogs. It now became indispensable for everyone who left the immediate neighbourhood of the ship to carry arms with him, and

the neglect of this precaution had sometimes rather ludicrous, at other times somewhat serious, consequences. On the 11th of October I left the ship unarmed, and with no other companion than our Lapland dog, Pekel, to employ myself in the harmless occupation of piling up a tower of ice. Working as I was in a stooping position, I was unconscious of what was immediately around me, when on a sudden the loud barking of Pekel caused me to raise myself, and I saw a bear quite close before me. Shaking his head and making a snuffling noise, he came on towards me. In the expectation that some of the people engaged on deck would see my critical position, I contented myself with shaking my fist at him, unwilling to reveal any weakness to my enemy. As this, however, seemed to produce no effect, I cried out repeatedly, "A bear!" At last I saw Klotz, who was on deck, go to the stand of arms, but with such stoical composure, that I ceased to trust to others, and left to the bear, who had now advanced to a distance of about fifteen paces from me, the glory of forcing his enemy to take to flight.

6. In the first days of October the temperature rose considerably, the thermometer standing a little below zero (C.). This was due to south-west winds, and to the temporary extension of the "ice-holes" in our immediate neighbourhood. The days now became shorter, the sun surrounded with red masses of clouds set behind barriers of blackish-blue ice, and an ever-deepening twilight followed his disappearance. Sept. 29, a "snowfinch" flew from the coast of Novaya Zemlya to the ship, hopped about the deck for a little time, and after delighting us all by his little song, again left us. Some few sea-gulls still wended their flight to the spaces of water in our neighbourhood. Skimming over the top of the mast, they seemed to gaze down upon us, and then with a shrill cry darted away like arrows towards the south. There was something melancholy in this departure of the birds; it seemed as if all creatures were retiring from the long reign of night which was before us. In order to divert our attention from the dreadful monotony of our captivity by some occupation in the open air, we fell on the plan of building houses of ice round the ship. The activity of a building-yard reigned on our ice-floe; heavy ice-tables were broken or sawed through, the dogs in

the sledges carried the fragments to their appointed places, and with these blocks we raised crystal walls and towers. Snow, mixed with sea-water, furnished an inexhaustible source of the most excellent mortar; and while we worked laboriously at these meaningless erections, we earned at least by our labour the reward of sleep free from care.

7. As we drifted helplessly northward, the coasts of Novaya Zemlya receded gradually from our gaze. Hitherto we had lain close to the land, which with its rounded mountains and



PARHELIA ON THE COAST OF NOVAYA ZEMLYA.

valleys filled with glaciers seemed a miniature of Alpine scenery. Daily almost the gigantic luminous arcs of parhelion stood above it, the usual precursors of stormy weather or heavy falls of snow. Towards the north and north-east the country becomes flatter, and runs into glacier-wastes little raised above the level of the sea. The topography of the northern parts of Novaya Zemlya is complete confusion. The only survey which exists—that of Lütke—extends no further than Cape Nassau. The maps of the Barentz Isles are frequently in contradiction with fact, and their correction is extremely desirable. Though this land was of no value for our object, yet it was still land, and it seemed also to us,

drifting as we did, the symbol of the stable and immovable. But now it was gradually disappearing from our eyes. During September we had moved slowly, but with October we drifted at a greater rate, so that by the 12th of this month we saw nothing but a line of heights some thirty miles off, towards the south. At last every trace of land disappeared from our gaze; a hopeless waste received us, in which no man could tell how long we should be, or how far we should penetrate.



CHAPTER IV.

THE "TEGETTHOFF" FAST BESET IN THE ICE.

1. AUTUMN was passing away, the days were getting shorter, and in our immediate neighbourhood no movement in the ice was perceptible, save that we had drifted continuously towards the north-east; sometimes, though rarely, a fissure in the ice grew to the proportions of an "ice-hole," only, however, to be quickly frozen over and present a surface for our skates. There lay the frozen sea, the picture of dull, hopeless monotony; shelter there was none. Our floe, though it seemed to combine the conveniences of a winter harbour, could not stand the test of closer observation, the illusion of such a notion must be short-lived. But many signs now indicated the insecurity of our position. Fields of ice in our neighbourhood cracked and split asunder, and piled-up masses floated round us, silent preachers, as it were, of the destruction which ice-pressure could produce.

2. A change, however, was soon to come over the scene. On the evening of October 12 we imagined that the cabin lamp oscillated, and consequently that our floe was in motion. On the same night we were conscious of a violent movement in the ice. A dreadful day was the 13th of October,—a Sunday; it was decisive of the fate of the expedition. To the superstitious amongst us the number 13 was clothed with a profound significance: the committee of the expedition had been constituted on February 13; on the 13th of January the keel of the *Tegetthoff* had been laid down; on the 13th of April she was launched; on the 13th of June we left

Bremerhaven; on the 13th of July, Tromsøe; after a voyage of 13 days we had arrived at the ice, and on the 13th of October the temperature marked 16 degrees below zero (C.). In the morning of that day, as we sat at breakfast, our floe burst across immediately under the ship. Rushing on deck we discovered that we were surrounded and squeezed by the ice; the after-part of the ship was already nipped and pressed, and the rudder, which was the first to encounter its assault, shook and groaned; but as its great weight did not admit of its being shipped, we were content to lash it firmly. We next sprang on the ice, the tossing tremulous motion of which literally filled the air with noises as of shrieks and howls, and we quickly got on board all the materials which were lying on the floe, and bound the fissures of the ice hastily together by ice-anchors and cables, filling them up with snow, in the hope that frost would complete our work, though we felt that a single heave might shatter our labours. But, just as in the risings of a people the wave of revolt spreads on every side, so now the ice uprose against us. Mountains threateningly reared themselves from out the level fields of ice, and the low groan which issued from its depths grew into a deep rumbling sound, and at last rose into a furious howl as of myriads of voices. Noise and confusion reigned supreme, and step by step destruction drew nigh in the crashing together of the fields of ice. Our floe was now crushed, and its blocks, piled up into mountains, drove hither and thither. Here, they towered fathoms high above the ship, and forced the protecting timbers of massive oak, as if in mockery of their purpose, against the hull of the vessel; there, masses of ice fell down as into an abyss under the ship, to be engulfed in the rushing waters, so that the quantity of ice beneath the ship was continually increased, and at last it began to raise her quite above the level of the sea. About 11.30 in the forenoon, according to our usual custom, a portion of the Bible was read on deck, and this day, quite accidentally, the portion read was the history of Joshua: but if in his day the sun stood still, it was more than the ice now showed any inclination to do.

3. The terrible commotion going on around us prevented us from seeing anything distinctly. The sky too was overcast, the sun's place could only be conjectured. In all haste

we began to make ready to abandon the ship, in case it should be crushed, a fate which seemed inevitable, if she were not sufficiently raised through the pressure of the ice. About 12.30 the pressure reached a frightful height, every part of the vessel strained and groaned; the crew, who had been sent down to dine, rushed on deck. The *Tegetthoff* had heeled over on her side, and huge piles of ice threatened to precipitate themselves upon her. But the pressure abated, and the ship righted herself; and about one o'clock, when the danger was in some degree over, the crew went below to dine. But again a strain was felt through the vessel, everything which hung freely began to oscillate violently, and all hastened on deck, some with the unfinished dinner in their hands, others stuffing it into their pockets. Calmly and silently, amid the loud sounds emitted by the ice in its violent movement, the officers assumed and carried out the special duty which had been assigned to each in the contemplated abandonment of the ship. Lieutenant Weyprecht got ready the boats, Brosch and Orel cleared out the supply of provision to be taken in them; Kepes, our doctor, had an eye to his drugs; the Tyrolese opened the magazine, and got out the rifles and ammunition—I myself attended to the sledges, the tents, and the sacks for sleeping in, and distributed to the crew their fur coats. We now stood ready to start, each with a bundle—whither, no one pretended to know! For not a fragment of the ice around us had remained whole; nowhere could the eye discover a still perfect and uninjured floe to serve as a place of refuge, as a vast floe had before been to the crew of the *Hansa*. Nay, not a block, not a table of ice was at rest, all shapes and sizes of it were in active motion, some rearing up, some turning and twisting, none on the level. A sledge would at once have been swallowed up, and in this very circumstance lay the horror of our situation. For, if the ship should sink, whither should we go, even with the smallest stock of provisions?—amid this confusion, how reach the land, thirty miles distant, without the most indispensable necessities?

4. The dogs, too, demanded our attention. They had sprung on chests, and stared on the waves of ice as they rose and roared. Every trace of his fox-nature had disappeared from

“Sumbu.” His look, at other times so full of cunning, had assumed an expression of timidity and humility, and, unbidden, he offered his paw to all passers by. The Lapland dog, little Pekel, sprang upon me, licked my hand, and looked out on the ice as if he meant to ask me what all this meant. The large Newfoundlands stood motionless, like scared chamois, on the piles of chests.

5. About 4 P.M. the pressure moderated; an hour afterwards there was a calm, and with more composure we could now survey our position. The carpenter shovelled away the snow from the deck in order to inspect the seams. They were still uninjured. The knees and cross-beams still held, and no very great quantity of water was found in the hold. This result we owed solely to the strength of our ship and to her fine lines, which enabled her to rise when nipped and pressed, while her interior, so well laden as to become a solid body, increased her powers of resistance. Everything was again restored to its place, so that it was possible to go up and down the cabin stairs without great difficulty, and in the evening the water in the hold, which had risen 13 inches, was pumped out to its normal depth of 6 inches. We went down into the cabin to rest, but though thankful and joyful for the issue, our minds were clouded with care and anxiety. Henceforth we regarded every noise with suspicious apprehensions, like a population which lives within an area of earthquakes. The long winter nights and their fearful cold were before us; we were drifting into unknown regions, utterly uncertain of the end. When night came, we fell asleep with our clothes on, though our sleep was disturbed every now and then by onsets of the ice, recurring less frequently and in diminished force; but daily—and for *one hundred and thirty days*—we went through the same experiences in greater or lesser measure, almost always in sunless darkness. It was, however, a fortunate circumstance for us that we encountered the first assaults of the ice at a time when we were still able to see; for instead of the calm preparations we were able to make, hurry and confusion would have been inevitable had these assaults surprised us amid the Polar darkness.

6. Early in the morning of Oct. 14 we all met at breakfast, but on every face there lay an expression of grave thoughtful-



AN OCTOBER NIGHT IN THE ICE.

ness, for each of us was contemplating the long perspective of those dreary nights, in which we should drift without a goal in the awful wastes of the Frozen Sea. The speedy restoration of our floe was now our most earnest desire. It was only severe frost and heavy falls of snow—as we vainly imagined—which could cement the chaos of broken fragments around us and form from them a new floe; for as yet we had not learnt by experience, that severe cold in itself, unaccompanied with wind, is sufficient to break up the fields of ice, from the contraction which it causes. We deluded ourselves with another consolation—we imagined that the ice-pressures would cease as soon as we passed the eastern extremity of Novaya Zemlya, and that in the Sea of Kara we should drift without encountering the pressures, due, as we conceived, to our nearness to land. But vain also was this hope, for we were drifting not into the Sea of Kara, but towards the north-east. We should have found, even in that sea, that pressures from the ice may occur within the Frözen Ocean, however, as well as at its coasts. The masses of ice which caused our disasters probably came from that sea.

7. The time subsequent to this crisis was full of painful and anxious moments, but a chronological description of the events of each day, involving a mere repetition of our sad impressions, would be wearisome to the reader. I will, therefore, transfer from my journal such portions of it as most forcibly express the thoughts that passed through the minds of the handful of men on board the *Tegetthoff* during those terrible days:—

“*October 14.*—About half-past eight o'clock in the evening a new fissure in the ice appeared astern of the ship; a strain was felt throughout her timbers; in a moment every one in his fur dress and with his bundle in his hand was on deck: so will it be, perhaps, throughout the winter—what a life!

“*October 15.*—All had slept in their clothes. Fresh pressures from the ice were felt about eight o'clock in the morning, not so powerful as on the 13th, but of such force that all sprang from their berths and within a minute again stood ready on the deck. Much ice had been forced under the after-part of the ship, which was raised up by the pressure. When all was calm every one set to work to make a bag to contain the gear

he meant to take if the ship should be crushed. Mine contained the following articles: one pair of fur gloves, one pair of woollen gloves, a pair of snow spectacles, six pencils, a rubber, three note-books, the journal of my Greenland expedition, a book of drawings, ten ball-cartridges, two pairs of stockings, a knife, a case of needles and thread. On the 13th we had neglected to provide ourselves with maps of Novaya Zemlya; two of these I now included among my stock of necessaries. Six Lefauchaux rifles, four Werndl-rifles, two thousand cartridges, two large and two smaller sledges, a tent for ten, one for six men, two great sleeping sacks, each for eight, and a smaller one for six men, were placed in the boats. Although all these preparations would have been quite vain if the ship had sunk with the ice in motion to crush us, we must, for our mutual encouragement, keep up the appearance of believing in them. About six o'clock in the evening the full moon rose, like a copper coin fresh from the mint, above our horizon on the deep blue of the heavens. In the evening the ice was at rest, and for the first time for some days we ventured to undress on going to bed.

"*October 16.*—Slept without care or disturbance till two o'clock in the morning, when pressure from the ice again set in, and all rushed on deck. Some of the crew threw out on the ice the antlers of a reindeer of Novaya Zemlya,—for according to a superstition of the seamen the horns of a reindeer are the generators of mischief! The ice again calm, and I fell asleep from exhaustion; but about half-past five in the morning there was a new pressure of about twenty minutes' duration, and almost as fearful as on the 13th of the month. The exceeding haste with which every one rushes up from below as soon as the ship begins to strain, shows the effect which the noise makes on us; it is impossible to become accustomed to it; every one runs on deck. Again the ice rests, but about half-past seven in the morning, another pressure, which almost tore away the beams protecting the hull and the davits to which they were fastened. The ship, however, rights herself. To-day the ice which overhung our bulwarks was dug away to prevent masses of it falling on the deck. In the evening, diminished pressure from the ice; at night, glorious moonlight scenery; nothing more

peaceful, but nothing more illusive, than such a scene at such an hour.

"*October 17.*—All quiet during the night till Lusina came to announce, with a voice as from the grave, that the ship was making more water, sixteen inches in the forepart, eleven inches amidships. East wind, with heavy drifting snow-storms—during the day once only a strain of short duration was felt in the ship, as a new fissure opened in the piled-up ice on our starboard quarter.

"*October 18.*—Our anxieties somewhat abate and our watchful state of preparation to leave the ship relaxes, and most of us determine once more to undress for the night. After several weeks the sun, which had been obscured by the weather, becomes visible, rising $2^{\circ} 25'$ above the horizon; the temperature stands at -20° F., and our latitude is $77^{\circ} 48'$.

"*October 19.*—Straining in the ship; the sun rose about a quarter past eight, but was soon veiled in frosty vapours.

"*October 20.*—The hull of the ship is still without its necessary protection of ice and snow, while we are wrapt in furs and wear reindeer-shoes and felt-boots. In the evening a faint mock moon was visible.

"*October 21.*—At night we were alarmed by a loud sound, and in few minutes all were on deck with their fur clothes on—a fissure had opened on the starboard side of the ship, connecting itself with that which had been formed astern of the ship. In an hour this fissure had widened about four feet, and we worked for some hours by the light of lamps to fill it up with snow and pieces of ice. The low temperature (-21° F.) led us to expect that this chasm would be bridged over without further effort on our part. The moon stood surrounded by a vast halo in the heavens and illuminated the awful loneliness of our abode. Once more a calm! When any one comes down from the deck into the cabin, the eyes of all are involuntarily turned upon him to read in the expression of his face what is going on above, and each dreads to hear it said, that the ice is in motion. In the afternoon, when the fissure closed, we heard the old dull sound from the ice, and the ship strained violently, and all were on deck ready to leave. About nine o'clock in the evening the motion of the ice was again felt. Uncertain and full of fears as to what the



THE MOON WITH ITS HALO.

night might bring forth, we go early to rest; no one knows how short that rest may be. Even Klotz lays aside his stoical calmness, and the philosophical dignity of his remarks departs when his comrades spring from their berths and rush on deck with their bundles. The frozen pumps are daily thawed by boiling water; to-day the shaft of one of them broke, through the excessive strain put upon it.

"*October 22.*—During the night, motion in the ice. At 9.30 A.M. the sun rose, and attains its meridian altitude at $1^{\circ} 41'$. In the evening the fissure in the ice again opens. Rents and small 'ice-holes' are all round us, and frosty vapour fills the air. To-day the skull of a bear was thrown out on the ice, the crew asserting that mischief comes from the possession of it!

"*October 23.*—During the night violent movement in the ice; the sound produced resembles the noise of a fleet of paddle-wheel steam-ships, steaming now with full, now with half power. The height of the sun to-day above the horizon was a little above one degree, its form was distorted by refraction into an egg-like shape, and its edges were in constant vibration.

"*October 24.*—The daylight is now so feeble that the lamps have to be lighted during the day, with the exception of two or three hours in the forenoon. Many of the crew are suffering from frost-bites on their hands, in consequence of their exposure in removing the unnecessary rigging, and in the preparations to facilitate the removal of our stock of provisions in the event of our being forced to abandon the vessel.

October 25.—In the afternoon we made an attempt to drive the dog sledges, but the snow, in spite of the low temperature, lay in such masses between the small hummocks and on the few level places, that they sank deep into it. It is storms of wind only that harden the snow, and for some time we have had calms or light breezes. In the evening there was a movement in the ice astern of the ship, accompanied with the highest soprano tones. The noise the ice makes in its pressure very much resembles the piping and howling of a storm among rocky cliffs or through the rigging of a ship. About half-past ten at night, the oscillating movements of the ice, occurring at definite intervals, made it appear as if they arose

from a swell of the ocean. The ship groans and creaks constantly; indeed, creaking and groaning are weak expressions for such a noise. Once more all are ready. We begin to fear that the ice will never rest.

"*October 26.*—Pressure throughout the whole night. Armed and provided with lanterns, we used the sledges to remove two boats, 150 logs of wood, fifty planks, and a supply of coals, to the port side of the vessel, and chose a stronger floe, on which to build a house of refuge. Tired and exhausted, we fell asleep, in spite of the straining and creaking of the vessel.

"*October 27.*—The sun at noon was scarcely visible above the horizon. At night of the same day a strong wind from the south-east opened a fissure on the starboard side of the



OUR COAL-HOUSE ON THE FLOE.

vessel and about 150 paces from it, which grew into the dimensions of an 'ice-hole.'

"*October 28.*—To-day the sun took leave of us. Only with its upper edge had it appeared above the horizon, and sent towards us its mild beams like the consoling glance of a departing friend. The coal-house is finished. But what reliance can be placed on such an abode in such a position? A storm may carry away the planks which form its roof; sparks from a fire may set fire to its walls and consume it; and at any moment, through a pressure opening up an abyss beneath, it may sink and be engulfed. Two o'clock in the

afternoon, the groaning sound comes from the piles of ice around us; our floe appears to twist somewhat, and the pressure of the ice will probably soon begin.

"*October 29.*—During the night a noise in the ice, which, though it did not further disturb us, was yet witness enough that it is ever ready to disturb us. The sun no longer appears; only a rosy light at noon in the heavens.

"*October 30.*—At half-past three o'clock in the morning there was a dreadful straining and creaking in the ship: at once we sprang out of our berths, and stood on deck with our fur garments on, and with our bags as before. New fissures had appeared which rapidly enlarge themselves; the two boats and the coal-house are now surrounded by up-forced masses of ice and separated from us. Then a pause! There is however no real repose, and the least sound on deck, the falling of anything heavy—at other times quite unnoticed—alarms us into the expectation of new onsets. At noon, as we sate at dinner, there was renewed and excessive straining in the ship, and even in the cabin we heard such a rushing sound in the ice without, that it seemed as if the whole frozen sea would the next moment boil and rise in vapour. During all the afternoon the noise continues, and all the fissures send forth dense vapours, like hot springs. During the day no quiet for reading or working, and every night almost our sleep is disturbed by a horrible awaking within a great creaking, groaning coffin. Men can accustom themselves to almost anything; but to these daily recurring shocks, and the constantly renewed question as to the end and issue of it all, we cannot grow accustomed."

8. There is however such an intolerable monotony in my diary, that, to spare my readers, I thus, in a few words, resuming its contents, describe our situation:—"One of us, to-day, remarked very truly, that he saw perfectly well how one might lose his reason with the continuance of these sudden and incessant assaults. It is not dangers that we fear, but worse far; we are kept in a constant state of readiness to meet destruction, and know not whether it will come to-day, or to-morrow, or in a year. Every night we are startled out of sleep, and, like hunted animals, up we spring to await amid an awful darkness the end of an enterprise

from which all hope of success has departed. It becomes at last a mere mechanical process to seize our rifles and our bag of necessaries and rush on deck. In the daytime, leaning over the bulwarks of the ship, which trembles, yea, almost quivers the while, we look out on a continual work of destruction going on, and at night, as we listen to the loud and ever-increasing noises of the ice, we gather that the forces of our enemy are increasing."

CHAPTER V.

OUR FIRST WINTER (1872) IN THE ICE.

1. IN the beginning of November we were already environed by a deep twilight ; but our dreary waste had become of magical beauty ; the rigging, white with frost, stood out, spectre-like, against the grey-blue of the heavens ; the ice, broken into a thousand forms and overspread with a covering of snow, had now assumed the cold pure aspect of alabaster shaded with the tender hues of arragonite. Southward at noon we saw veils of frosty vapour rise into the carmine-coloured sky out of the fissures and "ice-holes," in which the water seemed to boil.

2. All our preparations for wintering had now been completed. Lieutenant Weyprecht struck the top-masts to diminish pressure from the wind ; some sails were still kept set, in order that the ship, in the event of her being set free, might at once get under weigh. The fore-part of the ship only could be covered in as a tent, for the preparations to abandon her in case of need compelled us to leave her after-part uncovered. There, in perfect order, lay all the materials we meant to take with us, our provisions, ammunition, tents, sledges, &c. The ship was surrounded with a wall of snow and ice, which we constantly restored, whenever it was injured by pressure from without, and her deck was gradually overspread with a mantle of snow, which contributed, however, to maintain an equable warmth in the ship. Our distance from land rendered it impossible to cover the deck with a layer of sand, which would have prevented the melting of the snow from the warmth of the ship.

3. The temperature of November rose once only—about the middle of the month—considerably; but, except on that occasion, the thermometer stood with tolerable regularity below -13° F., and on the 20th of the month it reached its minimum at -33° F. Winds, from whatever quarter they might blow, constantly raised the temperature, because the colder air was thus modified by the warmer which lay above



THE TWILIGHT IN NOVEMBER, 1872.

the open spaces of sea-water; calms were accompanied by a rapid intensification of cold. Wind, increased drifting, pressure, and the formation of fissures—all these are naturally connected. New openings were quickly covered with young ice, which presented a smooth surface when formed by less intense cold, but when the temperature fell lower, its saline contents were exuded in a moist, tough layer, which lay on its surface about an inch thick. In this state of the ice, sledge-

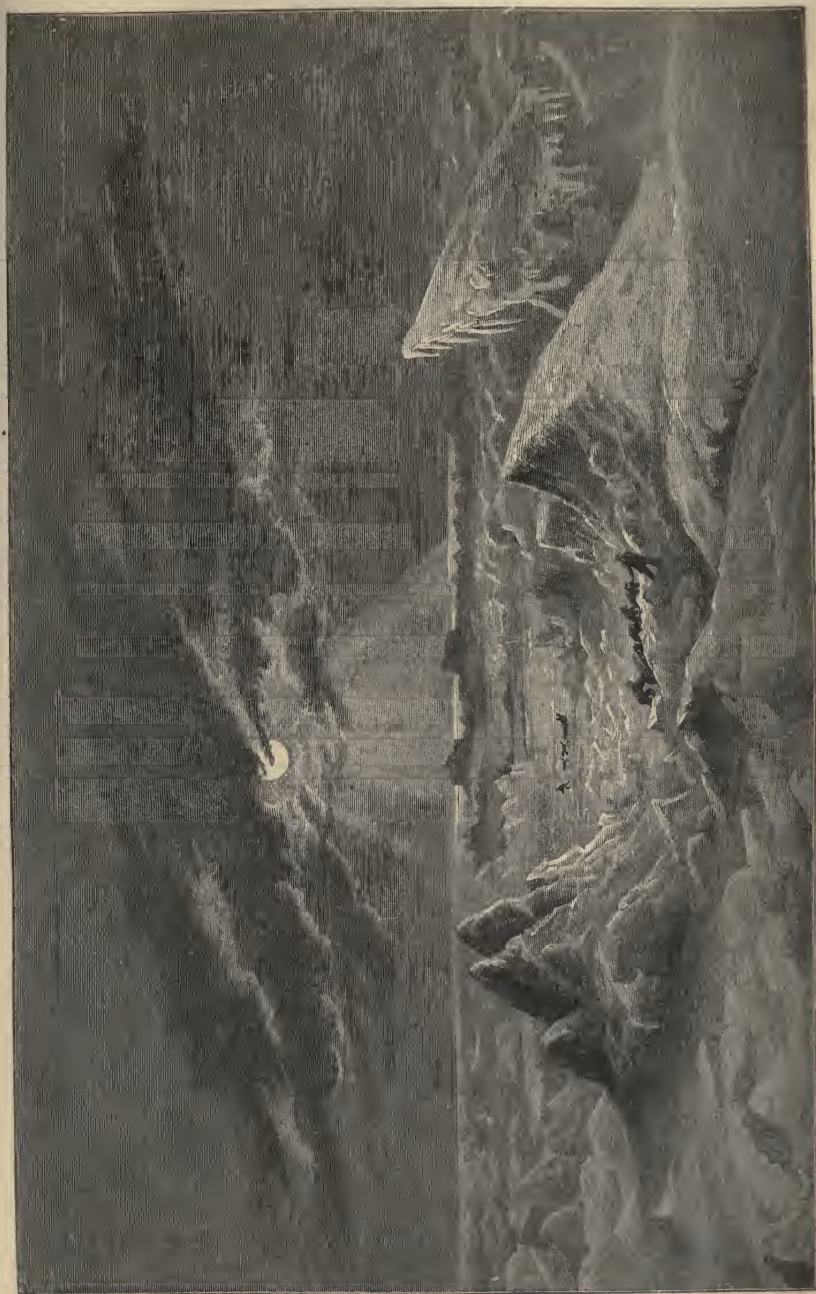
travelling was rendered more difficult, and even walking was far from easy; for it is only under a temperature ranging from -4° F. to -13° F. that this layer is frozen. The incessant rending of the ice-sheet, by exposing the warmer surface of the sea, tends to mitigate the cold, while, on the other hand, the freezing of these fissures augments the quantity of ice.

4. In the beginning of the month our nights were dark, and it was only occasionally that the light of the aurora and meteors visited us with their fleeting splendours. Although



SUMBU CHASED FOR A FOX.

in clear weather day was still distinguishable from night, yet the darkness, even at noon, was so great, that mists could not be seen, but felt only, and it was no longer possible, without the light of a lantern, to make even the slightest sketch, or to take aim with the rifle. Hence, when we met with bears we could not be certain of our aim, if they were at any distance from us, and, on one occasion, Sumbu was mistaken for a fox, chased, and but for my coming up would have been shot.



WANDERINGS ON THE ICE IN OUR FIRST WINTER.

5. The first days of November passed away without any new disturbance from the movement of the masses of ice, and our feeling of security grew apace, and with it our hopes revived, never again to leave us entirely, not even when the pressures returned, as they did too soon. Once more the fields of ice, firmly pressed together, were rent asunder; fissures opened out, and shone in the moonlight like rivers of silver. The night of Nov. 20 was one of extreme anxiety. A mountain formed of piles of broken ice bore down on us amid a fearful din, threatening to bury the ship. Silent, and conscious of our utter helplessness, we watched this gigantic heap of crashing ice-tables drifting nearer and nearer, crushing as it advanced the heaviest pieces of ice with a noise which echoed through our ship. Escape seemed impossible: and Providence alone arrested its career. This night the crew received each an extra glass of grog to obliterate the impression of this terrible crisis.

6. With the exception of books, we had no other amusement than short expeditions, never extending beyond a mile from the ship, in which we were accompanied by all the dogs. We generally set out with two small sledges, and, when the moon was not shining, with our rifles ready to fire, for the darkness and the utter absence of open spaces on the ice imposed the utmost caution against bears. At a very short distance we could see nothing of the ship, and only by our footsteps on the snow could we make out where we were and find the way back. In these expeditions we were exposed to another danger—the risk of being cut off from the ship by the breaking-up of one of the drifting floes. Even the dogs felt the insecurity of recently-formed ice, and put their feet on it with fear and hesitation, and only by compulsion. There seemed to be a cunning agreement among them to shirk the work altogether; for they often rushed away into the coal-house, and threw the harness of the sledges into inextricable confusion.

7. December came, but it brought no change in our situation. Our life became more and more monotonous; one day differed in no respect from another, it was but a mere succession of dates, and time was reckoned merely by the hours for eating and sleeping. The ice, however, did not

share in the universal repose. It was never weary of threatening; no day elapsed without movement on its part. My journal records December 1, 8, 9, 19, 20, 21, 24, 26, 28, 29, 30, and 31, as days of special disturbance and agitation. On the 20th, as we were talking in the coal-house of the approaching festival of Christmas, a sudden violent movement of the ice surprised us, and rushing out we found that the floe on which the house stood was breaking up. With all haste we endeavoured to save as much as possible of the coal and materials, and moved them close to the ship. The minimum temperature of December was -26° F.; the mean of the whole month amounted to -22° F.; and the extreme of cold, -33° F., was reached on the 26th. A few days before Christmas the temperature rose to a little below -13° F. It may be observed that the lower temperatures were registered during the prevalence of winds from the south-east, and the higher during winds from the north.

8. When the moon returned in the middle of December, our sledge expeditions were extended to a distance of $1\frac{1}{2}$ miles from the ship, over snow and hummocks, to recently frozen ice-holes, the lonely beauty of which, edged with dark masses of ice, in the distance, and lying under the clear silver light of the moon, filled us with feelings of profound melancholy. On returning from one of these expeditions to our vessel, after we had unharnessed the dogs, we heard loud barks from Sumbu, and looking round saw a bear close beside him, which Orel managed to shoot dead when he was not above five paces from the rope-ladder on the port side of the vessel. He was at once cut up, the dogs meanwhile looking on with profound attention; and in reward for his watchfulness, Sumbu was indulged with an extra good feast—the heart and tongue of the bear, which, as yet, we ourselves had not learnt to eat and enjoy. On the 18th, however, he encountered our heavy displeasure for the offence of frightening off a fox, which had ventured to come very near the vessel.

9. When there was no moon it was perfectly dark, even during the day; but on December 14, in a very clear forenoon, we saw in the south a tender orange segment of light, three or four degrees above the horizon, edged with green, sharply defined against the dark sky, and when the moon,

high in the heavens, faced this arch of light, a peculiar faint twilight was observable. But generally there was no difference between the light of midday and the light of midnight. The heavens were usually overcast, and the light of the aurora, during the few minutes of its greatest intensity, seldom exceeded that of the moon in its first quarter. But how deep would be the night of the Polar regions, if the land, instead of being white with snow, were covered with forests! On December 20 we were unable, even at noon, to read anything but the titles of books of the largest type; a man's eyes were



ENCOUNTER WITH A POLAR BEAR.

invisible at the distance of a few paces, and at fifty even the stoutest ropes of the ship were scarcely discernible. The effect of the long Polar night—when the range of the light of a lamp is the whole world for man—is most oppressive to the feelings; nor can habit ever reconcile those who have lived under the influences of civilization to its gloom and solitude. It can be a home only to men who spend their existence in eating and drinking and sleeping, without any disturbing recollection of a better existence. The depression



ICE-HOLE COVERED WITH YOUNG ICE.

was made more intense by the consciousness that we had been driven into an utterly unknown region and with our eyes bound. Work, incessant work, was the only resource in these circumstances.

10. Again from my journal I reproduce some passages which express the feelings which passed through our minds—through mine at least—during this season of the *Tegetthoff's* first winter in the ice:—"December 21—The middle of the long night. It is noon, and, though nothing can be lighter than the colour of all that surrounds us—of the snow—yet it is as dark as midnight. Nothing but a pale yellow sheen hovers over the south. The sun has sunk below the horizon $11^{\circ} 40'$, and we should have to ascend a mountain eighteen and a half (German) miles high in order to behold it. Nothing is to be seen, neither bears nor men, and we only hear the steps of those who are near us. We see but the confused outline even of the ship, as she drifts hither and thither with the floe, a prisoner in the fetters of the ice, the sport of winds and currents, carrying her further and further into the still and silent realm of death. A definite object, with hope to inspire them, raises men above toils and troubles of every kind; but exile like ours, when the sacrifice seems useless, is hard to be borne. An inexorable 'No' lays its ban on every hope, and daily struggle for self-preservation is our lot. If we attempt to fathom destiny, our utmost hopes are liberation from our icy captivity some time next summer, and the reaching the coast of Siberia. Siberia a hope! And yet how changeable are the feelings when the reign of monotony is interrupted! The moon is up—darkness exists no more. In the North the moon is an event—it is life, everything almost; it is the only link which connects us with the far-distant home. As its beams fall on the meanest forms, diamonds blaze forth in its light from the snow and the frost, and the soul feels the beauty of the transformation. She looks down on us like a returning friend that watches over us, and unfolds bewitching forms and magic images to cheer us. Two weeks ago she rose above the horizon, first as a blood-red disk, then paled as she climbed higher and higher, till she stands out the clear, silver-bright, full moon."

11. Christmas had come; the season when in the forests of

our far-distant home the branches of the pine-trees are heavy laden with snow, and which ever comes back with the memories of the days of our youth, and with the remembrances of our families and absent friends. Only for a short time, about noon, we were made uneasy by a movement and pressure of the ice. But the alarm passed away, and we gathered together for a choice and gorgeous feast, both on Christmas Eve and Christmas Day, and each of the cabin-mess had a bottle of good wine to himself. Carlsen and Lusina were our guests. Each of the crew received half a bottle of wine, together with a quarter of a bottle of "artificial wine,"¹ and in addition an allowance of grog, so weak, however, that even a baby might have drunk it without harm. Dried fish, roast bear well kept and seasoned, nuts and the like, contributed in their way to heighten the joyous feelings which, this day at least, animate even the most miserable of men. The dogs, at other times so insatiable, had for once enough and to spare, and carried off the fragments to bury them in the snow. The contents of a chest full of presents, which we had brought with us, were distributed by lot, and great was the delight of those who won a bottle of rum or a few cigars.

12. The last day of the year 1872 afforded us no very happy thoughts as we looked back on its events; it had been to us a year of disappointments. The comparison drawn between our actual condition and the expectations we had so ardently cherished seemed full of the bitterest irony. This day also, about noon, a pressure from the ice, which lasted but a short time, alarmed us all, and we rushed on deck to make our usual preparations. The enemy, however, passed away without further disturbance, and cheerfully and socially we awaited the first hour of the new year. With a bottle of champagne, one of the two still left, we meant to greet its coming in with that hopefulness of mind which seems extinguishable in all the changes and chances of life. But the champagne, alas! proved a delusion. Klotz, the Tyrolese, in one of his brown studies exposed this precious bottle for four hours to a temperature of -19° F., and when he produced it the bottle had burst and the wine was thoroughly frozen. At midnight the crew serenaded us, and we afterwards marched

¹ A decoction prepared by Kepes.

forth in a body with torches, and walked round the ship, whose rigging glowed in the light of the tarred torches. The frosted fur garments of the men seemed edged with shining light, and a red glare fell on the masses of ice.

13. To-day, too, we allowed the dogs to descend into our cabin,—the constant object of their longings. The poor animals were so dazzled by looking at our lamp, that they almost took it for the sun itself; but by and by their attention



CARLSEN MAKES THE ENTRY IN THE LOG.

was directed exclusively to the rich remains of our dinner, the sight of which appeared completely to satisfy their notions of the wonders of the cabin. After behaving themselves with great propriety, they again quietly withdrew, all except Jubinal, who appeared to be indignant at the deceitfulness of our conduct, inasmuch as we had allowed him to starve so long on dried horse-flesh and on crushed bear's head, while we revelled in luxury. He accordingly made his way into Lieutenant Brosch's cabin, where, discovering a mountain of macaroni, he immediately attacked it, and warned us off from every attempt to rescue it, by growling fiercely till he had

finished it all. Sumbu, however, with much levity, suffered himself to be made drunk by the sailors with rum, and everything which he had scraped together for weeks and buried in the snow and so carefully watched, was stolen from him by the other dogs in one night.

14. Another year had now glided away. Looking anxiously into the future, we shortsighted mortals saw the fulfilment of our highest wishes in being liberated from the floe. In the pious manner of the whalers of the Arctic Ocean, Carlsen wrote this day in the log: "Önsker at Gud maa vere med os i det nye aar, da kan intet vare imod os—*May God be with us in the new year and nothing can be against us.*" In this new year, with its happier issues, was verified again the eternal truth, that Providence acts in ways not to be fathomed, and that it is folly in man to mark out his own path beforehand according to his own mind. The sun of this new year, whose beams were to light us to new lands and discoveries, was still low beneath the horizon.

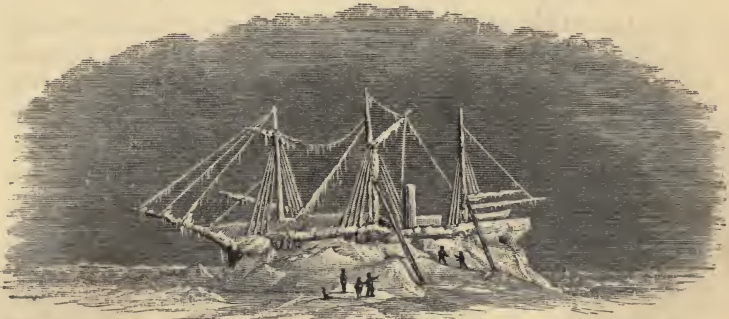
CHAPTER VI.

LIFE ON BOARD THE "TEGETTHOFF."

1. LIKE a spectre in white, the ship stretches out her arms, as if in silent complaint, towards the heaven, and rests, in cruel mockery of her destiny, on a mountain, not of water, but of ice, and seems like a building ready to fall in. A wall of snow and ice surrounds her hull, snow lies thick on her deck, and her rigging is stiffened in icy lines. Could we see through her sides, we should then behold four-and-twenty men parted off in two spaces under the suns of two lamps. Let us inspect them, and first the cabin of the officers in the after-part of the ship.

2. Neither few nor slight were our struggles to remedy the various inconveniences which we encountered ; their enumeration here is meant to aid the experience of future adventurers. Though our arrangements were far from complete or perfect, we had never to complain of the discomforts which previous expeditions, even the second German expedition to Greenland, had to endure from the excessive condensation of moisture. Against this enemy we protected ourselves by the snow wall which we raised round the ship, by covering in the deck windows of the cabin, by lining our quarters with vulcanized india-rubber, by sheds built over the cabin stairs, all acting as condensers. Before, however, I enter on the unavoidable inconveniences to which we were exposed by the formation of ice, or by damp and the sudden change of temperature, I would preface my remarks by observing, that all these discomforts and inconveniences are to be endured far more easily than would seem possible to the reader, and that life on board a ship of a North Pole expedition, under normal circumstances, is free from annoyances worthy of mention.

3. It is a matter of the last importance to keep the air pure and wholesome, and to maintain an equable warmth in the quarters of the officers and crew. The accumulation of moisture and consequent congelation in them is an inconvenience which requires incessant watchfulness to avert.¹ The destruction of the snow wall which surrounded the ship increased the condensation; for that snow covering was nothing but a greatcoat for the ship and those on board. In the beginning of November 1872 the frost on the bulk-heads of the berths, and on those parts of the cabins which were



THE "TEGETTHOFF" IN THE FULL MOON.

impervious to warmer air, was very perceptible. The bed-clothes were frozen at night to the sides of the ship, the iron knees of the beams—not, alas! covered with felt—gleamed like stalactites, small glaciers were formed under the berths, and even in October the skylight was frozen, inches thick. Every rise in the temperature caused this formation of ice to fall down like a "douche," and with the opening of a door a white vapour, even in October, streamed along the deck. We prevented the increase of moisture by cutting the openings in the deck, over which we placed two chimneys, each a foot high and covered with a thin metal cap. We boarded up the skylight, leaving a lid by which to air the

¹ Parry mentions, as a fact illustrative of the increase of moisture and its condensation into ice, that about a hundred hundredweights of ice were once removed from the lower quarters of the *Hecla*, which had accumulated there from the breath, the steam caused by cooking, and the moisture brought down by the clothes of the men.

cabin. But in spite of all this the variations of temperature within our quarters were extraordinary. If the heat of the air in the middle of the cabin and on a level with our heads rose from -2° F. to 76° F.—our usual mean temperature—it amounted on the floor to a little above 34° F., and fell during the night not unfrequently below freezing-point.

4. But the greatest inconvenience perhaps with which we had to contend, arose from the removal of the protection of the tent roof, which was stretched over the after-part of the ship. The want of this prevented our walking on the deck in bad weather, and it also hindered perfect ventilation, which could only be secured, with the constant heat which was maintained below, by keeping the deck windows open. Warming the air from underneath the floor of the cabin would possibly be preferable to the best stove. We had the stove of Meidingen of Carlsruhe, the excellence of which had been tested on the *Germania*. This stove consumed only 20 lbs. of coals daily, with a thermometer at -13° F., and after the adoption of certain arrangements to save the fuel, its consumption amounted to only 12 lbs. Even in the coldest period of the winter we never consumed more than $4\frac{1}{2}$ cwt. in a month. The lighting of the messroom and quarters of the men was effected by petroleum, the daily consumption of which amounted to about $2\frac{3}{8}$ lbs. Altogether there were in the ship two large and two small lamps, besides the deck-lantern, which were burning day and night. The berths were lighted with train-oil; for special purposes, such as drawing, candles were used.

5. The stove had one troublesome enemy in the shape of a hole, as big as a man's head, in the door of the mess-room, through which a cold stream of air poured itself; and as the ship dipped forward considerably, and the hearth was only about a foot above the floor of the mess-room, this stream filled the whole space with a lake of cold air from three to four feet deep. Hence, while in the berth close by the stove there was a temperature ranging between 100° F. and 131° F., in the other, there was one which would have sufficed for the North Pole itself. In the former a hippopotamus would have felt himself quite comfortable, and Orel, the unhappy occupant of it, was often compelled to rush on deck, when the

ice-pressures alarmed us, experiencing in passing from his berth to the deck a difference of temperature amounting to 189° F. In the other berth of the mess-room, water, lemon-juice, and vinegar froze on the floor. Those who occupied it, as they lay in beds, or those who sat at the table to read, were in a cold bath reaching up to their neck. But the hole was an indispensable necessity, for it was better to endure the discomfort even of such a draught than to impede ventilation. Other causes, too, disturbed the equilibrium of temperature. At night the stove was sometimes, from sanitary considerations, not lighted, and then all had to sleep in that cold bath. With the increase of cold and wind, our inconveniences often assumed somewhat ludicrous forms. Some passages from my journal will make this clear:—"When any come below the temperature falls. If the door be opened there rolls in a mass of white vapour; if any one opens a book which he has brought with him, it smokes as if it were on fire. A cloud surrounds those that enter, and if a drop of water falls on their clothes, it is at once converted into ice, even at the stove. Frequently the upper stratum of air in the mess-room becomes so heated, that the deck light has to be opened, and then it rises up, like smoke out of a chimney, to blend itself with the cold air without."

6. The arrangements of the officers' mess-room are simple and in harmony with its purpose. Here stands a large table, used for study and for meals; the smaller berths, where the officers sleep, are round the sides of the mess-room—just large enough to enable a man to breathe in. There, in a recess between two pillars, an untold resource, the library (of about 400 volumes, chiefly scientific); close beside it the chronometers; and lastly, the inevitable evils, the medical stores, ranged round the mast. By the side of scientific works stand Petermann's *Mittheilungen*; and between Milton's *Paradise Lost* and Shakespeare's immortal works, a whole tribe of romances, which were read with never-tiring delight. Our instruments, too, frosted with ice, are here, and a chest containing our journals. Once a month a cask, filled with wine—the chemical wine—concocted of snow, alcohol, tannin, sugar, and glycerine, was placed there. Dr. Kepes was not only our physician, but our wine brewer. One thing more we

have to mention, which, alas! incommoded us much too little—wine; that is, wine made in Austria, from grapes. As we have already mentioned, the want of room in the cabin prevented our laying in a large stock, and the supplies we had were frozen in a cellar below the mess-room, about the middle of December, for the temperature of even this place was about 16° F. or 14° F. Each, however, had a bottle of rum as an allowance for eighteen days. But quite inexhaustible was the supply of our common drink—melted snow—a great jar of which, filled to the brim, stood always on the table. Under the cabin were our supplies of alcohol and petroleum, accessible only by well-fitting pipes, but possible volcanoes as far as our safety was concerned. From the accumulation of so many combustible materials, together with 20,000 cartridges, and with several lamps constantly burning, it is clear that the danger of fire was great. But once only had we an alarm from this source—when Carlsen caused us much trepidation by accidentally discharging a rifle in the cartridge magazine.

7. Let us now turn to the persons who occupied this mess-room. Marola, the steward, lights the lamp, and kindles the fire, and awakens those who were not already awake by the smoke from the stove, with the cry, “Signori, le sette e tre quarti, prego d'alzarsi;” and after a pause of a quarter of an hour, during which the sleepers seem carefully to deny their existence, he startles this silence of indifference by the second call: “Colazion' in tavola.” Out of every berth now comes forth its occupant, each in picturesque costume; costumes teach us how superficial after all is civilization in man!

8. The day's work begins. The watch, as ever, walks the deck, lest the ice should slip away from the world unobserved; in the mess-room meanwhile calculations or drawing or writing are in full operation. Our daily meals consist of a breakfast of cocoa, biscuit, and butter; of a dinner of soup, boiled beef, preserved vegetables, and *café noir*; and of tea in the evening, with hard biscuit, butter, cheese, and ham. I would recommend *potage* instead of *tea* for the evening meal to all future expeditions. Many of the articles of food must be thawed before the process of cooking begins, the greater part

of the provisions being frozen as hard as iron. The tins with preserved meat stand for hours in boiling water, and the things for supper on the cabin stove, in order to be thawed. A plate of cheese that steams, butter as hard as a stone, which has thrown off the salt it contained in great lumps from the action of frost, a ham as hard as the never-thawed ground of the Tundra of Siberia, form an icy repast, specially if we use knives, which are so cold that they often break with the least exertion of force. I will here notice the sanitary importance—insisted on by Parry and Ross—of fresh bread, which the cook in an Arctic ship should be able to bake about twice a week. On board the *Tegetthoff*



DIVINE SERVICE ON DECK.

we used at first Liebig's "baking-powder," but this from being kept too long gave such a disagreeable taste to the bread, that we gave it up and contented ourselves with a defective leaven.

9. Every Sunday at noon we celebrated Divine Service. Under the shelter of the deck-tent, the Gospel was read to the little band of Christians gathered together by the sound of the ship's bell, in all that grave simplicity which

marked the worship of the early Christian Church. The Service over, we then sat down to the Sunday dinner, which was graced by a glass of wine and cake. Carlsen and Lusina were our guests by turns. Carlsen always appeared in his wig, trimmed with extra care, and on the high festivals of the Church decorated also with the cross of the order of St. Olaf. Lusina, our excellent boatswain, was ready to talk with enthusiasm on any subject whatever, prefacing his stream of words with some sententious remark or with some far-fetched introduction. During our meals the conversation turned on our plans for the future; we talked of Polar bears; we discussed the question of the existence of Gillis' Land and the possibility of our reaching Siberia; but very seldom did we venture to speak of what filled the minds of all—our captivity in the ice. Political combinations formed a favourite theme; and as we had some old numbers of the *Neue Frei Presse* on board, they furnished an inexhaustible source of topics for conversation. The events of the year 1870 were related as the latest news, and we thought anxiously of the issue of the war between Germany and France, and feared lest Austria should be compelled to take part in it.

10. After dinner came the hour for contemplation; in our lonely berths and by the side of our beds we sat down to brood—to listen to our watches beating seconds. The English Arctic expeditions, during the long period of their enforced leisure, found a great source of amusement and distraction in theatricals. But the ships of these expeditions had far larger crews than the *Tegetthoff*, and the men could be more easily spared for these recreations. But there were other reasons why we could not think of following the example of the English. Our situation during the first winter was far too serious for such things, and no other place for the theatre was at our disposal except the barricaded deck; and we should have had to sit there with a thermometer marking from 25° to 37° of cold, on the centigrade scale, and see how the actors and the audience suddenly rubbed their frost-bitten feet with snow! There was one other potent reason for this renunciation—our performances must have been in four different languages.

11. Monotonous beyond all monotony is life in the long night of a Polar winter, and exile can never on earth be so entire as here under the dreadful triumvirate—darkness, cold, and solitude. In such a life, the man who surrenders himself to idleness, or even to sleeping during the day, must necessarily be utterly demoralized. In fact, nothing can be more destructive to an expedition wintering in the Arctic regions than the indulgence of mental or bodily lassitude. The real ground of the failure of the attempts made in earlier times to winter in Jan Mayen and other places in the far North was probably the utter want of discipline. There is, however, a widely spread, though mistaken view, that the long day of Polar lands is oppressive to man. Nothing is more untrue; for not continual light, but constant darkness, is distressing. Continual daylight heightens the energies and vital powers; and yet, in our own first winter, it was less the darkness which wore us than the perpetual anxiety; when our greatest consolation was found in the Arabic proverb, "*In niz beguzared*" (*This too will pass away*), inscribed on our cabin wall.

12. After supper, before going to bed, we smoked our cigars in the shed over the cabin steps, with a thermometer from 25° to 37° below zero C., and talked pleasantly over bygone days, though our thoughts were not unmixed with gloomy forebodings, as we heard ever and anon the ominous sounds that issued from the moving ice. Existence on board a straining and groaning ship resembles life over a volcano. It was only after we had been some time in this ice-covered wooden grotto that the temperature rose, through our own heat, a few degrees, and it was certainly some testimony to the excellence of my down-quilted clothes that I could wear them in the cabin without being distressed by the heat, and yet I was able to sit the whole evening in this freezing hole without suffering from cold. A train-oil lamp sends out almost more smoke than light, and when the snow drifted, we had to contend with the importunities of the dogs, who seemed to regard the deck shed as a great dog-kennel. With a sudden rise of the outer temperature this shed became utterly uninhabitable, for its coating of ice then melted and fell down like rain.

13. The effect of the long winter night is even greater on the body than on the mind, because of the insufficient opportunities for exercise. Middendorf contrasting the influence of climate on men remarks:—"I consider travels in cold regions, even in the most unfavourable conditions of climate, to be far less dangerous to life than travels under the tropics. The former certainly are unutterably more miserable, but as certainly less deadly. I say this notwithstanding the danger which threatens ships when they penetrate far within the realms of ice. We are never secure from sudden and deadly attacks of illness in tropical countries, but the longer we remain in them the less is the danger; whereas the high North deteriorates the constitution of the blood, and after three winters, very few can stand a fourth." To the influences of Polar life detrimental to health must be added the constant hindrance to perspiration from wearing an extra quantity of woollen clothing—more or less hurtful as it is more or less waterproof—the want of fresh animal and vegetable food, and last, but not least, the periodic departure of light and warmth.

14. Our sanitary condition during the two winters we spent on board the *Tegetthoff* was not altogether satisfactory. Scorbutic affections of the mouth and diseases of the lungs appeared sometimes in distressing shapes, and scarcely a day passed in which we had not one or two on the sick-list. I believe, however, that our trying situation had far more to do with these evils than the southern blood and breeding of our people. The incessant watchfulness and care of Dr. Kepes left nothing undone which would counteract the evil influences to which we were exposed. The berths of the crew were changed in rotation, and those which were exposed to the greatest accumulation of ice were dried by warm air conveyed through movable pipes. Want of exercise, constant change of temperature, depression of mind, the periodic scarcity of fresh meat, were the causes of the scurvy. In our first winter it appeared only in the more crowded quarters of the crew. It was then also that the first symptoms of lung-disease appeared in Krisch, the engineer, which he probably contracted from "catching cold." From that time he liked to sit by the stove and always

complained of cold. Our supplies of preservatives against, and remedies for scurvy were rather limited, although we had at our disposal several hundred tins of preserved vegetables, a cask of cloud-berries (*Rubus chamæmorus*), which we had brought from Tromsø, and above a hundred bottles of lime-juice. Wine also is an important preservative; we therefore served out to the crew, notwithstanding our small supply, twice a week, not Kepes' artificial, but real wine—at the rate of two bottles for eighteen men. No doubt scorbutic symptoms would have been far more general and severe, had we not been fortunate enough to shoot no less than sixty-seven Polar bears, a larger number than had fallen to any previous expedition. It was more a sign of our good intentions to leave nothing undone or untried in our efforts against this malady, than any actual service it was to us, that we sowed cress and cabbage—radishes did not succeed—in a bed which we suspended over the stove. It was interesting, however, to observe how the little plants of cress, with every change of position, always turned to the light of the lamp, growing to the height of three inches, and in spite of their brimstone colour retaining the true cress flavour.

15. The use of the bath tends greatly to promote health, for without it the skin of the body has no other stimulant; but the insecurity of our position rendered bathing sometimes a somewhat doubtful enjoyment. I remember many cases, when some of us, while bathing in the cold dark washing place in lukewarm water an inch deep, were alarmed by a sudden pressure of ice. Ultimately we gave up this practice, finding that it produced a troublesome amount of damp.

16. To a stranger, who should have visited us during this winter, nothing in the ship would have been so surprising and interesting as a visit to the quarters of the crew. Except for an hour, from five to six o'clock in the evening, when they were encouraged to take exercise in the open air, the rest of their time was spent in school, or in the duties of the watch, or in the work of the ship. Our supply of Slavonic books was unfortunately not very ample, and besides, not all the crew were able to read; the greater therefore was their tendency, like men of southern climes, to harmless noise, and I believe that some of our people, during the whole

expedition, never ceased to speak. Here I beg to insert some passages from my journal:—"Passing by the steaming kitchen, we enter their messroom. Here in a narrow space we find the toilers of the sea and the mountains—eighteen in number. A little band of Dalmatians who for the first time encounter darkness and cold, the horrors of which are increased tenfold to men born and bred in the sunny South. Truly it could be no little thing to such men to be torn from sleep almost every night by the movement of the ice, to sit day after day in the long night of winter without any real intellectual occupation, and yet not to become demoralized, but remain calm and composed, and ever ready to obey and oblige. Can anything higher be said in their praise? Those men slept, each by himself, in a double row of berths; only Lusina the boatswain, and Carlsen the harpooner, who had circumnavigated Spitzbergen and Novaya Zemlya, occupied a separate partition. The clatter of the tongues of so many vehement Southerners was like the sound made by the smaller wheels of a machine, while the naive simplicity of the grave Tyrolese came in between times, like the steady beat of a great cog-wheel. It was a miniature reproduction of the confusion of tongues of Babel. Lusina speaks Italian to the occupants of the officers' cabin, English with Carlsen, French with Dr. Kepes, and Slavonic with the crew. Carlsen had adopted for the 'Slavonians,' as he called our people, a kind of speech compounded of Norwegian, English, German, Italian, and Slavonic. The crew, with the exception of the two Italians, speak Slavonic among themselves. The head of the little German colony is the cook, a Styrian; his heart is better than his culinary skill, for only too readily he leaves his work to be done by the stove. There is also among them a Moravian, Pospischill, the Vulcan of the ship; but we must return to the predominant race—the Slavonic. There is Lukinovich, a very Harpagon, always collecting, finding treasures in nails, empty bottles, lamp wicks, and searching even under the snow for articles wherewith to fill his sack—the sack which he was one day to leave behind him, much against the grain, when we abandoned the ship. There is Marola, the steward, and Fallesich, who had worked at the Suez Canal; these are our great singers. Then Palmich with

his lance, the man whose zeal never bated, and whose very glance transfixed everything; Vecerina, the Job of the party, and the merry Titans, Sussich and Catarinich; Latkovich and Lettis, 'the philosophers;' Stiglich, the immovable confessor of passive obedience and the unlawfulness of resistance; Zaninovich, the 'pearl;' Haller the herdsman and Klotz the prophet. Five of these men had run away from their wives. Klotz the prophet was under all circumstances, not indeed the most useful, but the most interesting person of this little community. A lofty calm worthy of an Evangelist graced his outer man; of still greater stature than Andreas Hofer, he wore, like him, a large black beard. As a hunter, a guide, a collector of stones, and a lonely enthusiast, he had moved about the mountains of his home, leading a life of visions. At home he was regarded as an incomparably bold mountaineer, and the ropes of the ship were to him so many convenient foot-paths. His reputation as a physician in his native land was great, and on board ship he failed not with his good offices. Haller, his fellow-countryman, shared with Klotz the office of armourer, and the duties of hunter and driver of the sledge-dogs; and when we began our sledge journeys, both of them were ready to relieve others in dragging. Both had served in the army, Klotz on the Tonale, Haller on the Stelvio, and in 1868 the latter had been my useful companion when I was engaged in the survey of the Ortler and Adamello Alps. 'The philosophers' of our party, Latkovich and Lettis, had drawn a fine distinction between the different layers of ice, according as they contained a greater or less amount of saline matter: *Ghiaccio della prima* and *Ghiaccio della seconda qualità*."

17. To obviate as far as possible the evils of too much leisure among the men, a school was instituted at the beginning of the January of the second year; Lieutenant Weyprecht, Brosch, and Orel undertook the Italians and Slavonians, and I the Tyrolese. To avoid all confusion I retired with my smaller body of pupils to the shed on deck. Here, with the thermometer at 25° to 37° below zero C., the seed of wisdom was sown in the hearts of these sons of nature; but alas! the climate was not favourable to its growth. After many painful disillusion, the Pole was

ascertained to be the intersection of lines in a point, of which nothing was to be seen in reality. If in this little lecture-room an exercise had to be examined, and the scholars were obliged to hold in their breath, in order that the teacher, who spoke out of a cloud, might be able to see the slate; or when the pupils engaged in a division sum had suddenly to stop to rub their hands with snow, was it a matter of wonder if the school did not flourish exceedingly?

18. The food of the crew consisted principally of preserved meats, different kinds of pulse, and the products of the chase, amounting on an average to two bears a week. Bear-flesh, roasted, was liked by all; the seal was at first despised, till necessity corrected taste. Besides artificial wine, water was their strongest drink.

CHAPTER VII.

ICE-PRESSURES.

I. WHEN compared with the tortures we endured from the thought that we were captives in the ice, little to us seemed the dangers which threatened our existence, though these assumed the appalling form of ice-pressures. Daily almost the ship had to sustain the attacks of our old enemy, and when the ice seemed to repose, threatening indications were not wanting to warn us how short that repose might be. My journal records a long series of commotions in the ice on almost every day of January 1873, and even during the pauses the timbers of the ship continually shook and trembled and creaked. The pressures accompanied by a low grumbling noise were very great on the 3rd, and lasted till the oldest ice was shattered, during which our hatchways were displaced. On the 4th the pressures continued without intermission during the whole day. But on the 22nd they exceeded all we had hitherto experienced. When we awoke in the morning, the crashing of the masses of ice was dreadful. In the messroom we heard a deep, grumbling, rumbling noise—the ship trembled like a steam-vessel under very high pressure. When we hastened on deck we were greeted by the long howls which issued from the ice, and we were soon convinced of the exceedingly formidable character of this special onset! Ten paces astern of the ship, the ice had been heaved up in a moment into mountains. With the greatest difficulty, amid the profound darkness that prevailed, the boats were got on board, and many stores re-shipped, though some of our coals had to be sacrificed. A tent formed of sails was engulfed,

and our water-hole utterly displaced by the pressures ; it was only after many attempts that we succeeded in finding a thinner ice-table, which we pierced till we found water. January 26, again tremendous pressures roused us from sleep. In half an hour every preparation was made to leave the ship, and I believe that many of us, while waiting the issue amid the fearful din heard from the deck, longed that the ship might be crushed, in order to escape from the torture of continually preparing to depart.



ICE-PRESSURE IN THE POLAR NIGHT.

2. I will not, however, fatigue the reader with the monotonous rehearsal of our ever-recurring daily dangers, but will here insert a few passages from my journal of that date, which will suffice to explain our position :—

“ Scarcely asleep after the exhaustion and cares of the day, the timbers of the ship begin to moan and groan close by our ear, and we awake and lie listening to the onset of the ice. We hear the step of the watch on deck crackling on the ice as he paces to and fro ; as long as it is measured and

steady we know there is nothing to be feared. Again that uncanny creaking in the timbers, and the watch comes to announce to those below that the terrible movement in the ice has begun, and once more we all spring from our beds, put on our fur clothes, seize our ready-filled bags, and amid the darkness stand ready on deck, and listen to the war between the ice and the elements. In autumn, when the ice-fields were not nearly so large as in the winter, their collision was accompanied by a deep dull sound ; but now, rendered hard and brittle by the extreme cold, a sound as of a howl of rage¹ was emitted as they crashed together. Ever nearer come the rushing, rattling sounds, as if a thousand heavy waggons were driving over a plain. Close under us the ice begins to tremble, to moan and wail in every key ;—as the fury of the conflict increases, the grumbling becomes deeper and deeper, concentric fissures open themselves round the ship, and the shattered portions of the floes are rolled up into heaps. The intermitting howls become fearfully rapid, announcing the acme of the conflict, and anxiously we listen to the sound which we know too well. Then follows a crash and crack, and many dark lines wander over the ice : these are for a moment narrow fissures, the next moment they yawn asunder like abysses. Often with such a crash the force of the pressure seems broken ; the piles of ice collapse, like the undermined walls of a fortress, and calm is again restored. But to-day this was but the commencement, and with renewed violence a second assault of the ice begins,—then a third, yea a fourth. Tables of ice broken off from the floes around us rise perpendicularly from the sea ; some are bent under the enormous pressure, and their curved shapes attest the elasticity of ice. Like a giant in the conflict, a veteran floe, many winters old, crushes in its rotations its feeble neighbours, and in turn succumbs to the mighty iceberg—the leviathan of all ice-forms, which forces its way through a phalanx of opposing masses, crushing them to pieces as it advances. And in this wild and fearful tumult a ship—squeezed, pressed, all but crushed, by the ice ; her crew on deck, ready to leave her at a moment's notice. Boats and sledges, tents, provisions, arms and ammunition, everything prepared, if the ship should

¹ The noise produced by such collisions cannot be more fittingly expressed.

at last be destroyed—but for what?—for an escape? No one really thought this possible, though all were ready for the attempt. But again the conflict ceases, and once more we breathe freely, and can contemplate the wonderful change that has come on everything round us. A few minutes have sufficed to create a maze of mountain chains from a plain of ice. The flat surfaces covered with snow, which we saw yesterday, are gone. Ice ruins are visible on every side. Abysses gape between the shattered masses, and show the dark sea beneath. Gradually a calm has crept over all; equilibrium is reinstated in the desolate realm of ice; new ‘leads’ and ‘ice-holes’ have been opened up, but for the *Tegetthoff*, no liberation.”

CHAPTER VIII.

THE WANE OF THE LONG POLAR NIGHT.

I. ALTHOUGH the sun was mounting higher, there was no essential change in the gloom and darkness which surrounded us. In fact we were drifting during the whole of January towards the north, and were wintering nearer the Pole than any who had ever preceded us.¹ On gloomy days, noon was not distinguishable. We were now four hundred miles within the Frozen Ocean, and had been for five months the sport and play of winds and currents, and nothing indicated any change in our situation. Yet, in spite of our desperate position, the first, ever so faint, indications of the return of light filled us with joy. With a clear atmosphere, January 10, we observed for the first time at noon a decided brightness, and on the 19th a brilliant carmine was seen in the sky, an hour before noon on the southern horizon. After a long obscuration from cloudy weather, the morning twilight increased gradually, and by the end of the month it was discernible in the forenoon. As the light increased, the signs of the convulsions were more distinctly seen. Round us there rose piles of craggy ice, which, hurled up, as from a crater, by the ice-pressure of the 22nd, kept us in a state of constant fear, lest the ice-walls would break up and fall in upon us. At a little distance off, nothing was to be seen of the ship but the tops of its masts: the rest of it was hidden behind a lofty wall of ice. The ship itself, raised seven feet above the level of the sea, rested on a protuberance of ice, and, removed from its natural element, looked a truly miserable object. This ice protuberance had been formed from a floe which had been often rent asunder and frozen again, and had been rounded in a singular manner from the under-driving of the ice and the lateral pressure in its recent movements. In other respects, also, our environment had been completely changed. Before the movement in the ice on the 22nd, a

¹ Hall's contemporaneous expedition excepted.

narrow strip of level ice wound like a river through a maze of hummocks, and throughout the winter this had been diligently used for exercising the dogs. Of this nothing was now to be seen: walls of ice rose, where a fortnight before our coal-house had stood: fissures gaped on every side. In every respect the weather during this month was capricious and unaccountable. In the first two weeks, the temperature fell several times below -35° F., and on January 8, 13 and 14, quicksilver, exposed to the cold, froze to a solid mass; gin also froze, and alcohol only maintained its fluid state. Yet, notwithstanding this low temperature, the snow was always soft; and it continued to be so, amid all the variations of temperature and the high winds of this month. January 22 and 23, the temperature rose for a short time to 26° F.; everything in the ship then began to thaw, and a disagreeable moisture penetrated both our clothes and our quarters. The mean temperature of this month, in consequence of these abnormal variations, did not exceed -8° F., and was therefore about ten degrees higher than might have been expected.

2. The bears had in these last weeks kept at a regrettable distance from us. On the 12th, however, a very large fellow ventured to come within ten paces of the rope-ladder on the starboard side. We fired at him with explosive balls and he fell; but his strength was so great, that even after these terrible wounds he was able to get up and run. Explosive bullets, however, are to be recommended for encounters with bears, though their flight is rather uncertain. A bear-hunt, on the 29th and 30th, had a somewhat tragical result. About ten o'clock at night, when it was quite dark, a bear approached the ship, and with the agility of a tiger fell on Sumbu, who got away very cleverly, and by his loud barking summoned Krisch, who was then on watch, to his aid. When he was not more than ten feet from the deck Krisch fired at him and wounded him. The noise brought some of us at once, and though it was exceedingly dark and the snow very deep, a useless chase, in which I joined, forthwith began. The pursuit through the midst of driving snow became weaker; until at last I found myself alone with Palmich. We could see nothing, and heard only an occasional howl of pain. We hastened our steps through the whirling snow, till we saw, by



FRUITLESS ATTEMPT TO RESCUE MATOSCHKIN.

the dim light of our lantern, Matoschkin lying howling on the ground, and the bear a few steps from him, vigorously assailed by Sumbu, who seized him by the foot whenever he began to retreat. As Matoschkin incautiously approached too near, the bear turned, seized him, and carried him off. To fire with effect was impossible; we were too far off to take aim with our rifles. The bear continued to drag the dog along, and at last a puff of wind put out our lantern, and we soon discovered our inability to keep up with our enemy. Bitterly as we lamented the fate of the poor dog, whose howls were brought to our ears by the wind, we had nothing for it but to return to the ship. About noon next day when it was sufficiently clear, Brosch, the two Tyrolese, and I set out to ascertain the fate of the dog. The snow was drifting heavily, and we constantly sank into it as we advanced. After a toilsome walk we came on traces of blood, which Sumbu followed up, while Gillis timidly stuck to us. At last, after we had gone on for the third of a mile, Sumbu came back in a great state of excitement, and then ran on before us till he stopped at an ice-hummock, where he renewed his angry barks. We advanced with quickened steps and with our rifles cocked, and when we were about twenty paces from it the bear came out from behind, apparently in great astonishment. After several shots the bear fell, but again gathering himself up he dragged himself along like a walrus, in spite of his broken spine, with extraordinary activity towards an "ice-hole" covered with young ice. Two other shots with explosive bullets terminated his career, and Matoschkin, whose body we afterwards found behind the ice-hillock, was avenged.

3. The cold set in with great intensity with the month of February and maintained itself throughout it: the mean monthly temperature being -31° F. Repeatedly the quicksilver froze, and in the last eight days it remained solid. Even the petroleum was frozen on the 17th at -49° F. in the globe of the lamp, though it was throwing out a considerable heat. The lowest temperature we experienced was on the last day of the month, -51° F. Notwithstanding the extreme cold, the light had increased so much that a thermometer, in which the degrees were strongly marked, could be read off, even on the 3rd of the month, at ten o'clock in the

forenoon without the aid of lamplight; and on the 20th we were able to carry on our meteorological observations, without any artificial light at six o'clock in the evening. The ruddiness we observed at noon in the south grew more and more decided. On clear days we could discern, about seven o'clock in the morning, a faint twilight, and at noon of February 14 the near approach of the sun was distinctly to be traced by a bright cloud that was resting over it, though it was still below the horizon. About the middle of the month there was light enough to cause the different forms and groups of ice to cast shadows. In spite of the low temperature, we remained for hours in the open air, though previously to this period we had ventured on deck for a few minutes only at a time—the watch of course excepted. But as the daylight increased, we saw also what a dark, gloomy grave had been our abode for so long a period. All our thoughts and conversations were concentrated on the returning light of the sun. The movements of the ice ceased to be a source of dread, though for several days during the month they had been exceedingly formidable. In the course of our drifting we had penetrated into a region where never ship had been before. The following table exhibits the course of the *Tegetthoff*, as she drifted from August 21, 1872, to February 27, 1873:—

Time.	N. Lat.	E. Lon.	Time.	N. Lat.	E. Lon.
Aug. 21, 1872, day when the ship was beset	76°22	62°3	Nov. 9, 1872.....	78°15	69°42
Sept. 1, 1872	76°25	62°50	„ 14 „	78°8	71°16
„ 4 „	76°23	62°49	„ 18 „	78°10	70°31
„ 11 „	76°35	60°18	„ 28 „	78°13	69°48
„ 14 „	76°37	60°50	Dec. 4 „	78°19	69°1
„ 21 „	76°28	63°9	„ 8 „	78°21	69°2
„ 26 „	76°36	64°8	„ 12 „	78°25	68°57
„ 27 „	76°38	64°4	„ 16 „	78°22	67°42
„ 28 „	76°37	64°10	„ 19 „	78°13	67°11
Oct. 1 „	76°50	65°22	„ 26 „	78°10	68°19
„ 2 „	76°59	65°48	Jan. 2, 1873.....	78°37	66°56
„ 3 „	77°4	66°1	„ 19 „	78°43	69°32
„ 17 „	77°50	69°22	„ 26 „	78°50	71°47
„ 18 „	77°48	69°8	Feb. 2 „	78°45	73°7
„ 22 „	77°46	69°26	„ 14 „	78°12	72°20
„ 31 „	77°53	69°12	„ 19 „	78°15	71°38
Nov. 5 „	77°53	69°30	„ 23 „	79°11	
			„ 27 „	79°12	

4. The inspection of this table shows that the movement of the ship was retarded as the increasing cold closed the open places of the sea, and when we fell under the influence of the Siberian ice-drift from east to west. It may be remarked, too, that we drifted generally straight before the wind, and that we and our floe during the first four months turned only one degree in azimuth. By the end of January all the open places of the sea were closed; and the masses of ice were thus driven one over the other from their mutual pressure, and pile thus rose upon pile. It seems probable, also, that wind was the main cause of our drifting, while sea currents were only of secondary moment. From the beginning of the month of February we drifted constantly toward the north-west, and from this deviation in our course we indulged in the hope that we were approaching the mysterious Gillis' Land. But at this time the liberation of the ship in the summer was the sum of our expectations and desires. In fact, there was not one of us who doubted this eventuality. Fully convinced, as we were, that our floes, firmly attached to each other, would ultimately break up and drift southwards, we determined to make them the bearers of the record of what had befallen us. Hence we threw out, February 14th, round the ship a number of bottles, inclosing a narrative of the main events of the expedition from the departure of Count Wilczek up to that date.

CHAPTER IX.

THE RETURN OF LIGHT.—THE SPRING OF 1873.

1. **THOUGH** the sun did not return to our latitude ($78^{\circ} 15'$, $71^{\circ} 38'$ E. long.) till the 19th of February, we were able to greet his beams three days previous to that date, owing to the strong refraction of $1^{\circ} 40'$, which accompanied a temperature of -35 (F.). To the Polar navigator the return of the sun is an event of indescribable joy and magnificence. In those dreadful wastes he feels the force of the superstitions of past ages, and becomes almost a worshipper of the eternal luminary. As of old the worshippers of Belus watched its approach on the luxuriant shores of the Euphrates, we, too, standing on mountains of ice or perched on the masts of the ship, waited to hail the advent of the source of light. At last it came! A wave of light rolled through the vast expanse of heaven, and then—up rose the sun-god, surrounded with purple clouds, and poured his beams over the world of ice. No one spoke for a time. Who indeed could have found words to embody the feelings of relief which beamed on the faces of all, and which found a kind of expression in the scarcely audible exclamation of one of the simplest and least cultured of the crew, "Benedetto giorno!" The sun had risen with but half his disk, as if reluctant to shine on a world unworthy of his beams. A rosy hue suffused the whole scene, and the cold Memnon pillars of ice gave forth mysterious whispers in the flood of heat and light. Now indeed with the sun had a new year begun—what was it to bring forth for us and our prospects? But alas, his stay was short—he remained above the horizon for a few minutes only; again his light was quenched, and a hazy violet colour lay over distant objects, and the twinkling stars shone in the heavens.



SUN-RISE (1873).

2. While we watched the sun's return, we had also an opportunity of looking on each other. How shocked and surprised were we with the change which had been wrought on us in the long Polar night! Our sunken cheeks were overspread with pallor; we had all the signs of convalescence after a long illness—the sharp-pointed nose, the sunken eye. The eyes of all had suffered from the light of lamps which had burnt for months; those especially who had used them for hard work. But all these consequences were of short duration under the beneficent influence of the daylight and the spring sun, which soon brought colour into our faces. Cheerfulness gradually returned to all on board the *Tegetthoff*, as we revelled in the warm beams of the sun. We built a house without a roof, and open to the south, and thither the healthy and the sick on calm fine days used to repair from the dreary ship, and sun themselves like lizards. But within the ship it was still night.

3. The visits of bears again became numerous. February 17th one of about five feet long was shot very close to the ship, and two days afterwards a second came near us, but was scared away by the awkwardness of the hunters. The dogs however pursued him, and we were compelled from fears for their safety to follow up the chase. The temperature of -33° F., and a pretty strong wind against which we had to run in the pursuit, brought on in some of our party palpitation of the heart and spitting of blood, and our return to the ship was a matter of some difficulty. On the morning of the 20th another bear came close to the ship, was fired at, but missed, and got away. Palmich, Haller, and Klotz immediately gave chase, though the temperature was -40° F., and the wind high. After a short time Palmich returned with his face frost-bitten, and the Tyrolese after several hours, without any success, but with their feet so frost-bitten that they had lost all feeling in them. The second stage of the malady had begun, which renders amputation almost a necessity. For several hours their feet had to be rubbed with snow till sensation returned, and with returning sensation much suffering; large swellings as big as a man's fist rose on their feet, which were reduced only after the application of ice for several days. Again, in the grey of the morning of

February 22nd a bear came within eighty paces of the ship, which Sussich, the watch on deck, after several shots, which the animal seemed not in the least to regard, at last hit and killed. By a wound on his right forepaw we recognised our friend whom we had hotly chased a few days before. He was six feet in length, and in his stomach there was nothing but a small piece of the skin of a seal. Sussich was overjoyed with his success, and for the whole day tried to drag everyone outside the ship to show the result of his prowess, "Se mi non era, il copava tutti," he added, with a look of contempt on those who had not been so successful as himself



THE CARNIVAL ON THE ICE.

4. Although at the end of February the sun rose with a carmine light which imparted an indescribable charm to the fields of snow and ice, we were doomed to disappointment in our expectation of bright and clear weather in the after-part of the day. Soon after sun-rise, white frosty mists gathered over the ice-fields, making the sun as he shone through them a mere ball of light, or completely concealing him. On February 24th we enjoyed the peculiar spectacle of seeing

the sun appear, the temperature being -44° F., distorted by refraction, through the thick mists on the horizon, as if he were quite flat, beamless, and of a coppery red. The end of February reminded us of the carnival time of the land of the South, and the crew appeared in such masques as they could command; but their masquerading formed a sad and mocking contrast with the gravity of our position. The men bestowed all their art on "Sumbu," who was dressed up as the demon "Lindwurm," and departed himself in a manner highly becoming his costume.

5. With the month of March the spring had, in name at least, begun; but in our sense of the word no spring as yet appeared. Instead of the joyous gleams of early vegetation, a blinding white waste environed us; instead of the perfumed breath of flowers and the soft air of spring, there rose driving clouds of ice-needles; and parhelia of almost daily occurrence shone in a heavy sleepy fashion through white frosty mists. The atmosphere was filled with snow; to be convinced of this we had only to look at the sun when the weather seemed clear and bright. This continual fall of snow as fine as dust was the cause of the retardation of the evaporation of the ice. The influence of the sun was so great, that on March 3 the black-bulb thermometer indicated the unusual temperature of 45° F., and a layer of snow on the bows of the vessel showed evident signs of diminution. The thermometer, in the sun, rose eight degrees March 6, and nine degrees two days after. The weather was calm and clear, and the increasing influence of the sun was a most joyful sensation. A cube of ice freely suspended showed during the second half of March a daily diminution of $\frac{1}{100}$ of its weight from evaporation; while in the sea itself its behaviour was the very opposite; the cube of ice, which was submerged to a depth of ten feet from February 19th to March 5th, showed at the latter date an increase of its mass, amounting to $\frac{3}{4}$ of an inch round its surface. In the beginning and end of March the cold was so severe, that the thermometer every day for three weeks marked -35° F. Calms and clear weather, however, characterized this period of the spring, and snow-drifting and a clouded sky were rare. On the 13th of March the full moon again appeared in the azure twilight of

the western heavens, and its soft light fringed with silver the dark ranges of ice. The days became longer, and the shadows cast by the masses of ice were shorter and more marked, and every one who remained long in the open air was forced to use snow-spectacles. Small avalanches began to fall from the rigging, and the masts, spars, and ropes lost their white frosted aspect. On the 22nd the fore-part of the ship's hull facing the south was completely free from snow and its dark colour was visible. On the 29th the temperature in the sun exceeded the temperature at 9.30 A.M. by 34° F.; and on the 30th we could for the first time observe the melting of the snow on the seams of the timber of the ship's hull. The enumeration of these events, insignificant as they may appear, will serve to show with what attention the Polar navigator notes the minutest occurrence due to the influence of the sun.

6. Welcome, though illusive, harbingers of the returning summer were the first birds, whose arrival we greeted on the 19th. These were little divers, which flew over the ship to the open spaces of water amid the ice, there to seek their food in the countless crustaceæ which abound in them. Magnificent auroras continued to illuminate our nights; and although the duration of their intensity was much too brief to serve as a source of light, there was a charm in these phenomena which their daily recurrence could not weaken.

7. While under these various influences the health of all on board the *Tegetthoff* greatly improved, we were threatened with the serious calamity of losing our excellent physician, Dr. Kepes, who fell ill on the 13th of the month. For two weeks we were kept in a state of anxious fear for him; and our anxieties were increased as we had to treat his malady without the necessary knowledge and experience. To our great joy, however, he was spared to us; and our supply of fresh bear's-flesh was henceforth reserved for him.

8. For some time the bears had observed a very distressing reserve and shyness in their visits. On the 15th one came near us, and as Pekel had for some time announced his approach, he found a long front of rifles drawn up behind some masses of ice to give him a warm reception. He, as usual, came on under the wind, showing considerable interest in our

edifices. He then ascended a small ice-crag, and, after balancing himself carefully, sat down on the top of it, with his snout uplifted, snuffing all round. This seemed so ludicrous to some of our party that they burst out into a laugh so loud, that the bear came down from his pinnacle in evident astonishment, and with much circumspection drew nearer and nearer till at a short distance from us he fell mortally wounded. He was, alas! a very small animal, about $5\frac{1}{2}$ feet long, and his stomach was absolutely empty. On the 30th of March another came close to the ship; the watch on shore fired



THE "TEGETTHOFF" DRIFTING IN PACK-ICE.—MARCH 1873.

at, but missed him, whereupon both the watch and the bear took to flight.

9. April at last arrived, and with it the time of icicles, which hung down from every yard of the ship, and from every rope of the rigging, from every icy ridge and crag. The melting and decaying of the ice, though always a source of satisfaction when the question of its breaking up is discussed, went on, to our impatient desires, with intolerable slowness. What was

it to us that we were able to read even at midnight on the 2nd of April; that the number of divers and sea-gulls constantly increased; that on the 6th the difference of temperature between sun and shade was 18° ; that the black-bulb thermometer on the 20th showed 43° F.; that the sun on the 11th rose about two o'clock in the morning, and from the 16th remained constantly in the heavens? What did all this matter? The constant light notwithstanding, we were still environed with the signs of deepest winter, and the forms and masses of ice collapsed with a slow deliberation that tortured us. We were no longer to be satisfied and amused with the spectacle of parhelia, even though the phenomenon should appear, as it did on the 1st of April, with eight suns. Months of weary waiting still lay before us; daily we had to arm ourselves with patience, as, when we came on deck, we discovered the apparently unchangeable character of our environment, with all its forms, which had become familiar to us down to the smallest details. Reluctantly condemned to almost total idleness, we filled up our time with such occupations as fancy suggested. Some of our people built a tower of ice on a level part of our floe; others tried their rifles—tried often enough before—at empty bottles as targets. Along with the Tyrolese I constructed a road through hills of ice, over passes and ridges, going up and down in serpentine paths, making a circuit of about three miles round the ship. The labour of weeks with picks and shovels was expended in making and preserving it; after each downfall of snow this road had to be dug out afresh. Our passing and repassing along it through a maze of ice not only beneficially exercised our bodies, but furnished opportunities for training our dogs to drag heavy-laden sledges. I continued also to fill my portfolio with studies of scenery in the ice, and I accustomed myself, whenever there was no wind, whatever might be the temperature, to draw for hours together with no other protection to my hands than light gloves.

10. April had begun with a temperature of -38° F.; as the month advanced it steadily increased. At the end of the month the extreme of cold was but -20° F. But the weather had now lost the clearness of the early spring; and constant calms, together with the frequent falls of snow,

undid the work of the few hours of the day on which the sun shone. The ice was covered with deep snow ; on the level we sank ankle deep, while among the hummocks it was up to our knees. Sledging would have been impracticable. Among the changes produced by the softening of the weather, none was greater or more agreeable than the return of daylight to the cabin, when we took off the covering of the skylight and removed the tent-roof from the fore-part of the ship. Once more to be able to read without the dull glimmer of artificial light was an extraordinary event in our monotonous life. For five months our lamps had been burning in our mess-room, so that the walls were black with smoke, and it was a work of no small labour to make them clean and pleasant. The unloading of the ship's hold was, however, a far heavier, though necessary task ; the thick crusts of ice which had accumulated on its sides must be removed, lest the provisions should be damaged by their thawing ; and there was no time to lose, for the temperature in the hold was only 1° below zero. The provisions, which had been left out on the ice, were again stowed in the ship, the cessation of the ice-pressures rendering this precautionary measure useless.

11. Round a ship which has wintered in the ice there is gradually accumulated a mass of rubbish of all kinds, of which cinders form a considerable constituent. These, when thrown out in small quantities, sink at once into the snow, while larger quantities act as a non-conducting layer. Hence we were surrounded by a maze of holes, big and little, alternating with plateaus, under which winter still continued to linger. When thaw-water made its appearance, all this was transformed into a succession of lakes and islands, which we bridged over by planks.

12. Meantime we began our labours of digging out the ship. We removed the wall of snow, which had served as an outer garment and protection during the winter, and the hard-trodden layer which covered the deck a foot thick. In clearing away from the after-part of the ship, we discovered that the machinery protecting the screw had been torn away by the ice-pressures. The mischief done, however, was not considerable ; and as the ship made no water, we consoled ourselves with the thought, that she had sustained no material

injury, though she had lain so long out of water perched on the floe.

13. The continued cessation of movements in the ice induced Weyprecht to erect a tent at no great distance from the ship, to carry on in it observations of the magnetic constants, which were taken on certain appointed days. On the night of one of such days, Orel, who conducted these observations, was surprised by the visit of a bear. His shouts for help brought us on deck, but before we could actually reach him, the seaman on the watch had killed the bear with an explosive bullet. Hitherto these animals had shown little courage in the neighbourhood of the ship, and to shoot them from the deck exposed no one to any danger; but this incident showed us that we could not count securely on their actions. Soon after this we had another surprise. Stiglich, the seaman on watch on shore, suddenly found himself confronted with a bear about eight paces off. Throwing his cap to the bear, he made a rush for the rope-ladders of the ship, but fell in his hurry and confusion. Carlsen, hearing his cries for help, hastened to the rescue, and dexterously shot the pursuer. A glorious event for Carlsen! who used to tell us strange stories of his encounters with bears: how he had scared them away with the glance of his eye; and how once in Novaya Zemlya he had frightened away a whole pack of them by the magic of his glance. All doubts in the prowess of his eye were silenced to-day by the more unquestionable prowess of his rifle. On the 28th of May a bear clambering over the wall of ice close astern of the ship was shot dead with an explosive bullet. His stomach was empty, but notwithstanding his leanness, he furnished more meat than many others, for he was fully seven feet long.

14. At the end of April the force of the winds so loosened the compactness of the ice, that dark strips hanging above the horizon in all directions announced the existence of numerous fissures, although they were invisible even from the masts of the ship. We counted on these signs with such unshaken confidence, that when on the 2nd of May we heard in the distance the now familiar sound of the ice-pressures, we heard them not only without dismay, but as the voice of a joyous message. Three-quarters of a year had passed away

since we were first caught in the ice—a time laden to us with bitter disappointments to our hopes, and great dangers to our lives. The hour of our long and ardently desired liberation seemed at hand. If once we got free, it lay within the bounds of possibility that we might reach, if not the somewhat mythical Gillis' Land, then at least the uninhabited Arctic coasts of Siberia. Siberia had, in fact, become the rosiest of our hopes. Some, indeed, still indulged in extravagant expectations and counted on the discovery of new lands, even while they drifted with the ice. But our wishes for the most part had become so subdued, that the discovery of the smallest cliff would have satisfied our ambition as discoverers.

15. But Nature's laws held their own course, undisturbed by our desires. Snow continued to fall in abundance, and spread its mantle over the ice. The constant round of downfalls and evaporation was a sad bar to our hopes. In the beginning of May the snow began to thaw on the surface, and became soft and sticky. Even in the depth of winter it was never hard, but like the fine dry grains of driving sand. This change in the snow, which occurs a fortnight earlier than in Greenland, compelled us to substitute our black leather boots for those of sailcloth, which we had hitherto worn. On the 2nd of May the temperature fell to -8° F., but it now began to rise gradually, so that it sometimes reached the freezing point about the end of the month, and on the 29th rose five degrees above it. The mean temperature of the month, however, was not above 16° F. But the difference of temperature in the sun and the shade became greater and greater. The thermometer marked -18° F. at 6 P.M. of the 1st of May, and on the 11th the black-bulb thermometer showed 90° F. at 3 P.M., while the common instrument gave only 14° F. In the middle of the month, after the heavy winds fell, we were enveloped with dark fog banks; stray beams of the sun broke through the warm misty atmosphere, and dark skies were succeeded by masses of white vapour illuminated by the sun. Just as in our happier clime, the Arctic April has her alternations of cloud and sunshine.

16. Hitherto the only birds which had visited us were divers and gulls. Once only a snow-bunting flew among us, and fearlessly settled on the ship. On the 24th of May the

auks made their appearance, and from that date we were constantly entertained by the whirring sounds of their flight. As they keep one direction in their flight, we could shoot those only which passed over the ship; they were a useful addition to our table, though they had to be steeped in vinegar to make them palatable. The majestic Burgomaster Gull appeared somewhat later, and later still the "Ice-birds" frequented the shores of the lakes around us, and hovered round the remains of the bears we had shot. These birds settled with the greatest boldness in the immediate neighbourhood of the ship, and day and night filled the air with their wild shrill cries.

17. By the middle of March, Krisch, the engineer, had put the steam machinery in working order, but another month elapsed before the screw-propeller, which had been frozen fast, was set free; our fears lest it should refuse to act proved to be groundless. As, however, there was no prospect of our being able to use steam for some time, it was thought advisable to dig out and raise the rudder in order to secure it.

18. On the 26th of May a partial eclipse of the sun was visible in our latitude; but from an error in our calculations we had ante-dated the commencement of the observation by about two hours and a half. Everyone on board who had an instrument at his command stood ready to observe the passage of the moon over the sun's disk. After waiting for some time in vain, we discovered the error we had committed as to the time of the beginning of the eclipse, but in order that the dignity of astronomical observation might not be degraded in the eye of the crew, we still held our ground with the telescopes in our hands. Two hours of such suspense enabled us to feel that there could be no more perfect fulfilment of the punishment of Sisyphus than being condemned to wait for an eclipse of the sun which would not come off! At last the eclipse took place, but not until great disgust had been excited in the minds of men who were too much inclined to regard the whole thing as a piece of humbug. At the height of the eclipse about one-third only of the sun's disk was obscured, and the sun was so covered with mist that we could look at it without the use of coloured glasses. The whole duration of the eclipse was one hour and fifty-six minutes.

19. From the 1st of the month the number of living creatures belonging to the expedition had been increased by the birth of four Newfoundland puppies, who passed the earliest days of their youth in a tent erected on the ice, and artificially heated to the temperature of a European May. But all our care in rearing this litter was frustrated by one of these little Polar wretches, who, after sucking his mother till he was as round as a drum, lay on his brothers as they slept, and stifled them. This little criminal received the name of Torossy, and soon became the pet of the crew, and a favourite with all the other dogs. The fame which he afterwards gained made him an important member of the expedition. All the dogs had become so hardy during the past winter, that they now slept outside their kennels, finding the inside too warm for them.

CHAPTER X.

THE SUMMER OF 1873.

1. THE time crept away with indescribable monotony. The crew performed their heavy labours, but of events there were none. The only change in our position was the constant decay of the buttresses and walls of ice, until the frozen sea lay like a snowy chaos before us. Pure sharp-edged ice was nowhere to be seen; the edges were no longer transparent; evaporation had transformed the surface into a kind of glacier-snow. June 1, we had the greatest degree of cold of the month, the thermometer marking 13° F.; but on the last day it rose to 32.2° F.; the mean temperature being 31.1° F. Every week brought us promises of summer. On the 1st the black-bulb thermometer reached 98° F.; on the 14th rain fell for the first time; on the 16th the temperature at 9 o'clock A.M., was 41.5° F., on the 26th 46.4° F., and on the 29th even 50.2° F. On these days the air seemed to have the pleasant mildness of southern climes, and when there was no wind we felt an oppressive sultriness. Wreaths of mist moved along the icy wastes which glowed with sunlight, while the long dark lines of ice-wall lay in deep shadow. The air was filled with flocks of birds; day and night we heard the shrill cries of the Robber-gulls, ever and anon mingled with the barking of the dogs in full pursuit of them. Flocks of rotges congregated without fear in the narrow basins of distant "leads;" and the "great gulls," shunning

companionship, sat for hours on the top of an ice-cliff, or in the middle of a floe.

2. No one who has not actually seen it, can imagine the blaze of light in the Arctic regions on clear days, or the glow which floats sometimes over the cold white ice-floes, with their outlines in constant vibration, while refraction transforms the icebergs into a variety of shapes. The sun's power is sometimes so great as to blister the skin in a few hours, and the glare from snow and ice produces snow-blindness, if the eyes be not carefully protected. At a little distance the sea appears to be of a deep black colour, though it still preserves its ultramarine hues in the narrow "leads;" even the pure blue of the heavens may be called almost black when compared with the dazzling sheen of the ice. In the middle of June there was an incessant dripping and oozing in the ice-world, and streams of thaw-water flowed into the open fissures. By the end of the month the surface of the ice resembled snow; and even at some depth it was viscous, instead of brittle and hard as glass, as it is during the colder season. Streams of thaw-water ran through the softened and saturated snow. Small lakes were formed on the levels, and swamps of snow, wearing a traitorous exterior, surrounded their borders. In the summer of 1873 we observed a vertical decrease of five or six feet in the thickness of the ice; but this diminution in thickness was from the surface downwards, while in the sea itself there was little or no thawing, because the temperature of its surface was still below zero. The moisture, from which there was no escape, became exceedingly troublesome. In spite of our stout leather boots we had never the comfort of dry feet during the whole of the summer, and this we felt the more, as our labours to free the ship, which we had commenced at the beginning of May, necessitated our being constantly amid the snow and ice.

3. At the end of May the ship began slowly to settle, and the water rose between the ice and the hull on the fore-part of the ship. But we soon discovered that these small changes would not suffice to free us from our prison-house, but that we must ourselves endeavour to loosen the fetters which held us fast, if it were only to banish gloomy thoughts of the

future by action of some kind or other. Hence constant digging, sawing, and blasting on our floe, through May, June, July, and August—labours in which the whole crew of the ship, with the exception of the sick and of the cook, took part; labours, alas! which admonished us of the impotence of man when he contends against the power of Nature. Only on the port side of the ship were our efforts to dig through the floe at all successful; on the starboard side the floe had been so enormously increased by the tables of ice forced upon one another, that we had not pierced through the ice after sinking a shaft eighteen feet deep; and at last the water, forcing itself through the pores of the ice, compelled us to desist from the labour of sinking deeper. The process of sawing was possible only where we had broken through the ice—that is, on the port side; yet even there the great thickness of the floe necessitated the construction of longer instruments, for which the iron casing of the engine-room had to furnish the material. The difficulty of sawing increases with the thickness of the ice in an almost incredible manner. It is easy enough to cut through a floe, four or five feet thick, but to break up one, eight or ten feet thick, is a matter of great difficulty. Our saws too, even when they were lengthened, permitted a play of only a foot; and their twisting, as they cut deep, proved a great hindrance. Besides, when we had cut to the depth of a fathom, the saws were always frozen fast, and when we attempted to free them by blasting they were very often broken in pieces. But even the sections, made with so much difficulty, often proved to be quite useless, as they were frozen together again by broken ice left in the cut. Blasting with gunpowder proved as ineffectual as in the previous year; in fact, the process was only applicable to ice-blocks which had been loosened by sawing, and which could not be broken up by the crow-bar alone.

4. By the middle of June we were at last convinced that the thickness of the ice rendered it impossible to join together, by sawing, the two-and-twenty holes which we had dug out round the ship. Henceforward our labours were confined to the formation of a basin at the fore-part of the ship. Although we saw the impossibility of liberating the vessel, as long as

she rested on a mountain of ice, we hoped that the basin would help to break up the floe, and that the *Tegetthoff* would of itself return to its normal position. The gliding down of the ship, raised as it was, to its natural water-line might indeed easily end in a catastrophe, but we braved this peril when we thought of the vain attempts we had made to free her. Though the ship sunk so much in the course of the summer, that its height above the water-line was a little more than two feet in the fore-part of the ship, and three feet in the after-part, this circumstance in our favour was outweighed by the disadvantage of the rapid melting away of the ice at its sides. The ship, freed from its covering of ice, stood so high above it, that in order to guard against the danger of its overturning we were obliged, in the second half of the summer, to shore it up by strong timbers fastened to its masts. It looked no longer like a ship, but like a building ready to fall in! In the middle of July Lieutenant Weyprecht ordered Krisch, the engineer, to construct heavy chisels and borers to ascertain the thickness of the ice. After long and hard labour, we found that after boring through several ice-tables, to a depth of twenty-seven feet, we still struck on ice! Every attempt, therefore, to break through this accumulation had to be given up, and we contented ourselves with leading the basin we had formed on the fore-part round the larboard side of the ship. On the 27th of the month, twenty tons of coal were removed to the ice, in order to lighten the ship as much as possible, and every day we had to look to the props which steadied the ship, as the melting of the ice rendered them unsafe. In the following weeks, the bows continued to sink into the water, while the after-part as a natural consequence was raised up.

5. Even in the month of July, the weather was generally gloomy and unsettled. We had several times two or three inches of snow, and the showers were mingled with mist, rain, and snow, as had been the case in June. The winds were generally from the west; the mean temperature of the month was 34.7° F.; on the 8th of July, the black-bulb thermometer marked 108° F., and the temperature in the shade at the same date amounted to 34° F. But neither wind nor

temperature made any change in our position. The sun on which our liberation depended was seldom visible; and the winds on which he had counted failed to blow. For weeks we watched for the formation of fissures round the ship. Fissures indeed were formed, but at such a distance that they were utterly useless to us. On the 16th of June, one opened towards the south-east; but it was at least two miles distant, and in the middle of July it was only half a mile nearer to us. Nothing, absolutely nothing, was to be seen from the deck but ice, and Klotz, coming down one day from the top-sail yard, described our position with a melancholy laconic brevity: "Nix als Eisch, und nix als Eisch, und nit a bisserl a Wosser. (*Nothing but ice, ice everywhere, and not a patch of water.*)" Amid such impressions all hope gradually left us. The drifting of the ice ceased to animate our hopes. Even the approach of a fissure on the 29th of July to the distance of three-quarters of a mile, in consequence of heavy gales from the south and west, ended in miserable disappointment. A movement in the ice which began a little way off on the 6th of August resulted only in the diminishing of our floe. There was no essential change in the remainder of this month, except that the monthly mean temperature fell to 32.7° F. We had the greatest extreme of heat on the 4th of August, 41.9° F.; but on the last day of the month we had 5.7 degrees of cold.

6. For some time we had been surprised by the appearance of a dark mass of ice, the distance of which prevented us from making a closer acquaintance with it. Our life on the narrow space of our floe had quite assumed the character of that of mere insects, who dwell on the leaf of a tree and care not to know its edges. Excursions of one or two miles were regarded as displaying an extraordinary amount of the spirit of enterprise and discovery. On the 14th some of us pushed on for about four miles to the group of ice just mentioned, and discovered it to be a very large iceberg. Two moraines lay on its broad back. These were the first stones and pieces of rock we had seen for a long time, and so great was our joy at these messengers of land, that we rummaged about among the heaps of rubbish, with as much zeal as if

we had found ourselves among the treasures of India. Some of the party found what they fancied to be gold (pyrites), and gravely considered whether they would be able to take a quantity of it back to Dalmatia. Although the glaciers of Novaya Zemlya could not shed icebergs of such magnitude as that on which we now stood, we all held it for certain that it had come from thence. Not one of us had the least presentiment that it could belong to new lands, to which at that time we were near. Even the other icebergs which we discovered in increasing numbers on the following days, did not as yet speak to us the language of a message to fill us with hope and ardour. Our walk to the "dirt iceberg" was an event in our monotonous life, and was often repeated. These expeditions enabled us also to form some conception of the size of our floe, the diameter of which could not be less than six or seven miles.

7. August 18—the birthday of his Majesty our Emperor, —the ship was dressed with flags, the only form left to us of expressing our loyalty. Our dinner was as sumptuous as the circumstances permitted, though fasting would have been more appropriate, as the third day after this was the anniversary of that sad and gloomy day on which we were inclosed in the ice. In order to visit an iceberg which lay to the north-west of us, we ventured beyond our floe for the first time, and passed over a fissure to some drifting ice-floes which lay in the way. A seal lying on the ice was immediately attacked by our dogs, but succeeded after many efforts in reaching its hole. From the top of the iceberg, which was about sixty feet high, we discovered that the few openings in the ice were not navigable "leads," but isolated holes utterly unconnected, and therefore useless for navigation.

8. We had continually drifted, since the beginning of February, first to the north-west and then to the north, with few modifications; at that date, we had reached our greatest East Longitude, and winds appeared as before to be the main cause of this drifting. At the end of that month there was a succession of calms, and we lay almost motionless in latitude 79° , and longitude 71° . The subjoined table shows our change of place in the following months.

Time.			Latitude.			Longitude.			Time.			Latitude.			Longitude.		
March	3,	1873	79° 13'	69° 32'		June	27,	1873	79° 13'7"	59° 46'0"							
"	9	"	79 19	68 28		"	28	"	79 15'5"	59 35'4"							
"	14	"	79 20	68 28		July	3	"	79 15'2"	59 14'8"							
"	20	"	79 33	68 52		"	4	"	79 14'8"	59 13'3"							
"	25	"	79 23	67 17		"	8	"	79 15'2"	59 5'8"							
"	27	"	79 15	67 29		"	10	"	79 13'2"	59 9'0"							
"	29	"	79 14	67 35		"	15	"	79 9'8"	59 52'6"							
April	2	"	79 5	66 49		"	18	"	79 7'3"	59 50'4"							
"	3	"	79 5	66 42		"	19	"	79 7'6"	59 35'1"							
"	7	"	79 4	—		"	20	"	79 8'7"	59 33'6"							
"	10	"	79 12	68 1		"	21	"	79 9'2"	59 33'1"							
"	12	"	79 19	67 43		"	22	"	79 9'0"	59 34'1"							
"	13	"	79 20	67 40		"	23	"	79 6'6"	59 34'2"							
"	15	"	79 14	67 0		"	24	"	79 7'1"	59 29'5"							
"	19	"	79 18	65 51		"	25	"	79 6'6"	59 27'3"							
"	20	"	79 19	65 37		"	31	"	78 58'5"	60 25'5"							
"	27	"	79 13'5"	64 37'0"		August	1	"	78 56'9"	60 40'6"							
"	28	"	79 12'2"	64 41'8"		"	4	"	79 0'4"	61 6'2"							
May	1	"	79 15'8"	64 58'8"		"	13	"	79 25'4"	61 6'6"							
"	2	"	79 17'1"	65 3'9"		"	14	"	79 24'5"	61 16'3"							
"	6	"	79 16'0"	65 0'5"		"	16	"	79 27'8"	61 7'6"							
"	10	"	79 20'4"	65 41'9"		"	19	"	79 29'1"	61 31'0"							
"	11	"	79 20'2"	65 32'4"		"	21	"	79 31'3"	61 44'8"							
"	13	"	79 19'7"	65 15'8"		"	30	"	79 43'0"	60 23'7"							
"	14	"	79 19'8"	64 45'6"		"	31	"	79 42'5"	60 5'6"							
"	16	"	79 15'5"	63 39'0"		Sept.	2	"	79 40'2"	60 32'9"							
"	17	"	79 13'1"	63 21'7"		"	5	"	79 41'3"	60 12'5"							
"	22	"	79 9'2"	62 3'5"		"	8	"	79 34'2"	59 47'3"							
"	29	"	79 2'4"	62 55'5"		"	9	"	79 33'6"	59 45'9"							
"	30	"	79 2'5"	62 54'2"		"	10	"	79 32'2"	59 53'1"							
"	31	"	79 2'5"	62 53'9"		"	16	"	79 45'6"	61 30'5"							
June	1	"	79 2'4"	62 43'2"		"	23	"	79 49'6"	61 58'1"							
"	3	"	79 0'4"	62 29'7"		"	30	"	79 58'3"	60 41'1"							
"	5	"	79 1'3"	62 24'8"		Oct.	16	"	79 54'6"	60 34'7"							
"	6	"	79 1'1"	62 20'2"		"	19	"	79 53'9"	60 40'6"							
"	9	"	79 5'4"	61 31'4"		"	23	"	79 44'5"	60 7'9"							
"	10	"	79 5'3"	61 23'6"		"	26	"	79 44'3"	59 17'1"							
"	11	"	79 4'3"	61 21'3"		"	27	"	79 44'0"	59 14'1"							
"	18	"	79 6'6"	61 5'2"		"	28	"	79 43'8"	59 6'6"							
"	20	"	79 8'6"	61 2'8"		"	29	"	79 44'8"	59 9'8"							
"	22	"	79 9'2"	60 54'9"		"	30	"	79 49'0"	58 59'9"							
"	24	"	79 8'4"	60 31'8"		"	31	"	79 50'6"	58 53'7"							
"	25	"	79 11'2"	60 14'6"		"	Ship in										
"	26	"	79 13'3"	59 55'3"		"	Land ice										
									79 51'1"	58 56'0"							

9. The meteorological observations of the expedition, and the course of the *Tegetthoff*, have been ably analysed by Vice-Admiral Baron von Wüllersdorf-Urbair in the *Mittheilungen* of the Imperial Academy of Sciences of Vienna, and while I refer the curious reader to these reports for a fuller discussion of these questions, I subjoin the most important paragraphs of

the Admiral's report which concern the course of the *Tegetthoff*:—

“Under ordinary circumstances a ship drifts on with the floe; is imprisoned, and necessarily obeys the force of the wind and the sea-currents. Its course, consequently, corresponds to the combined effect of these forces. But, inasmuch as the *Tegetthoff* was not in the free sea, but was driven along for the greater part of the time in close pack-ice, the ship not only obeyed the general movement of the ice, which was dependent on the direction of the winds and currents of the sea, but was also influenced by its vicinity to coasts and by the greater or lesser accumulation of ice.

“In so far as the *Tegetthoff* with her hull and masts presented a greater surface to the wind, the floe, on which it was imprisoned, would necessarily receive an excess of movement in the direction of the wind. If this excess formed an angle with the direction of the movement of the ice, the ship's floe would deviate to the side of the least resistance, and drift according to the resultant between wind and resistance. Thus it might be that the ship's course deviated from the wind, even in a direction opposed to it. But these anomalies certainly were not great, and could not well be estimated, because the deviations which thus arose depended on the direction of the wind, on the density and mass of the ice, on causes, in fact, which could not be exhibited under numerical relations.

“If we compare the statements, as given in the *Meteorological Journal*,¹ concerning the ice-drift and ice-pressures, it is seen that the maximum of both occurred in those parts of the sea in which the ship was within the action of the ice coming from the Sea of Kara, and that the greatest deviations in the ship's course necessarily happened there.

“With respect to another abnormal deviation in the ship's course, it cannot be doubted that this depended on the vicinity of Franz-Josef Land, towards which the masses of ice drifted under the action of continuous south-west winds; and were again driven back, thus forming a circle in their movement. It would seem natural to assume the existence of a sea-current in order to explain this peculiarity; but the configuration of that land and its coasts, or the greater or lesser amount of

¹ See Appendix.

immovable ice, or, lastly, the prevailing winds in those regions, may have influenced the direction of the movement of the ice, and consequently of the ship's course.

“If we consider the prevalence of winds, as furnished by Weyprecht's observations for more than two years, we find south-west winds prevailing in the southern part of the seas that were navigated, and north-east winds in the northern part of those seas.

“If the sea to the east of Franz-Josef Land should not be broken by larger groups of islands, or by masses of land, but be a vast range of ocean, the winds would be free from the influence of land, and blow in a north-easterly direction, and exhibit, so to speak, the phenomenon of a Polar north-east trade wind. If it should be the case that north-east winds prevail to the north of the 78th or 79th degree of north latitude, and, at the same time, south-west winds to the south of that same degree, the notion of a sea-current must be dismissed, and a revolving movement in the ice assumed, in the opposite direction to the hands of a clock. The observations of Weyprecht on these winds establish their circulatory character. The curve of deviation in the course of the *Tegetthoff* seems to be in harmony with this assumption. But these suppositions cannot be accepted, until observations be made on the winds to the south of 79° N. L. at the same season of the year with those which were so successfully made by Weyprecht to the north of this degree.

“The following arguments, however, would seem to favour the supposition of the existence of a sea-current. The curve at the commencement of its deviation corresponds pretty nearly with the direction which the Gulf Stream would take after passing round Norway, and in its further course with that current, which comes out of the Sea of Kara between Novaya Zemlya and Cape Taimyr, and which undoubtedly exists, though its course has to be more accurately determined.

“However small may be the value we assign to the winds in explanation of the deviation in the *Tegetthoff's* course, it is at any rate impossible to ascribe those phenomena to the influence of the coast formation. We must, therefore, assume either, that the different directions of the wind produce a

constant circulation of the ice in the sea to the north of 79° ; or that currents known to exist in this and contiguous seas cannot be excluded from the small part of the ocean lying between Novaya Zemlya and Franz-Josef Land."

From these and other grounds the Vice-Admiral Baron von Wüllersdorf draws the following conclusions:—

"It is probable that there exists a sea-current in the seas between Novaya Zemlya and Franz-Josef Land; that at any rate, its existence cannot positively be denied, although the prevailing winds may produce similar phenomena.

"That there is a great probability that the Ocean stretches far to the north and east beyond the eastern end of Novaya Zemlya."



SOUNDING IN THE FROZEN OCEAN.

10. During the summer Orel took soundings of the depth of the sea, which he was prevented from continuing in the winter by the frost. These show its shallowness on the north of Novaya Zemlya, especially towards Franz-Josef Land. A bank, over which we drifted in the summer of 1873, and which we explored with a drag-net, was the principal source of the collection of marine fauna, which we shall speak of in a later chapter. These soundings also enabled Orel to prove the small increase of the temperature of the sea at any considerable depth. He used in his experiments the maximum and minimum thermometer of Casella. The specimens we col-

lected showed, that the bottom of the sea consists of layers of mud and shells. The soundings are exhibited in the following table :—

Time.	Metres.	Time.	Metres.	Time.	Metres.
July 20, 1872	400	June 19, 1873	186	Aug. 9, 1873	244
" 28 "	115	" 20 "	220	" 10 "	225
" 31 "	250	" 21 "	195	" 11 "	209
Aug. 3 "	130	" 22 "	200	" 12 "	214
" 4 "	80	" 23 "	169	" 13 "	189
" 22 "	36	" 24 "	178	" 14 "	177
" 30 "	170	" 25 "	195	" 15 "	170
Sept. 16 "	100	" 26 "	220	" 16 "	170
" 25 "	90	" 27 "	227	" 17 "	174
" 29 "	85	" 28 "	233	" 18 "	148
" 30 "	190	" 29 "	240	" 19 "	152
Oct. 2 "	170	" 30 "	240	" 20 "	138
" 9 "	450	July 1 "	240	" 21 "	130
Nov. 14 "	345	" 3 "	245	" 22 "	131
Jan. 28, 1873	510	" 4 "	250	" 23 "	128
Mar. 27 "	450	" 5 "	235	" 24 "	145
April 28 "	350	" 6 "	235	" 25 "	140
May 17 "	230	" 7 "	274	" 26 "	185
" 18 "	187	" 8 "	266	" 27 "	219
" 19 "	172	" 9 "	250	" 28 "	180
" 20 "	163	" 10 "	250	" 29 "	132
" 21 "	138	" 11 "	236	" 30 "	211
" 22 "	186	" 12 "	265	" 31 "	197
" 23 "	162	" 13 "	247	Sept. 1 "	260
" 25 "	177	" 14 "	215	" 2 "	142
" 25 "	182	" 15 "	195	" 3 "	212
" 26 "	186	" 16 "	184	" 4 "	215
" 27 "	249	" 17 "	200	" 5 "	178
" 28 "	251	" 18 "	240	" 6 "	188
" 29 "	254	" 19 "	232	" 7 "	204
" 30 "	253	" 20 "	231	" 8 "	250
" 31 "	256	" 21 "	231	" 9 "	240
June 1 "	238	" 22 "	226	" 10 "	218
" 2 "	210	" 23 "	198	" 11 "	168
" 3 "	183	" 24 "	205	" 12 "	127
" 4 "	207	" 25 "	216	" 13 "	132
" 5 "	200	" 26 "	218	" 14 "	137
" 6 "	198	" 27 "	218	" 15 "	111
" 7 "	190	" 28 "	236	" 16 "	134
" 8 "	215	" 29 "	260	" 17 "	178
" 9 "	231	" 30 "	236	" 18 "	175
" 10 "	203	" 31 "	234	" 19 "	275
" 11 "	240	Aug. 1 "	225	" 20 "	300
" 12 "	218	" 2 "	219	" 21 "	220
" 13 "	211	" 3 "	173	" 22 "	188
" 14 "	235	" 4 "	188	" 24 "	237
" 15 "	161	" 5 "	210	" 25 "	325
" 16 "	184	" 6 "	107	Oct. 28 "	165
" 17 "	222	" 7 "	216	" 31 "	210
" 18 "	200	" 8 "	184		

CHAPTER XI.

NEW LANDS.

1. WE spent the latter half of August in seal-hunting, for it was only by the use of fresh meat that we were able to contend with, if not prevent, cases of scurvy. Day after day lines of hunters lay in wait before the fissures at the edge of our floe, and in the evening our dogs generally had to drag in the sledges several seals to the ship. Many of these creatures which we wounded sank and disappeared. All these seals belonged to the class *Phoca Groenlandica*. Walruses were never to be seen, and once only in an "ice-hole" we came across a shoal of white whales, which however seemed to be moving on. In the capture of seals we sometimes used a light boat, made of water-proof sailcloth, which two men could easily drag out of the water. Some of our people too had learnt the use of the harpoon. By the end of September we had killed in one way or another some forty seals, and as we shot many of the birds which flew round us, and on an average one bear a week, we were seldom without fresh meat. With the exception of Krisch, the engineer, who suffered from lung disease, and of the carpenter, who had become lame from a scorbutic contraction of the joints, all on the sick list recovered under the influence of work in the open air and of the improved diet.

2. The covering of deep soft snow, which had been so troublesome, almost disappeared at the beginning of autumn, and the surface of the ice had been transformed by evaporation into a firm mass like the congealed snow of a glacier, so that we were able to walk on its hard surface without sinking ;

only the numerous small ice-lakes, on the floes, impeded our excursions. In all these signs, we were reminded of the near approach of winter, and it seemed that, drifting as we were constantly towards the north, we should spend it nearer to the Pole than any other expedition had ever done. On the 25th the sun set at midnight. The period intervening between this and the time when the sun ceases to reappear may be regarded as the autumn of the Arctic region. For some time the light had so diminished, that our quarters again became dark at night, and from the 19th of July we were obliged to use a light in order to read at midnight. On the 29th of August, after falls of rain and snow succeeded by north winds, the ship was stiffened in a coating of ice. The rigging was covered with an incrustation of ice of an inch thick, and pieces of ice of a pound weight sometimes fell on the deck, rendering walking on it neither comfortable nor safe. After a succession of frosts and thaws, complete congelation at last set in, and when the moon was up, the masts and rigging shone like burnished silver.

3. The second summer was gone. It had come in with the hope and promise of liberation, and patiently had we awaited this result. With sad resignation we now looked forward to another winter. But once more it was to be seen, in our case, how great is the power of men to endure dangers and hardships, when these come upon them not suddenly but gradually. A few months ago, the thought that we should be prisoners on the ice, bound to our floe, for a second winter, would have been unendurable. But now that the intolerable thought had become a stern fact, we accepted and endured it. But often as we went on deck and cast our eyes over the wastes, from which there was no escape, the despairing thought recurred, that next year we should have to return home—without having achieved anything, or at most with a narrative of a long drift on the ice. Not a man among us believed in the possibility of discoveries, though discoveries beyond our utmost hopes lay immediately before us.

4. A memorable day was the 30th August 1873, in $79^{\circ} 43'$ Lat. and $59^{\circ} 33'$ E. Long. That day brought a surprise, such as only the awakening to a new life can produce. About midday, as we were leaning on the bulwarks of the ship and

scanning the gliding mists, through which the rays of the sun broke ever and anon, a wall of mist, lifting itself up suddenly, revealed to us, afar off in the north-west, the outlines of bold rocks, which in a few minutes seemed to grow into a radiant Alpine land! At first we all stood transfixed and hardly believing what we saw. Then, carried away by the reality of our good fortune, we burst forth into shouts of joy—"Land, Land, Land at last!" There was now not a sick man on board the *Tegetthoff*. The news of the discovery spread in an instant. Every one rushed on deck, to convince himself with his own eyes, that the expedition was not after all a failure—there before us lay the prize that could not be snatched from us. Yet not by our own action, but through the happy caprice of our floe and as in a dream had we won it, but when we thought of the floe, drifting without intermission, we felt with redoubled pain, that we were at the mercy of its movements. As yet we had secured no winter harbour, from which the exploration of the strange land could be successfully undertaken. For the present, too, it was not within the verge of possibility to reach and visit it. If we had left our floe, we should have been cut off and lost. It was only under the influence of the first excitement that we made a rush over our ice-field, although we knew that numberless fissures made it impossible to reach the land. But, difficulties notwithstanding, when we ran to the edge of our floe, we beheld from a ridge of ice the mountains and glaciers of the mysterious land. Its valleys seemed to our fond imagination clothed with green pastures, over which herds of reindeer roamed in undisturbed enjoyment of their liberty, and far from all foes.

5. For thousands of years this land had lain buried from the knowledge of men, and now its discovery had fallen into the lap of a small band, themselves almost lost to the world, who far from their home remembered the homage due to their sovereign, and gave to the newly-discovered territory the name

KAISER FRANZ-JOSEF'S LAND.

With loud hurrahs we drank to the health of our Emperor in grog hastily made on deck in an iron coffee-pot, and then

dressed the *Tegetthoff* with flags. All cares, for the present at least, disappeared, and with them the passive monotony of our lives. There was not a day, there was hardly an hour, in which this mysterious land did not henceforth occupy our thoughts and attention. We discussed whether this or that elevation in the grey and misty distance were a mountain, or an island, or a glacier. All our attempts to solve the question of the extent of the land lying before us were of course still more fruitless. From the headland which we had first seen (Cape Tegetthoff), to its hazy outline, in the north-east, it seemed to extend nearly a degree; but as even its southernmost parts were at a great distance from us, it was impossible to arrive at anything more definite than a mere approximation to its configuration. The size and number of the icebergs which we had recently fallen in with were now amply explained,—they were indisputable witnesses of its great extent and its vast glaciation.

6. At the end of August and the beginning of September north winds drove us somewhat towards the south, so that the outlines of the land were still more faintly defined. But at the end of September we were again driven towards the north-west and reached $79^{\circ} 58'$, the highest degree of latitude to which the *Tegetthoff* and its floe drifted. We now saw an island at some distance off—afterwards called Hochstetter island—lying before us. Its rocky outlines were distinctly visible, and the opportunity of *reaching the land by a forced march* seemed more favourable than any which had been presented. It might also be the last chance offered to us, for our fears lest we might drift out of sight of this land were well founded. Six of her crew now left the *Tegetthoff* and committed themselves to the destiny which the movement of the ice had in store for them. The east winds, which had prevailed during the last days, had forced the ice landward, and the pressures had crushed in the edges of our floe, and greatly diminished its size. We rushed over the grinding, groaning, broken walls of drifting ice, and so great was our ardour, that we took no notice when some one or other of the party tripped and fell. Each panted to reach the land. We had already gone half way, the ship having long disappeared from our eyes, when there arose a mist which enveloped everything,

so that the masses of ice looked like high mountains through the hazy atmosphere. Of the land itself we could see nothing, and no choice was left to us but to return to the ship through the mist. The compass was little help, and within the barriers of recently broken ice the traces of our steps were lost. We took at last a wrong direction and were following it up, in spite of Jubinal's loud barks to divert us. As he ran backwards and forwards, magnified in the mist he ran many risks of being mistaken for a bear. What the sagacity of six men could not do, this the instinct of the animal effected. Exhausted by our own exertions, we yielded ourselves to his guidance, and he actually brought us into the right track—and back to the ship.

CHAPTER XII.

THE AUTUMN OF 1873.—THE STRANGE LAND VISITED.

I. THE autumn was unusually mild, though stormy and gloomy. The thermometer up to the 20th of September fell daily some degrees below zero (C.), and occasionally we had rain. At the end of the month the minimum temperature ranged from 14° to 5° F., and the mean temperature of the month was as low as 24.5° F. The mildness of the season was, perhaps, connected with the unusual recession of the ice-barrier in the south; though it might have been a consequence of the open water which had been formed under the land during the drifting of the floes. The land itself was but seldom visible, and heavy masses of dark-blue clouds, which are peculiar to southern latitudes, generally hung over it. Frequent falls of snow again covered everything around us. Parhelia were sometimes visible, and these were generally the precursors of driving snow, which reared deep drifts round the ship. The numerous little lakes on the ice-floes were frozen over in the night even in the earlier part of August, and at the end of the month these bore us during the day. The clear mirror of their surface cracked whenever the temperature fell suddenly some degrees, while the effect of contraction in the ship was followed by the noises which we called "Schüsse." The "ice-holes" were overspread with a viscous ropy ice, which was strong enough to bear us at their edges. The ship now stood out from the ice; her hull was about fourteen feet above the surrounding surface of snow. To facilitate egress and ingress, we constructed steps of ice on each side of the vessel. After the 7th of September our efforts to free the ship were given up. The little basin at

the fore-part of the ship—the result of the toil of many months—was completely frozen over, and afforded us the recreation of skating as a reward for our labours.

2. The experience of the past greatly strengthened all the grounds and motives which so readily presented themselves to abandon our helpless vessel in the following summer and attempt the return to Europe by means of sledges and boats. If there had been no other reason for this resolution, regard for our health would have dictated the step. Our supply of lemon-juice was so reduced, as to leave scarcely a doubt as to the necessity of attempting to return. But amid these prudential considerations, we were filled with fear lest we should be unable to explore the mysterious land we had discovered.

3. The daylight now began to fail. On the 9th of September the sun set at 8.30 and the stars were visible at night. About the middle of the month lamps were kept burning all the night through in our quarters below, and our environment, never very animated, again wore the aspect of the dark realm of ice. The visits of birds became rarer, although they did not quite leave us as long as there was any open water near. The divers and auks had already disappeared. They flew in long lines southward, and as they whizzed past us through the rigging of the ship, we acknowledged the superiority of these little creatures to us and to our ship, which was never to hoist its sails again. The ice-birds, and the robber-gulls still remained with us. We once shot a rose-coloured gull (Ross's gull), said to belong only to North America and Iceland. On the 28th we saw the last snow-bunting. The first aurora was seen on the 22nd, and during the winter its light fell not merely on the Frozen Ocean but on the distant Franz-Josef's Land, showing us that we were not drifting away from it. By the end of the month we had drifted to the eightieth degree of latitude, nearly; and every cliff of the land, even the most insignificant, emerging at a distance from the ice, had charms enough to call us all on deck.

4. In the second half of October, winds from the north and north-east had driven us towards the south and south-west, and as we neared the land we saw that the ice-fields were broken up by their contact with its immovable barrier. Our

own floe had been greatly diminished from the general pressure of the ice. On the 1st of October we were driven so near the land that we found ourselves in the midst of the destruction going on in the ice. Our ice-floe was shattered and broken, and so rapidly had it diminished in size, that the distance of the ship from the edge of the floe, which was 1,300 paces on the 1st, amounted to only 875 two days afterwards. On the 6th it had diminished to 200 paces, so that it was reduced to a mere fragment of its former size. The shocks it now received caused the ship to quiver and shake, and we heard the cracking and straining in its timbers, which kept us on the tenter-hook of expectation lest the ice should suddenly break up. It seemed as if we were doomed to a repetition of the trials and dangers of the preceding winter. The bags of necessaries to be taken with us if we should be forced to leave the ship, were kept in readiness for immediate use. As we watched the advancing wall of ice, and heard the too well known howl it sent forth, and saw how fissures were formed at the edge of the floe, the days of the ice-pressures were painfully recalled, and the thought constantly returned—what will be the end of all this? The Land we had so longed to visit lay indeed before us, but the very sight of it had become a torment; it seemed to be as unattainable as before; and, if our ship should reach it, it appeared too likely that it would be as a wreck on its inhospitable shore. Many were the plans we formed and debated, but all were alike impracticable, and all owed their existence to the wish to escape from the destruction that stared us in the face. Such were our out-looks when on the 31st of October we were driven close to a headland of no great height, about three miles distant from the ship, and found ourselves in the midst of icebergs, several of which were of considerable magnitude. Towards this, the bergs, or we ourselves, or both, were rapidly drifting, as the soundings showed. If the icebergs drifted they would of course crush all the ice-fields which stood in their way. We were now in $79^{\circ} 51'$ N. Lat. and $58^{\circ} 56'$ E. Long. Here exactly in the longitude of Admiralty peninsula of Novaya Zemlya, and with the ship lying north and south, we were to pass the winter—but harbourless.

5. On the forenoon of the 1st of November, the land lay to the north-west of us in the twilight. The lines of rocks were so clearly and distinctly seen, that we were convinced that it could be reached without endangering our return to the ship. There was no room for hesitation; full of energy and wild excitement, we clambered over the ice-walls lying to the northward, which consisted of barriers, fifty feet high, of huge pieces of ice recently forced up amid the pressure. These passed, we came on a broad surface of young ice, which showed that there had been open water there a short time before. Over the surface of this young ice we now ran towards the land. We crossed the ice-foot and actually stepped on it. Snow and rocks and broken ice surrounded us on every side; a land more desolate could not be found on earth than the island we walked on; all this we saw not. To us it was a paradise; and this paradise we called Wilczek Island.

6. So great was our joy at having reached the Land at last, that we bestowed on all we saw an attention which, in itself, it in no way merited. We looked into every rent in the rocks, we touched every block, we were ravished with the varied forms and outlines which each crevice presented. We talked in grand style of the frozen slopes of its hollows as glaciers! Nothing was of greater moment in these first hours than the question of its geological character, and great was our surprise to find here the same rocks, with which we had become acquainted at the Pendulum Islands during the second German North Polar Expedition. The columnar conformation of these Dolerite rocks singularly resembled those of Griper Roads and Shannon Island. The vegetation was indescribably meagre and miserable, consisting merely of a few lichens. The drift-wood we expected to find was no where to be seen. We looked for traces of the reindeer and the fox, but our search was utterly fruitless. The land appeared to be without a single living creature. We then ascended a rocky height on the southern margin of the island, whence we had a view of the frozen ocean extending some miles beyond the ship. There was something sublime to the imagination in the utter loneliness of a land never before visited; felt all the more from the extraordinary character of

our position. We had become exceedingly sensitive to new impressions, and a golden mist which rose on the southern horizon of an invisible ice-hole, and which spread itself, like an undulating curtain, before the glow of the noontide heavens, had to us the charm of a landscape in Ceylon.

7. How vexatious was it to feel, that if we had reached this Land some weeks earlier, we might have explored it without the risk of being cut off from the ship. For some days the sun had sunk below the horizon, and the twilight of noon admitted of only a few short excursions from the ship, quite insufficient to satisfy our earnest desire to learn more of its structure and configuration; and we much feared lest the constant north winds should cause us to drift out of sight of it. Southwards stretched a flat surface of bluish-grey ice, and beyond the distant ship, a large "ice-hole" from whose yellow mirror there arose undulating mists. Beyond this again stretched dark lines of floes running parallel to the horizon, over which, in the south, hung the sky in deep carmine. We scrambled over a rugged slope covered with ice as smooth as glass, which ran into the interior of the little island, in order to get a clear view northward; but we were compelled to return without achieving our purpose, for we feared to absent ourselves longer from the ship. We accordingly went back, but returned next day to explore. But these barren days and small events made a profound impression on our minds, and even Carlsen, the old and tried navigator of the frozen deep, wore on his breast, beneath his fur coat, the star of the order of St. Olaf, to do due honour to the dignity of discovery. We built a pyramid of stones six feet high on the island, and fixed in it one of our flags attached to a pole.

8. On the 3rd of November a party of us started about eight o'clock in the morning, when it was quite dark, to attempt to reach a glacier which we had seen, on the north of the island and on the other side of a frozen inlet of the sea. We took with us a small sledge drawn by three dogs, and, in constant fear of being cut off from the ship, we pressed on over a level surface of snow towards some objects suffused with a dim rosy light, which seemed to float over them. As we neared them we found them to be icebergs, which sparkled

like jewels, and which we took to be the terminal precipice of the glacier we were in search of. It was only, however, after some hours that we came actually in sight of it; the ship having meanwhile disappeared from our view. Suddenly there emerged before us, in the east, a white band, which proved to be the terminal front of the glacier, which, as we approached it, we were surprised to find had an inclination of only two or three degrees. Its highest point, therefore, must have been at a very great distance. On its left side there was a moraine of great depth. When we began our return to the ship, the rosy evening light had disappeared from the



APPROACHING THE LAND BY MOONLIGHT.

higher clouds, while it became clearer behind the gigantic mass of the glacier, so that its dark outline stood out strongly marked on the heavens. It was quite dark when we again drew near the ship, but the brave Carlsen, armed with rifle and walrus-lance for any emergency, came out to meet us.

9. In an excursion on the 6th of November we reached a point on the north-west of Wilczek Island—passing for the first time during this expedition beyond the eightieth degree of north latitude—whence we could see the mainland of the new country stretching before us under the silver light of the

moon. An indescribable loneliness lay on its snowy mountains, faintly illuminated by the span of twilight in the south and by the light of the moon. If the ice on the shore, as it was moved by the ebb and flow of the tide, had not sent forth shrill notes, and had not the wind sighed as it passed over the edges of the rocks, the stillness of death would have lain on the pale and spectral landscape. We hear of the solemn silence of the forest or of the desert, or of a city buried in sleep during the night; but what is this silence to the silence of a land with its cold glacier mountains losing themselves in snows and mists which can never be explored, and the very existence of which had remained unknown from creation till this moment?

10. On the 7th another short expedition towards the southwest of Wilczek Island was carried out; but notwithstanding all our exertions we were unable to determine its configuration, even of the parts immediately contiguous to us. Until the spring of the following year, the whole island, except perhaps a portion of its southern side, remained a mystery to us.

CHAPTER XIII.

OUR SECOND WINTER IN THE ICE.

I. THE Land had meantime been thickly enveloped in its pure white mantle, and wreaths of snow-drifts lay over the rocks scattered over its surface. The light became fainter. Sometimes the precipitous faces of the glaciers seemed to glow in subdued rose-colour through the leaden grey of the atmosphere. When new "ice-holes" appeared, a frosty vapour rose and spread over the surface of the ice; the ship and surrounding objects were covered as if with down; even the dogs were frosted white. We used to stand on deck and gaze on the sun as it sank, surrounded by the evening clouds, behind the jagged edges of the hummocks. Raised by refraction, he appeared for the last time on the 22nd of October with half his disc above the horizon, and the whole southern sky was for a time like a sea of fire over the cold, stiff forms and lines of ice. At length the disc disappeared, and masses of dark clouds moved up and obscured the light still lingering in the sky. The long reign of night began, and the wastes around us relapsed into the stern sway of winter. A pale twilight still lingered for some time, but its faint arc became smaller and feebler. No shadows accompanied the forms of those who strayed over the ice. The wind moaned in the frozen desert. The darkness and the cold continually increased, till the dome of night vaulted the lonely spot which had become our home.

2. But the hope and expectation of successes to be achieved, and the feeling that our safety was not immediately threatened, rendered this second winter a happy contrast to the preceding one. We had now leisure and calmness for intellectual occupa-

tions, which were, indeed, the only means of relieving the monotony of the long period of darkness. We lived like hermits in our little cabins in the after-part of the ship, and learned that mental activity without any other joy suffices to make men happy and contented. The oppressive feeling of having to return ingloriously home, which had always been disagreeably present to our minds during the first winter, was no longer felt. We had now a hope, the charms of which grew day by day, that in the spring we should be able to leave the ship and start on expeditions to explore the land we had discovered. Happy in this expectation, we could enjoy the indescribable pleasures of good books, all the more that we were far from the busy haunts of men, and that the presence of danger clears and sharpens the understanding. Nowhere can a book be so valued as in such an isolated position as ours was. Great, therefore, was the advantage we possessed in a good library, consisting of books of science, and of the classics of literature. In fact, freed from the constantly recurring perils, which had been our portion in the first long Arctic night, this second winter was, to all who actively employed their minds, comparatively a state of happiness, undisturbed by cares. With regard to the crew, they were kept in good humour by the increase of their comforts. As we had not the prospect of a third winter in the ice—which would have rendered a greater economy of our provisions imperative—we were enabled to provide them with a more generous diet.

3. In the last three weeks of November we had complete darkness, the sky clouded over and the weather bad. So dark was it, that our environment, though it was overspread with countless hummocks and ice-cliffs, looked like one black unbroken level. On the 31st of October most of the stars were visible about 3 o'clock in the afternoon; by 4 o'clock actual night prevailed. On the 16th of November large print was barely legible even at noon. On the 18th of the month we were able to read the larger letters on the title-page of Vogt's *Geology* at the distance of a foot. At noon, on the 13th of December, not a letter of this same title-page was legible, even in clear weather. On the 5th of November there was a total eclipse of the moon, which then sank below the horizon and did not return till the 29th of that month. Its



DEPARTURE OF THE SUN IN THE SECOND WINTER.

beams then fell on a large ice-hole, which had formed itself twenty miles to the south of the ship, which made us apprehensive lest our floe should be driven by the north winds in a southerly direction. On the 4th of December the moon reached its highest declination, but, as it waned, it was constantly obscured by bad weather. I had reckoned on the return of moonlight to make an excursion of some days to the mainland. But the fickleness of the weather at the beginning of December compelled me to confine my wanderings to Wilczek Island, which I frequently visited, although with a thermometer at -35° F. I was exposed to frost-bites in the face and hands, whenever I attempted to draw by the light of a lamp, and with only the protection of light woollen gloves.¹

4. We observed during this winter, that, on the clearest nights, snow of the finest texture continued to fall, so that we saw the heavenly bodies, as it were, through a veil of fine gauze. In the moonlight this fine snow sparkled faintly, and its presence could only be discovered by a prickling on the skin. The constancy of these downfalls added of course to the depth of the snow under which the *Tegetthoff* was almost buried; indeed at the beginning of the spring she no longer stood out from the covering of snow, although her fore-part was eleven-and-three-quarter feet, and her after-part four-and-a-half feet, above the ice on which she rested. The air was also often filled with an indescribable quantity of driving snow; and when the wind dropped and permitted it to fall, we were struck with the profound stillness of our environment. The cold constantly increased and penetrated all the parts of the interior of the ship which were not artificially heated,² and almost all the fluids, which were not specially protected, were frozen. The various kinds of spirits on board were exposed on the 23rd of November to the cold at -26° F.; at the end of an hour-and-a-half they still remained fluid. When the temperature fell to -31° F., hollands, common gin

¹ I take this opportunity of stating that the originals of nearly all the illustrations of this book were drawn on the spot from nature, and that they have been reproduced as they were drawn.

² On the 24th of November the thermometer marked -14° F. in the ship's hold. The screw propeller had been fast frozen a month before.



NOON ON DECEMBER 21, 1873

and maraschino were congealed in two-hours-and-a-half, but rum and brandy remained unchanged. On another occasion a mixture of two parts of pure alcohol to one part of water froze at -47° F., cognac at -53° F. This low temperature had so increased the thickness of the ice, that the basin of open water, which had been sawed through in the previous summer, was covered on the 3rd of January with ice three-and-a-half, and on the 20th with ice six-and-a-half feet thick.

5. On the 21st of December, the middle of the second long Polar night—which lasted in all 125 days—was reached; and although we knew where the south lay, every trace of twilight had disappeared, and for six weeks we were enveloped in unbroken darkness. The figure of a man could not be discerned at a very short distance. In order to be able to sketch the ship, I had to illuminate it by torches. Those who made expeditions afoot were struck, as it were, with blindness. If they approached what seemed to be a lofty chain of mountains, over the ridge of which the planet Jupiter hung like a glowing point, they came at once on a dark wall of ice; and when they ascended the apparently far distant ridge, the planet stood almost in the zenith. There was something approaching to twilight only when the crescent moon shone in her first quarter. On the 7th of December the sun was 12° , and on the 21st $14\frac{1}{2}^{\circ}$, below the horizon. We should not have seen the sun, could we have ascended the pinnacle of the Alps, which Pliny imagined to be 120,000 feet high, or even from that summit of the Caucasus which Aristotle reckoned at 230,000 feet.

6. Distrusting the quiescent state of the ice, we had again stretched a tent over one-half of the ship's deck, while the other portion was covered with snow trodden down as hard as a skating-rink. The space for free movement was narrowed still further by the long-boat placed between the two masts, by the stores of provisions kept in readiness for the possible disaster which might compel us to leave the ship, by the stand of rifles, by dog-kennels, and other inevitable impediments. In bad weather the dogs sheltered themselves under the tent, and sometimes showed ill-temper if their feet were trod on. There were places on deck where only their particular friends were safe from being bitten; Sumbu especially had a bad

habit of lying behind a cask and springing out on every one that passed by. Here under its friendly shelter the men waited the summons to their meals. Hither came Carlsen to enjoy the opportunity of talking Norwegian with some one or other. The deck light shone feebly on all this, shedding its rays on the fine snow which fell through the tent-roof. In the second half of the winter, when the deck was less frequented, the lantern became, like the crew—more sleepy; and its dull light fell on hard-frozen sailcloth, boards covered with snow; and on empty tin cases. Here, too, walked, of course, the deck-watch, enveloped in clothes from head to foot, with only their eyes uncovered, looking more like moving figures than men. The deck-watch had also to keep open the water-hole in the ice, to look out for bears, and to assist in reading off the thermometers exposed on the ice. They were on duty for two hours, and the moment they were relieved, they shot down into their quarters, as quickly as a harpooned whale dives under the waves. He, too, whose duty it was to fetch the snow to be converted into water was often to be seen on deck. Although the store of snow in which we lived was inexhaustible, yet, in order to be exempt from this duty in bad weather, it was the practice of those who were told off for this service to lay up a supply of blocks of frozen snow under the tent. Some of the crew showed the scrupulosity of chemists in their work. Before they proceeded to build up their pile, they brought specimens to the cook, in order to learn his opinion as to the residuum of salt in the ice.

7. With December a new era began for the dogs. A large snow house was built for them outside the ship, in which were placed their kennels, well filled with straw. The name of each dog was written on his house. And here let me remark, that the winter quarters of the dogs should always be on the ice. To keep them under the deck-tent is unhealthy and inconvenient, and would be an impossibility if their numbers were great. Every morning Haller opened the door of the snow house, and out rushed the dogs, with their tails in the air, to begin forthwith a general fight. No shouts, no blows, not even the discharge of a rifle could separate the combatants. Pouring water over them at a temperature of -35° F., though a somewhat barbarous way of producing peace, was successful

only with the younger dogs. When the fight was over, the next object was to find out their special patron, and the instant they recognised him they rushed upon him, tugged at his clothes, and thrust their noses inquiringly into his pockets. Each then made his morning round, visiting the places where he had hid in the snow a piece of bread or covered up a bit of seal. When they had satisfied their appetite, it was curious to observe how they would make it smooth over the hole in which they deposited their treasure, all the time cunningly turning their eyes right and left to see whether they were observed.

8. Their violence and eagerness having somewhat abated, we may observe the members of our pack one by one. The red giant there, who offers his paw as huge as a bear's, is named after a god of the heathen days of Lapland, "Jubinal;" and not a few legends surrounded the accounts of his early life. A Siberian Israelite, so it was said, brought him from the north of Asia over the Ural. He was the victor in all fights, the leader of the sledge team, and could drag four men on a hard level path without any effort. The day before we sailed from Bremerhaven he tore a sheep to pieces. Every summer when he changed his coat, the sailors clad him in a canvas dress. Bop was his inferior in strength, but his superior in wisdom; Matoschkin surpassed him in gravity. The latter used to sit for hours in a moody manner on a pile of chests looking at the ice world. Bop and Matoschkin were Newfoundlands; the first died of cold in our first winter, the latter, as our readers may remember, was carried off by a bear and torn to pieces. We had also two Newfoundland bitches, who were called respectively "Novaya" and "Zemlya;" the former died in the first year, the latter, though she was of little use in sledging from her laziness, may claim indisputably the merit of being the mother of her hopeful son, "Torossy," who grew to a considerable size, and was the pride of the whole crew. He knew no other world than the frozen ocean, and no other destiny than to draw a sledge; and to this work he had devoted himself zealously since the commencement of winter. In the happy courage of ignorance he wagged his tail all day on deck; wagged his tail as he followed us on the ice; wagged it, even when Sumbu stole

his dinner ; wagged it, even before the jaws of a bear. Gillis, the fifth Newfoundland, was incessantly quarrelling, and was the irreconcilable enemy of Jubinal ; he was a favourite with no one, chiefly because he had killed the two cats which we brought from Tromsøe as pets for the dogs. His body was covered with scars, and half his time was spent under the medical treatment of the Tyrolese. He was not wanting in docility, but he was essentially an eye-pleaser ; all his efforts in the sledge were mere sham. Pekel, the Lapp, was the smallest of all the dogs. In his early days he had tended the reindeer at the North Cape and on the plains of Tana Elf, and



PEKEL, SUMBU, AND JUBINAL.

his ways did not fit him for life amid the ice, but for the brown herd which roamed at the foot of Kilpis. Hence he was quarrelsome, and showed special enmity to Sumbu, the mere sight of whom was enough to stir up the most hostile feelings. He was therefore banished with his house to a high ice-cliff, but the thaw destroying its supports, house and dog fell plump into an ice-lake. Among all the dogs there was no such desperate hypocrite as Sumbu, the most demonstrative in his friendship, but withal the most greedy and dissatisfied. He was the first to slink away with tail between his legs and find out the most secluded nook, when he saw the other dogs being harnessed in the sledges ; and, when pulled out and put in a team, at once laid himself down on the sledge, not to draw, but to be drawn. When at last he was set in motion, he was no longer the same dog. He was then full of action, unsurpassed in speed and agility, and his sportiveness was as great as his cunning. From the carpenter he would carry off a hoop,

or a bag of nails from the stoker, or he lay flat on his belly and thrust out his long nose in the snow. His agility stood him in good stead, for it enabled him to catch all the mice that ventured on deck. Neither the stores of provisions for the dogs nor the depot of food for the crew were safe from his depredations. He hated bears so fiercely, that he began to howl like a wolf when we turned out to hunt them. Boldly he followed up their trail, even when at a distance from the hunters and close to the heels of the bear. The dogs were fed once a day with bear's flesh or blubber, or dried horse-flesh, as long as it lasted.¹ They well knew the hour of feeding, and gathered together before it arrived. At night they were shut up in their house, and when the snow drifted they all lay huddled in a heap before the door. The dog-house was about eight feet high, but after a few weeks we could scarcely discern it from the accumulation of snow-drifts. For some time we kept up communication with it by means of a shaft dug in the snow; but one day in February a fissure in the ice was formed right across where the house stood, which compelled us to remove it.

9. The end of December came, and with it the season of those festivals which animate the Christian world—Christmastide and the New Year. In order to celebrate them in common, we built a snow house, decorated its interior with flags, and placed in it a Christmas tree, which, however, more resembled a wooden hedgehog or a *cheval de frise*. About six o'clock in the evening all our preparations were made, and the ship's bell, sounding mournfully in the dark and misty atmosphere, summoned us to our snow house on the ice. Here lots were drawn, and cigars, watches, knives, pipes or rum fell to the fortunate drawers. For all these presents we had to thank friends in Vienna, or Pola, or Hamburg. Then came the Christmas dinner, but no one's heart was in the matter. Our bodies, indeed, were present, but our thoughts were far away with those we loved at home. New Year's Eve passed off somewhat more cheerfully. Bettergrounded seemed our expectations that 1874 would at last bring us our long-desired activity and a not inglorious return to Europe. Scarcely had the new year begun than the crew knocked at our cabin

¹ We had brought 1,400 lbs. of it from Bremerhaven.

doors with their congratulations, and such salutations continued to be the order of the day. On the whole this second winter both before and after the new year (1874), passed away without the fearful events of the preceding. Although floes lay close to us on every side, and we had no harbour in which to pass the winter with comfort—like a bear in its winter sleep—the quiescent state of the ice allowed us to hope that our floe would remain in the position it had hitherto maintained. This hope, indeed, lay at the mercy of the winds; for if north winds should set in, it was extremely probable that the ice would break up and drift asunder.

10. The life we now led below in the ship had ceased to be in any way disagreeable, and cheerful and entertaining reading seemed to be healthier than bodily exercise. We did not suffer from any want of the necessaries of life; the temperature of our living-rooms generally admitted of our sitting for hours even without our overcoats. The long night of this Polar winter was gloomy and oppressive only to those who had time and leisure to weigh the burden of the hours. There were, of course, even in this second winter, some of those discomforts and dangers of which the reader has heard enough, and which lead him when he reads of life in the frozen regions to think of ice-floes rather than of a room in which comfort is quite possible. We had, indeed, the usual inconveniences. As early as the middle of October the skylight was so covered with frost that we could scarcely read even at noon. On the 20th of that month we were obliged to keep the lamps constantly burning, and to close in the skylight, which brought night into the mess-room before the night of Nature had arrived. By the middle of November the condensation of moisture was perceptible, and our bed-clothes were frequently frozen to the wall, and had to be torn from it before we could go to rest. Yet what signified all this? We all slept soundly notwithstanding, and during the day had to complain rather of warmth than of cold. The condition of the crew, however, was not so happy. We could not follow the example set by Hayes and others of removing the contents of the hold to the land, and so transforming it into quarters for the men. On board the *Tegetthoff* we suffered some of the evils of over-population, and the moisture was so

much increased from it, that some of the berths were completely saturated. The employment of hammocks would perhaps avert this evil.

11. The number of those afflicted with scurvy decreased with the approach of spring. Their gums recovered their fresh and natural appearance, and the general weakness, the pains in the joints, the leaden weight of the feet, the depression of spirits—symptoms of this terrible malady—abated, and the scorbutic marks disappeared from their bodies.



IN THE MESS-ROOM.

Pachtusow, when he wintered in Novaya Zemlya, so abundant in supplies of drift-wood, caused his people to use the bath once a week in a log house constructed on the land, as a preservative against scurvy, and had their inner clothing washed twice a week, but even these steps were insufficient to avert the malady. In our case baths so added to the moisture that we were obliged to put a stop to them, and our under-garments could be changed only as our stock of them

permitted. Hence we could hope to prevent the spread of scurvy only by the improvement of our diet. Several hundred-weight of potatoes and a large supply of preserved meat had been kept in store for the second winter. These now came into use, and were the more welcome as our supply of lemon-juice—the most important preservative against scurvy—was diminishing. By the advice of our physician, Dr. Kepes, we departed from the maxim, so generally adhered to in Arctic expeditions, of avoiding spirituous liquors. From the beginning of October our men daily received rations of brandy. When I compare the sanitary condition of the crew of the *Tegetthoff* with the better state of that of the *Germania*, I attribute this to the lesser power of resistance to disease in some of our people on board the *Tegetthoff*, and to the moral depression so easily explained by our disasters in this ship.

12. The Arctic voyager is exposed to no disease so much as to scurvy. Its appearance among a crew exercises a most untoward influence. Its causes are still but little known; the means, however, of combating it are numerous. It is no longer the scourge it was in the days of Barentz, when he and all his men were attacked with it on the short summer excursion of 1595, or when in Munk's expedition of 1619 all died but two. In Behring's expedition of 1741, out of seventy-six men, forty-two were attacked and thirty died. In Tschirikoff's summer expedition during that same year (1741), out of seventy men, twenty died. Rosmyslow, who passed the winter of 1768-69 in "Matoschkin-Schar," lost seven out of thirteen men. When the disease gains the mastery, the utter incapacity of the expedition for further exploration follows as a necessary consequence. Lassinius, who was sent out to explore Novaya Zemlya in 1819, had to return in the height of summer, all his men having fallen down with the scurvy. This disease has been a frightful enemy to expeditions which have wintered in that region, and carried off numerous victims. All these, it is true, were miserably equipped, and depended on the medicinal virtues of the "Löffel-kraut" of that country for remedies against the disease. In 1832-33 Pachtusow, wintering in the south of the island, out of ten men lost three; in 1834-35, two more died of the same disease. In the expedition of Ziwolka and Mojsjew, 1838-39, the scurvy gained

such mastery that at the end of February half of the crew were attacked, and Ziwolka himself with eight men died. Parry regarded damp, especially damp bedding, as the principal cause of the malady. During his wintering at Melville Island he found sorrel an effective remedy or palliative. He attributed the greatest anti-scorbutic effect to beer; and according to him and to most of the English expeditions, beer and wine take the place of brandy. The disease generally has a fatal issue when there has been excessive loss of blood, or when dropsy supervenes. Most of Ross's second expedition suffered more or less from it, and the experience of that expedition showed that vegetable nourishment alone was not competent to make head against it. Ross regarded the addition of fish or seals to the ordinary diet as an effective preservative, and did not disdain the use of blubber for the same purpose. Lemon-juice, uncooked potatoes, fruit with much acidity, fresh vegetables and fresh meat, wine and yeast, exercise in the open air, and cheerfulness, have always proved sufficient to prevent its appearance, or at any rate to render it improbable. But however valuable these may be as preventives, they almost cease to have any effect when the disease has once broken out. The lime-juice must be fresh, and, like vinegar, be taken in as concentrated a form as possible. It is decomposed and useless by being kept too long, and also by the action of frost. This was the case with the lemon-juice which Sir John Ross found among the stores of the *Fury*. An anti-scorbutic effect has been attributed also—and with justice—to the chewing of tobacco. It appears that liability to scurvy is very different among different races, and that neither vegetable nor animal food is an absolute preservative. The Eskimos, and even the Lapps, who seldom or never use vegetables, are almost exempt from it, and McClure's men fell down with it in their second winter, although they had fresh meat three times a week. Steller relates that in Kamschatka scurvy attacks strangers only, but not the natives, who live largely on vegetables; he states also, that the scurvy when it does appear among strangers and visitors there, is cured by a diet of the fresh fish of spring.

CHAPTER XIV

SUNRISE OF 1874.

I. AN unbroken sleep for the whole winter would, undoubtedly, be a blessing to the Arctic navigator, and the most energetic among us resigned himself to slumber for a few hours in the afternoon—the profane time of the day for all zones of the earth—especially after the coming in of the New Year, when the long unbroken night is intensely felt. The darkness diminished very gradually, and as the weather was frequently cloudy and dull, it was little lessened by the full moon, which we had at the beginning of January and February. December 26, we were able to read only the title of *New Free Press*, at the distance of a few inches, but not a word of Vogt's *Geology*. January 11, the word *Geology* on the title of that book was discernible in clear weather, but only when the book was held up to the light of the midday twilight. On the following day it was as dark at nine o'clock in the morning as at noon on December 1st. The moon returned again on the 24th of January, and after it was four days old we could distinguish the common print of the "Press" by its light, and for the first time read off the degrees of the thermometer without artificial means. During the whole of the month we had alternations of high temperatures and snow-drifting, and at the end of it the wind dropped and the cold became exceedingly great, causing the ice to break up to the south of our position. It would be difficult to give in an illustration any notion of the wonderful forms produced by the twilight, and its glowing colour-effects, and quite impossible to describe the blaze of the

meridian heavens, while deep shadows still lay over the ice-plains and a dark ridge fringed and closed the horizon.

2. At noon on the 23rd of February the rolling mists glowed with a red light, announcing the reappearance of the sun. The next day the sun himself, raised and distorted into an oval shape, appeared above the horizon about 10 A.M. Again there was spread over the snow that magical rosy hue, those bright azure shadows, which impart a poetical character even to the landscape of the frozen north. The return of the sun was this year the deliverance from our long night of 125 days.¹ Anxiously had we waited his return, and joyously we greeted it, but not with the frenzied feelings of the previous year. Then the reappearance of the sun was tantamount almost to a deliverance from hell itself; but now the sun was nothing to us but as a means to an end: would it enable us to begin our sledge-journeys to explore the Kaiser Franz-Josef Land? The mere thought of the possibility of making new discoveries threw us into a feverish impatience, and our fears became intense lest the ship with its floe should drift away and frustrate the execution of our plans just as they seemed feasible.

3. On that same day Lieutenant Weyprecht and I resolved to abandon the ship after the termination of our projected sledge-journeys of discovery, and to attempt to return to Europe by means of the boats and sledges. No arguments were needed to convince every one of the ship's company of the absolute necessity of this resolution. Our ship lay on its icy elevation, beyond the power of man to liberate her, and the provisions would not be sufficient to sustain us for another year. But fear lest the state of our health should greatly deteriorate in a third winter spoke more forcibly than anything else in favour of our decision. When we looked at our medical stores, once so ample, now so reduced, at the few bottles of lemon-juice we could count on, all saw the impossibility of our remaining longer in these latitudes. The melancholy issue of Franklin's expedition forced itself on our

¹ Parry's winter night of 1819-20 lasted eighty-four days; Ross's, in the Gulf of Boothia, fifty days; Kane's, in Rennsalaer harbour, 113 days, and Hayes' 123. In the latter case, however, the mountains on his southern horizon were the cause why the sun was not earlier visible.

mind as an instructive example and warning. In all likelihood that ill-fated expedition had delayed its return a year longer than it should have done, and began it in so weakened a condition, that it was next to an impossibility that they should have succeeded in their purpose. We began to be pinched also in many of our stores, in spite of the greatest economy in their use. To add to our perils, the doctor drew a sad picture of the sanitary condition of our crew. Of nineteen men, several had fallen sick: Krisch still suffered from scurvy and consumption; Marola from the first scorbutic symptoms; Fallesich from its consequences; Vecerina from the utter inability to move his lower extremities produced by the same malady; Palmich from a constant tendency to it and the contraction of his lower extremities; Pospischill from lung disease; and Haller from a rheumatic affection of his extremities which almost incapacitated him for any exertion.

CHAPTER XV.

THE AURORA.

1. THE Northern lights had shone for these two winters with incomparable splendour, not, indeed, with the quiet diverging beams, sometimes observed in our northern latitudes, and different also from the phenomena which have been seen and noted in recent years, even in Central Europe; they resembled rather those we saw in East Greenland, save that the brilliancy and intensity of their colours were far greater.

2. It is very difficult to characterize the forms of this phenomenon, not only because they are manifold, but because they are constantly changing. Sometimes the Aurora appears like flaming arches with glowing balls of light; sometimes in irregular meridians painted on the heavens, sometimes in brilliant bands and patches of light on the sky. Each of these forms was frequently developed from a different one, but towards morning the last-named appearance was the most general.

3. The movement of the waves of light gave the impression that they were the sport of winds, and their sudden and rapid rise resembled the uprising of whirling vapours, such as the Geysers might send forth, which generally assumed the form of enormous flames, except that they were transparent and mist-like. In many cases the Aurora much resembled a flash of summer lightning conceived as permanent. It appeared almost always in the south, and was visible from September till March, during which period it was to us the only external excitement which we had. The illuminating power of the Aurora, when its colours were most brilliant and intense, was inferior to the illuminating power of the full moon.

Some rare cases excepted, this was either so small or so transitory, that it had no influence on the darkness of our long winter nights. Like a stream, or in brilliant convolutions, the light rushed over the firmament, as well from east to west as from west to east. The formation of the corona (or the convergence of the streamers in the direction of the inclination needle) was sudden, and short in its duration, and frequently happened more than once in the course of a night. Its greatest intensity was from eight till ten o'clock at night. It was never accompanied with sound.¹ The sketch we have given represents one of its most characteristic forms. The inner parts of the flames are usually whitish green, and their edge on the upper side red, on the lower green.

4. Brilliant auroras were generally succeeded by bad weather. Those on the other hand which did not rise to any great height in the sky, or which did not show any special mobility, were regarded as the precursors of calms. None of the theories which have been ventilated are in exact accordance with all the manifestations of these northern lights. The undulating motion of their waves of light, their rolling forth like pillars of smoke driven by winds, has hitherto remained unexplained. Although electrical processes, still unknown, seem to be the main causes of the Aurora, atmospheric vapours may, however, have a considerable part in producing the phenomenon; and nothing so much favours this supposition as the indefinite form in which it often appears. Its occurrence during the day, *i.e.* light clouds with its characteristic movement, has been rather imagined than actually observed. The transition of white clouds into auroral forms at night has never at least been satisfactorily proved. Falling stars pass through the northern lights without producing any perceptible effect, or undergoing any change. A dirty sulphur yellow was characteristic of all auroras when the sky was overcast with mists or when they were seen by moonlight. In clear weather they were colourless.

¹ It has often been asserted that sound accompanying the Aurora has been heard in the Shetland Isles, and in Siberia; but all scientific travellers protest against this. Franklin, who at first believed in this alleged phenomenon, afterwards retracted his opinion, and was convinced that the noise proceeded from terrestrial causes.



THE AURORA DURING THE ICE PRESSURE.

5. Their influence on the magnetic needle was very variable. While the quiescent and regular arches had little or no effect, the quicker and more fitful streamers, especially when accompanied with prismatic colours, produced great disturbance in it. Sir John Ross remarked, that the aurora when tinged with deep red colour had a great effect on it, although he completely stultifies his observation by his supposition, that the phenomenon was produced by rays of the sun reflected on the vast fields of snow and ice surrounding the Pole. Parry in 1820 could discover no effect from it either on the magnetic needle or on the electrometer. During the winter of 1872-3, the character of the northern lights was much altered, though their colour remained constant. At first they consisted chiefly of bands of light, running from the south-northwards. At a later period of that winter they assumed for the most part the appearance of coronæ, and then their direction was from the north southwards. During the voyage of the *Tegetthoff* the observations of the behaviour of these lights and of the magnetic constants were taken by Weyprecht, Brosch, and Orel by means of a magnetic theodolite, a dipping needle, and three variation instruments. The extraordinary disturbances of the needle rendered the determination of exact mean values for the magnetic constants impossible. The diminution of their intensity was considerable during the continuance of auroras. In $79^{\circ} 51' N.$ Lat. and $58^{\circ} 56' E.$ Long. the declination amounted to $19\frac{1}{2}^{\circ} E.$ and the inclination to $82^{\circ} 22'.$ The ice-pressures which occurred in December, 1873, together with the tedious preliminaries in fixing the magnetic instruments, prevented these officers from carrying out their labours regularly till the next month. The following are the principal results of these observations: (1) The magnetic disturbances were of extraordinary magnitude and frequency. (2) They were closely connected with the aurora; and they were greater as the motion of the rays was more rapid and fitful, and the prismatic colours more intense. Quiescent and regular arches, without changing rays or streamers, exercise almost no influence on the needle. (3) In all the disturbances the declination needle moved towards the east, and the horizontal intensity decreased while the inclination increased.

6. In spite of the extreme difficulty of describing the appearances of those fitful and changing lights, I believe that the following description of Lieutenant Weyprecht will be found equally faithful and effective :—

“There in the south, low on the horizon, stands a faint arch of light. It looks as it were the upper limit of a dark segment of a circle ; but the stars which shine through it in undiminished brilliancy convince us that the darkness of the segment is a delusion produced by contrast. Gradually the arch of light grows in intensity and rises to the zenith. It is perfectly regular ; its two ends almost touch the horizon and advance to the east and west in proportion as the arch rises. No beams are to be discovered in it, but the whole consists of an almost uniform light of a delicious tender colour. It is transparent white with a shade of light green, not unlike the pale green of a young plant which germinates in the dark. The light of the moon appears yellow, contrasted with this tender colour so pleasing to the eye, and so indescribable in words, a colour which nature appears to have given only to the Polar regions by way of compensation. The arch is broad, thrice the breadth, perhaps, of the rainbow, and its distinctly marked edges are strongly defined on the profound darkness of the Arctic heavens. The stars shine through it with undiminished brilliancy. The arch mounts higher and higher. An air of repose seems spread over the whole phenomenon ; here and there only a wave of light rolls slowly from one side to the other. It begins to grow clear over the ice ; some of its groups are discernible. The arch is still distant from the zenith ; a second detaches itself from the dark segment, and this is gradually succeeded by others. All now rise towards the zenith ; the first passes beyond it, then sinks slowly towards the northern horizon and as it sinks loses its intensity. Arches of light are now stretched over the whole heavens ; seven are apparent at the same time on the sky, though of inferior intensity. The lower they sink towards the north, the paler they grow, till at last they utterly fade away. Often they all return over the zenith, and become extinct, just as they came.

“It is seldom, however, that an aurora runs a course so calm and so regular. The typical dark segment which we

see in treatises on the subject, in most cases does not exist. A thin bank of clouds lies on the horizon. The upper edge is illuminated; out of it is developed a band of light, which expands, increases in intensity of colour, and rises to the zenith. The colour is the same as in the arch, but the intensity of the colour is stronger. The colours of the band change in a never-ceasing play, but place and form remain unaltered. The band, is broad and its intense pale green stands out with wonderful beauty on the dark background. Now the band is twisted into many convolutions, but the innermost folds are still to be seen distinctly through the others. Waves of light continually undulate rapidly through its whole extent, sometimes from right to left, sometimes from left to right. Then again it rolls itself up in graceful folds. It seems almost as if breezes high in the air played and sported with the broad flaming streamers, the ends of which are lost far off on the horizon. The light grows in intensity, the waves of light follow each other more rapidly, prismatic colours appear on the upper and lower edge of the band, the brilliant white of the centre is inclosed between narrow stripes of red and green. Out of one band have now grown two. The upper continually approaches the zenith, rays begin to shoot forth from it towards a point near the zenith, to which the south pole of the magnetic needle, freely suspended, points. The band has nearly reached it, and now begins a brilliant play of rays lasting for a short time, the central point of which is the magnetic pole—a sign of the intimate connection of the whole phenomenon with the magnetic forces of the earth. Round the magnetic pole short rays flash and flare on all sides; prismatic colours are discernible on all their edges; longer and shorter rays alternate with each other; waves of light roll round it as a centre. What we see is the auroral corona; and it is almost always seen when a band passes over the magnetic pole. This peculiar phenomenon lasts but a short time—the band now lies on the northern side of the firmament; gradually it sinks, and pales as it sinks; it returns again to the south to change and play as before. So it goes on for hours; the aurora incessantly changes place, form, and intensity. It often entirely disappears for a short time only to appear again suddenly, without the observers

clearly perceiving how it came and where it went : simply—it is there.

“ But the band is often seen in a perfectly different form. Frequently it consists of single rays, which, standing close together, point in an almost parallel direction towards the magnetic pole. These become more intensely bright with each successive wave of light ; hence each ray appears to flash and dart continually, and their green and red edges dance up and down as the waves of light run through them. Often again the rays extend through the whole length of the band and reach almost up to the magnetic pole. These are sharply marked but lighter in colour than the band itself, and in this particular form they are at some distance from each other. Their colour is yellow, and it seems as if thousands of slender threads of gold were stretched across the firmament. A glorious veil of transparent light is spread over the starry heavens ; the threads of light with which this veil is woven are distinctly marked on the dark background ; its lower border is a broad, intensely white band, edged with green and red, which twists and turns in constant motion. A violet-coloured auroral vapour is often seen simultaneously on different parts of the sky.

“ Or again, there has been tempestuous weather, and it is now—let us suppose—passing away. Below on the ice the wind has fallen, but the clouds are still driving rapidly across the sky, so that in the upper regions its force is not yet laid. Over the ice it becomes somewhat clear ; behind the clouds appears an aurora amid the darkness of the night. Stars twinkle here and there ; through the openings of the clouds we see the dark firmament and the rays of the aurora chasing one another towards the zenith. The heavy clouds disperse ; mist-like masses drive on before the wind. Fragments of the northern lights are strewn on every side ; it seems, as if the storm had torn the aurora bands to tatters and was driving them hither and thither across the sky. These threads change form and place with incredible rapidity. Here is one ! lo, it is gone ! scarcely has it vanished before it appears again in another place. Through these fragments drive the waves of light ; one moment they are scarcely visible, in the next they shine with intense brilliancy. But

their light is no longer that glorious pale green, it is a dull yellow. It is often difficult to distinguish what is aurora and what is vapour—the illuminated mists as they fly past are scarcely distinguishable from the auroral vapour which comes and goes on every side.

“But, again another form. Bands of every possible form and intensity have been driving over the heavens. It is now eight o'clock at night, the hour of the greatest intensity of the northern lights. For a moment some bundles of rays only are to be seen in the sky. In the south, a faint scarcely-observable band lies close to the horizon. All at once it rises rapidly and spreads east and west. The waves of light begin to dart and shoot; some rays mount towards the zenith. For a short time it remains stationary, then suddenly springs to life. The waves of light drive violently from east to west; the edges assume a deep red and green colour, and dance up and down. The rays shoot up more rapidly; they become shorter; all rise together and approach nearer and nearer to the magnetic pole. It looks as if there were a race among the rays, and that each aspired to reach the pole first. And now the point is reached, and they shoot out on every side, to the north and the south, to the east and the west. Do the rays shoot from above downwards, or from below upwards? Who can distinguish? From the centre issues a sea of flames; is that sea red, white, or green? Who can say?—it is all three colours at the same moment! The rays reach almost to the horizon; the whole sky is in flames. Nature displays before us such an exhibition of fireworks as transcends the powers of imagination to conceive. Involuntarily we listen; such a spectacle must, we think, be accompanied with sound. But unbroken stillness prevails, not the least sound strikes on the ear. Once more it becomes clear over the ice, and the whole phenomenon has disappeared with the same inconceivable rapidity with which it came, and gloomy night has again stretched her dark veil over everything. This was the aurora of the coming storm—the aurora in its fullest splendour. No pencil can draw it, no colours can paint it, and no words can describe it in all its magnificence. And here below stand we poor men, and speak of knowledge and progress, and

pride ourselves on the understanding with which we extort from Nature her mysteries. We stand and gaze on the mystery which Nature has written for us in flaming letters on the dark vault of night, and ultimately we can only wonder and confess that, in truth, we know nothing of it."

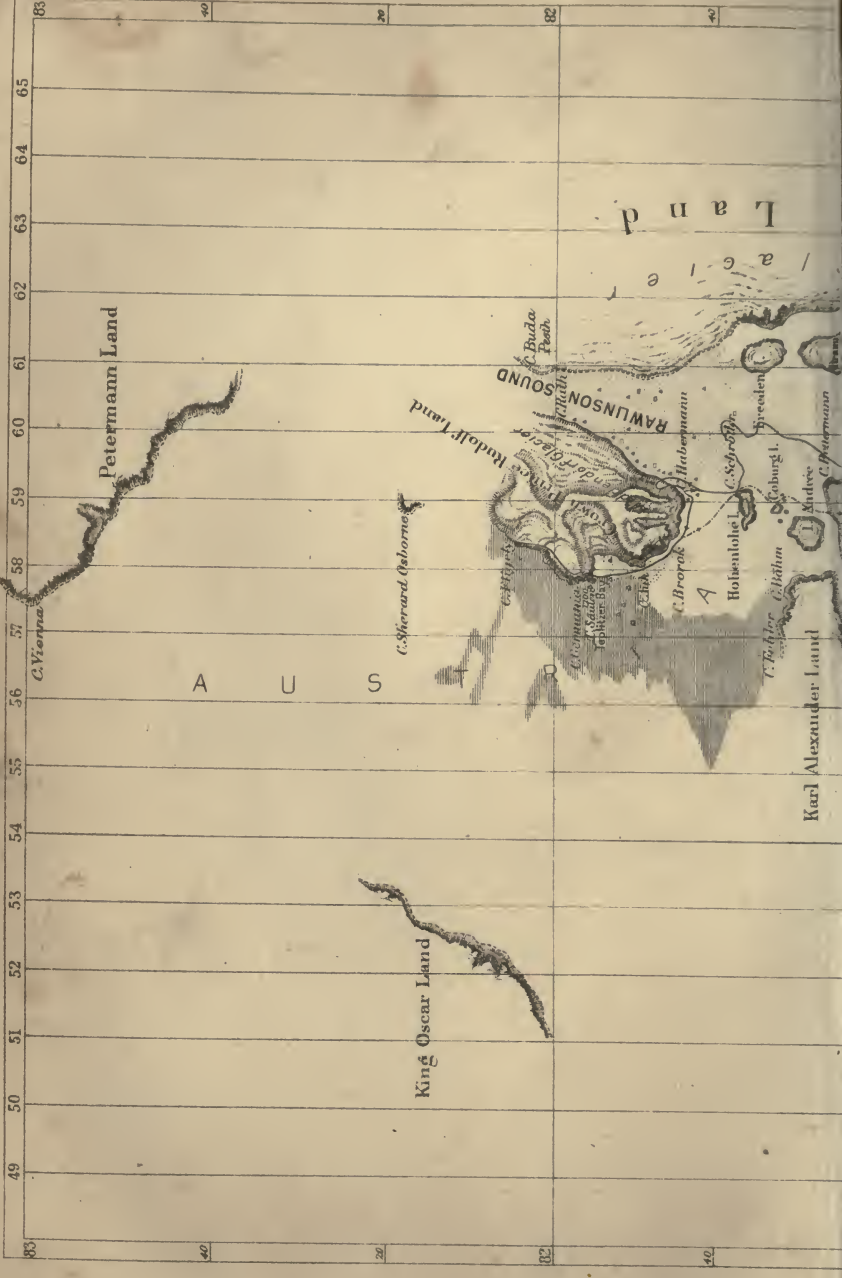
THE EXPLORATION
OF KAISER FRANZ-JOSEF LAND.

THE SLEDGE JOURNEYS.



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ORIGINAL MAP

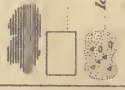
of the

KAISER FRANZ JOSEF LAND

surveyed by

JULIUS PAYER.

Explanation.



Open Water.

Level Ice.

Ice hummocks with Icebergs.

Coast line not accurately determined.

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CHAPTER I.

THE EXPLORATION OF KAISER FRANZ-JOSEF LAND RESOLVED ON.

I. THE necessity of returning home admitted of no question; but the exploration of the Land of which we had seen hardly anything, beyond the cliffs that lay in our immediate neighbourhood, was also felt to be a necessity. That land, which we were all predisposed to imagine as stretching far beyond this wall of rocks,—of what did it consist? Was it an island or a group of islands? And those white masses lying on these lofty ranges, were they glaciers? To these questions no one as yet could give an answer. But of this there could be neither doubt nor question, that we could not count on our floe for a moment, and that those were lost who were not on board the ship if the floe with the ship began to drift. On the 1st of March the Tyrolese announced, that a fissure had appeared half-way between the ship and the shore, and the danger of being cut off became the chief subject of talk, both in the cabin of the officers and in the quarters of the men. When, however, we considered the importance of the venture, all hesitation disappeared, and there was not a man in the ship who would not have made his apprehensions subordinate to the necessity of exploration.

2. As the commander of the expedition on shore, I explained to the council we held on the 24th of February, my plan for the projected sledge-journeys, namely: that the sledge-parties count on the means of escape being left behind to supplement those they may have at their command, and that the depositing of these means be completed before the sledge-parties start; that the expeditions shall begin between the

10th and 20th of March, be continued for six or seven weeks, and take, if possible, the following directions:—one along the coast towards the North, a second towards the West, and a third into the interior, and each to be concluded by the ascent of a dominating height; that in the event of the sledge-parties not finding the ship on their return, they should attempt to go back at once to Europe, and only under the most urgent circumstances pass a third winter in the ice, though the superfluous stores, which were to be transported to the land, would to a certain extent enable them to do this. I engaged also not to extend these journeys to a date which would prevent the men recruiting their strength before the return of the whole expedition to Europe.

3. The exploration of the strange land having been resolved on, the greatest activity reigned in the ship. There was not a man on board the *Tegetthoff* who was not eager to prepare for the sledge-journeys, though all knew that besides the two Tyrolese only four men were to accompany me. Every one longed to take part in the exploration of the unknown land, and the monotony of our life was now exchanged for a state of great excitement; a great venture had been resolved on, and expectations rose with the possibility of discoveries. The comparatively short period for which our stores had now to last enabled us to indulge in what, under the circumstances, might be called luxury. We could thus dispose of more than two hundred bottles of wine, which had been reserved for the sick in the event of a third winter being passed in the ice. Three-and-twenty men now in three months drank two hundred bottles of wine and smoked like chimneys the superfluous stores of cigars and tobacco. Potatoes, preserved vegetables and fruit, were daily on our table. Our allowance of rum was increased; lights were freely burnt in every corner, and the novel sensation of luxury was universal.

4. While we were all living as if the oppressive load under which we had lain so long had suddenly been removed, in these days of general hilarity and amid the excitement of new plans, our comrade Krisch drew toward his sad and melancholy end. From the beginning of February his malady had made great progress. His body was covered with scorbutic spots; but in spite of all this the hope of speedy

recovery constantly animated our afflicted companion, who set us a lofty example of the fulfilment of duty by his zealous activity. In the summer, though already under the influence of his mortal disease, he had been busy in the construction of new ice-saws and borers, in order that he might contribute something to the liberation of the ship, and when he heard of the projected expeditions to Franz-Josef Land, he gathered sufficient strength to extort from me the assurance that I would take him with me. But his end was surely though slowly drawing on; his nights were sleepless, and pain left him neither day nor night. At the beginning of March a state of unconsciousness supervened, and the action of his diseased lungs was now to be heard in an uninterrupted rattling in his throat. Moments of mental clearness became more infrequent in his delirium; help had become impossible; all the care of our physician and of the watchers, who never left him, was now directed merely to the alleviation of his sufferings. He lingered till we returned from our first sledge expedition on the 16th of March.



KRISCH, THE ENGINEER.

CHAPTER II.

OF SLEDGE TRAVELLING IN GENERAL.

1. THE sledge is pre-eminently the means of geographical exploration in high latitudes, and as discovery now forms the main purpose of Polar expeditions, it may be important to describe clearly and precisely the system we followed, that others may either adopt or improve on our methods. Thus I will enter into many details, not in order to dwell on the inconveniences incident to this mode of travelling, but to show how the greatest amount of safety and protection may be secured to the sledge-party.

2. Sledge-journeys presuppose that the ship is safe and secure in a winter harbour. A ship which has not yet completed its summer voyage should avoid them as exceedingly hazardous; and as a principle such expeditions are to be absolutely declined by a ship which is beset in the ice; the success which may have attended some must by no means stimulate others to imitate them. Their object is the exploration of lands still unknown or imperfectly known. They presuppose also the existence of ice, closely adhering to a coast, on which the journeys are performed, and this coast-line must run in a northerly direction, if the North Pole be the goal of discovery. Though sledge-parties follow the coast-line they actually travel on the frozen sea; for it is never safe to abandon that line and make for pack-ice at a distance from it. The crossing of glaciers, however small may be their inclination, is always attended with danger; and if the route be stopped by a stretch of land whose extent forbids dragging, it is of course impossible to proceed. The roughness of the land and its insufficient covering of snow

even in winter sufficiently explain this. A sledge cannot, for any considerable length of time, be dragged up an inclination exceeding two or three degrees.

3. The season of the year for sledging must depend on the climate of particular Arctic localities, and the capacity of the men to endure low temperatures during the night-camping, and driving snow during the march. It is advisable, when more than one year is to be spent in the ice, to begin the more extended sledge-journeys in the first year, because the capacities of Europeans to endure cold rather decrease than increase. Sir John Ross, for example, says that his people at the beginning of a third winter were incapable of bearing hardships, especially those of travelling on the ice. The best season for sledging must always be that time of the year when snow-storms are infrequent, for even a healthy and seasoned party will more easily confront a very low temperature than driving snow-storms. As a rule, these conditions are found most perfectly in autumn; and I do not understand the objection which Hayes makes to this season as being the most damp; whereas as a matter of fact it is the least so. Autumn journeys are preferable to those in spring, both with respect to climate and the state of the road; only they must be commenced early, on account of the rapidly decreasing length of the days.¹ The darkness of winter puts an end to all sledging, and the excessive cold of spring renders it difficult. Summer makes it impossible by breaking up the land-ice, or impedes it by transforming the snow into thaw-water and sludge. Next to autumn, therefore, the latter part of March, all April, and a part of May, are most adapted for this purpose. It must at the same time be remarked, that Captain Lyon (1822) and Dr. Kane regarded March as peculiarly dangerous on account of the prevalence of storms.

4. Next to the season, the state of the snow road, depending on the hardening action of wind and cold, has to be considered. The cold should not vary more than from -2° to -24° F., because greater frost transforms the smooth evaporating surface of snow into a rough plain, bestrewed with sharp pointed crystals, so that the sledge instead of gliding along

¹ Experience acquired both in Greenland and in Franz-Josef Land convinces me that autumn is to be preferred to spring for sledge-journeys.

encounters the friction, as if of a sandstone surface, and stops at the least obstacle. Snow of an ivory-like smoothness rarely occurs; on the contrary, we find the snow in deep layers as fine as powder, into which we sink knee-deep, or among barriers of hummocks, miles in extent, which impose enormous détours in the transport of the baggage. During the journey from 2° to 13° below zero F. constitutes the pleasantest temperature, and even the nights, under this condition, are passed without inconvenience by a party inured to exposure. Snow-storms, however, in their mildest form—snow-drifting—are, at this moderate temperature, distressing and dangerous. In fact, among all the contingencies which may occur during a Polar expedition, there is no severer test of enduring perseverance than dragging a sledge in the face of drifting snow at a temperature from 13° to 35° below zero F.

5. The ship in its winter harbour is the only place of refuge, in all cases where a meeting with Eskimos cannot be counted on. Except for the accidents of hunting, on which no dependence should be placed, the country itself affords no kind of means of subsistence; hence all the necessaries of life must be carried in the sledges. The heavily laden sledge becomes in truth a ship of the icy wastes, and its loss involves the destruction of the whole party. In order to lighten its load and yet prolong the journey as much as possible, supplies of provisions are often deposited along the routes to be traversed. This may be done, either by previous shorter journeys, or by leaving behind a part of the provisions which have been taken from the ship, or by burying the product of the chase in the manner adopted by fur-hunters and Indians. The danger to such stores from the inroads of bears or the breaking up of the ice must be guarded against by a careful selection of localities; and the place being chosen, the provisions should either be buried four feet deep in snow between steep rocks, somewhat above the level of the sea, or the bags containing them should be suspended on the inaccessible faces of the rocks. The choice of an elevated point is some security against visits from bears. But it is never advisable to build confidently on finding the depôt, or to make the possibility of return dependent on this contingency. A small stock of the necessaries of life should always be kept in reserve, as a

prudent precaution in case the depôt should be destroyed. If however the depôts remain untouched and uninjured, and their numbers be considerable, the duration of the journey, which can be prolonged for thirty or forty days only where provisions are carried in the sledges, may thus be doubled in extent. The depôts for journeys in the spring are often formed in the preceding autumn, though their preservation is of course exposed to great risk.

6. Sledges are dragged sometimes by men and dogs conjointly, sometimes by men without dogs, or by dogs alone. Reindeer are found to be unfit for sledge dragging; although Parry in former days, and Nordenskjöld more recently, frequently attempted to employ them in this service. Though a reindeer is able to make with a sledge as many as 120 miles in three days, it cannot continue such efforts without long periods of repose, nor drag the heavy loads which are requisite in longer journeys. Besides this, he who has had any experience in this mode of travelling, knows the unaccountable capriciousness of these animals, their stubbornness, and the difficulty of feeding them. Natives alone are able to manage them, while to strangers they refuse subjection. When the sledges are dragged by men alone, unexpected contingencies are less to be apprehended, but at the same time their rate of progress is diminished. In an expedition calculated to last a month, ten miles constitute the average day's march, when circumstances are favourable. If the length of the journey be prolonged, this average will be considerably diminished. The combination of men and dogs in the work of dragging accelerates the speed. With regard to the men employed in this work, it is advisable to engage experienced mountaineers¹ of great bodily strength, such men being able to do work for which, it is admitted, sailors have neither training nor inclination.

7. No form of sledge travelling, when measured by results, can be compared with sledging by the help of dogs alone; for this method enables us to compass the greatest possible distance, and diminishes the dead-weight of the load in the sledge. Besides this, dogs are not only active but tractable;

¹ This is the reason why the English North Pole Expedition has engaged the services of two mountaineers accustomed to glacier travelling.

they show no fear ; they can endure hunger longer than men, even while making great exertions ; they neither drink nor smoke ; neither fuel for the stove to liquefy the snow, nor tent, nor sleeping bag, need be taken for them ; none, in fact, of those many little things which are indispensable for men. In extreme necessity they may be even used for food. And since a strong dog is able to drag, even for a long journey, double of what he needs for his own support, the surplus falls to the share of the man who accompanies him, and who is able, therefore, to prolong his absence from the ship. Without considering the forced marches which Englishmen, Americans, and Russians have frequently made on the ice with a number of dogs, the employment of a few dogs in sledge expeditions has such conspicuous advantage over teams of men, that I would earnestly recommend the following method of procedure : two teams of dogs, each of two or four strong Newfoundlands, should be employed, one to be driven by the leader of the expedition and the other by one of the most experienced and trustworthy of the party. Each sledge should carry at starting, a weight of from 4 to 7 cwt., *i.e.* provisions for thirty to fifty days, only needing a slight supplement from the products of the chase. Sixteen miles a day, on an average, may easily be thus accomplished, especially if the rest of the party attached to each sledge walk on before their respective teams. Distances varying from 500 to 800 miles may thus be reached, while 300 or at the most 500 miles are all that men alone in the same time can perform. Journeys of this kind require much experience, so that those men only are serviceable who have much practical acquaintance with life in the Arctic wastes, and not merely with life as it is in the ship, but who are inured to fatigues and skilled in the use of those precautions which distance, from the ship imperatively demands during the prevalence of extreme cold. With regard to the route itself, whenever the object is the reaching of higher latitudes and the exploration of a still unknown country, it is advisable to choose one from four to eight miles distant from the land. The search for a route is greatly facilitated whenever we can ascend dominating heights to enable us to determine our position. Such a course not only saves us from the necessity

of making détours, but affords the only possibility of being able to touch the land at desirable points and of ascertaining the character of the intervening districts. A survey may be made either by triangulation, the base being measured by those who remain behind in the ship and the summits of the mountains serving as the points of the triangles, or by the determination of the geographical latitude and longitude of the different spots. The combination of both methods is of course most desirable.

8. The following instruments may be employed in sledge journeys, according to the degree of exactness which is required: a small universal instrument, a sextant with an artificial horizon, a pocket chronometer, an azimuth compass, a boat compass of simple construction, an alcohol and mercurial thermometer, and two small aneroids.

CHAPTER III.

THE EQUIPMENT OF A SLEDGE EXPEDITION.

1. THE equipment of a sledge expedition on a large scale, demands an amount of circumspection and precision which experience alone can give, and its safety and success may be endangered by the neglect of apparently trifling precautions. At a distance from the ship the most formidable dangers may arise, from allowing the matches to become damp, from the leaking or the loss of a vessel containing spirit, from the setting fire to a tent, which only too probably may happen from the carelessness of the cook, to say nothing of those yet greater perils,—the inability of some of the party to march, the destruction of depôts of provisions by bears, or the breaking in of the sea. The first principle in fitting out such an expedition should be the rejection of everything not absolutely necessary for the support of life, the instruments only excepted; and the second, that the whole of the travelling gear should be of the most perfect and convenient form. The departure from these rules contributed, among other things, to the melancholy issue of the Franklin expedition. McClintock speaks most emphatically of the evils of over-loading with things not absolutely necessary. The success of an undertaking may be defeated by the neglect even of things apparently insignificant. Mojsejew's sledge expedition along the coast of Novaya Zemlya in 1839 was a proof and illustration of this. It was wrecked within a few days by the snow-blindness of the entire party, caused by their want of snow-spectacles. If we except the journeys of the Russian explorers of the Siberian coast, carried out, however, at the sacrifice of the whole nomad population, and of

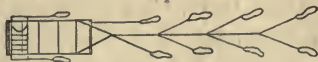
all the dogs and reindeer of North Asia—from which to this day the exhausted country has not recovered—the merit of the organization of sledge expeditions belongs pre-eminently to the English. It was by Parry and James Ross that those experiments with sledges were begun, which have since been brought nearly to perfection by McClintock.¹ The method thus perfected serves to this day as a pattern to be imitated, as it enables a party of men, inured to hardships and fatigues, to pass many weeks without the help of those resources which only a ship in such icy wastes can afford. I will now endeavour to describe with sufficient detail the equipment of our sledges in the journeys we carried out.

2. The changeableness of the weather during the season for sledging, and the character of our expeditions, required the employment of three sledges of different sizes. The smallest of these was a dog-sledge, and the two others were larger and intended to be drawn by men. The runners were respectively 6, 8 and 11 feet long, and $1\frac{1}{2}$, 2 and $2\frac{3}{4}$ inches broad²—gently curved at each end—and about one foot high, so as to raise the lading above the snow. The sledges were constructed of the best ash, and carried loads amounting to 7, 12, and 20 cwts. respectively. The two runners were fastened together by two strong front boards, and by four cross-pieces of wood firmly lashed to the upright standards of the sledge, which were themselves dovetailed into the runners. Screws were sparingly used, and chiefly in the fittings of the two horns of the sledge, and of the rail on which the rifles were suspended, and which also was used to push and guide the sledge. The rail was, therefore, of considerable strength, in order to withstand the pressure of a man's force. The runners were shod with steel carefully riveted on. The accompanying sketch shows the manner in which a sledge is drawn by a

¹ I take this opportunity of fulfilling a duty of gratitude, when I add that in our equipment we followed, in every respect, the tried and tested advice of Admiral McClintock, and that to this we owed for the most part such successes as we achieved.

² Broad runners facilitate progress through deep snow. March 7, 1874, we scarcely could move a sledge of medium size with its load, though we afterwards transported the same load easily with a sledge with broader runners; and the former became available when we fastened a pair of Lapp snow-shoes on its runners.

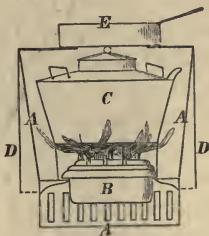
team of men and dogs combined. Those who take the longest steps in the march should precede, and the less active should be placed in the middle, so that any slackness may be easily detected; for in a sledge journey it is disgraceful to draw a weight less than the weight of what we can eat.



TEAM OF SEVEN MEN AND THREE DOGS.

The centre trace should never be grasped, as this diminishes the force of the pull.

3. The proper construction of the cooking apparatus is of the greatest importance, the great principle being to develop heat and prevent its escape as much as possible. The accompanying woodcut represents an apparatus which excellently well fulfils this condition. A, is the inner compartment; B, the holder containing about a bottle of spirit, with seven wicks; C, the covered pan for cooking; D, the outer case; and E, a pan filled with snow and fitted with a moveable handle, which, being placed over an opening in the outer case, utilizes the ascending heat, which would otherwise escape, to liquefy the snow. The apparatus should be made of sheet



THE COOKING APPARATUS.

iron, each of its parts of one piece, and there should be no soldering, in order to diminish the risk of breakage and the setting fire to the tent by the escape of the spirit in a state of combustion. These cooking machines should be of different sizes, according to the number of men in the expedition. The largest of those used by us consumed $\frac{3}{4}$ lb. of spirits of wine

to convert snow, with a thermometer from 13° to 22° below zero F., into three gallons of boiling water. On account of the smaller consumption of alcohol, it is better to use ice than snow for the purpose of cooking.

4. Alcohol of the greatest purity and strength is the best fuel, and is most easily transported in vessels containing about ten gallons. Next to alcohol, stearine is most to be recommended, on account of its great heating powers; and then train-oil, though the smoke and dirt produced by it in the tent are almost unbearable evils. Petroleum ought not to be employed, on account of its dangerous character and its being prejudicial to health. Wood and coals generate too little heat in proportion to their bulk. Parry was the first who, in his journey of 1827, employed spirits of wine; he still used wood and coals in 1820 and Lyon in 1822.

5. The nights are passed either in snow huts, or in tents. If tents be used, the climate must determine their material, whether cotton or sailcloth. A mackintosh floor-cloth should always be spread over the ground of the tent. It is indispensable to make the walls of the snow huts two or three feet high, in order to allow room for movement, and the closed side, *i.e.* the side opposite the entrance, must be made double, as it is always exposed to the direction of the wind. The tent entrance must be carefully closed with hooks and rings, and should not reach to the ground. A tent formed by two poles, about eight feet long, crossed at each end, with another to rest on these supports, is the most simple and secure form of erection. During the journey, a small sail may be advantageously used, whenever the wind is favourable; one of the tent-poles may be used as a mast, and an "Alpine stock" may serve as a yard for the sail.

6. The sledge party passes the night in a common sleeping bag, in which there may be, under propitious circumstances, smaller separate bags for each. When the temperature is not below -13° F., the sleeping bag may be made out of a warm strong quilt; but when the cold is more intense, it must be made of buffalo-skin, and to prevent its being pulled off during the night it should be buttoned at the top in the middle. Sheepskins cannot be recommended for this purpose, as they are far heavier than buffalo-skins; and as they more easily collect

moisture, so they freeze more quickly. The sleeping bag should always be wrapped up in the tent and packed with it on the sledge, so that it may come as little as possible in contact with the snow. If the temperature should fall below -35° F., the travelling party suffers greatly from the frost even in such a sleeping bag, and it would then be advisable to lay an inflated india-rubber mattress under the bag, so that only the legs of the sleepers should be exposed to the influence of the cold.

7. As for arms, it is enough to have three double-barrelled Lefauchaux rifles and one revolver; and even in districts where encounters with bears may be daily expected, three cartridges a day are a sufficient stock of ammunition. These should be explosive shells, with steel points. Small shot cartridges are indispensable on sledge expeditions, as birds are not unfrequently met with. When the cold is excessive, great caution must be used with the cock of the lock, as the brittleness of the metal then causes it to be easily broken; and from the same cause the hammer will often not stand at half-cock. The guns must not be oiled, as it sometimes happens that the hammer on full-cock will not go down where the lock is smeared with oil. Light woollen gloves should be worn for shooting, in order that the fingers may not be frozen in handling the guns.

8. A chest, fixed on the fore-part of the sledge, contains the instruments used in surveying and in the determination of localities; also a thermometer and an aneroid barometer, lucifer matches and cartridges, packed in tin boxes and carefully protected from damp; a supply of nails and screws, wind-screens for the travellers, sewing materials, the spoons of the party, extra soles of felt for shoes, medical stores, brushes, sketch-book, flags, and a supply of light cord. The pocket-chronometer must be worn in close contact with the body of the leader of the party, to guard it against the hurtful influences of the cold.

9. The provisions should be placed below everything, when the sledge is loaded. The daily allowance for each man ought to be increased by half a pound above the usual rations on board ship, so that about $2\frac{1}{2}$ lbs. or $2\frac{3}{4}$ lbs. of solid food fall to the share of each man, and about an equal weight

to each dog. McClintock allowed $2\frac{1}{2}$ to 3 lbs. a head for the men; but only 1 lb. pemmican a day for the Eskimo dogs. Hayes calculates provisions for fourteen dogs for twelve days at 300 lbs.—almost 2 lbs. a day; and, on another occasion, for fifteen dogs for thirty-eight days, at 800 lbs.; and considers $1\frac{1}{2}$ lbs. for Eskimo dogs as too little, when great demands are made on their strength and endurance. From my own experience, I should say, that the least diminution of this quantity of nourishment reduces the capacity to endure great cold and excessive exertions, and produces, after even a few days, a feeling of lassitude both in the men and the dogs, harder to endure than even the sensation of hunger. Parry, in his sledge and boat expedition of 1827, found that 10 oz. of biscuit and 9 oz. of pemmican were hardly sufficient to sustain a man's strength. "It may be useful," he observes,¹ "to remark, as the result of absolute experience, that our daily allowance of provisions, although previously tried for some days on board the ship, and then considered to be enough, proved by no means sufficient to support the strength of men living constantly in the open air, exposed to wet and cold for at least twelve hours a day; seldom enjoying the luxury of a warm meal, and having to perform the kind of labour to which our people were subject. I have before remarked, that, previously to our return to the ship, our strength was considerably impaired, and, indeed, there is reason to believe, very soon after entering upon the ice the physical energies of the men were gradually diminishing, although for the first few weeks they did not appear to labour under any specific complaint. This diminishing of strength, which we considered to be owing to the want of sufficient sustenance, became apparent, even after a fortnight, in the lifting of the bread bags; and I have no doubt that, in spite of every care on the part of the officers, some of the men, who had begun to fail before we quitted the ice, would, in a week or two longer, have suffered very severely, and become a serious incumbrance, instead of an assistance, to our party; and we were of opinion, that in order to maintain the strength of men thus employed, for several weeks together, an addition

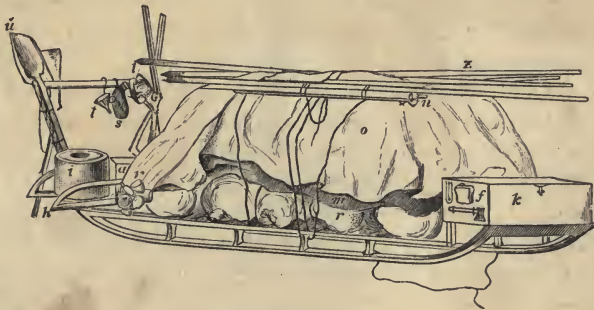
¹ *Narrative of an Attempt to Reach the North Pole*, pp. 145, 146, 4to. London: 1828.

would be requisite of at least one-third more to the provisions we daily issued."

10. To facilitate inspection, it is advisable to portion off the stock of provisions for each week in separate sacks, and never to open a fresh sack till the previous one has been emptied. The contents of the sacks for the latter weeks should be increased a fifth-part at least above the normal weight; because hunger with its accompanying loss of strength generally grows in a distressing manner. The provisions should consist of boiled beef, hard bread, extract of meat, chocolate, grits, pea-sausages, sugar, rice, condensed milk, and coffee. Tea and the two last mentioned articles of food have an indescribably reviving effect, especially in the morning, and enable the party to make long forced marches, warding off the great enemy of such expeditions—thirst. Pemmican and fatty substances, however, when the temperature is very low, must be used in moderation, inasmuch as they tend to promote this evil. The fact that we require more carbon in our food in winter than in summer, and that the colder a country is, the more of this element should be found in its nourishment, may, indeed, be true for life in settled abodes or on board an Arctic ship, but does not hold good of sledge journeys. As fresh meat affords, under all circumstances, the strongest nourishment, the business of hunting must not be left to chance. In order to diminish the weight, all preserved foods—with the exception of milk—are turned out of their tin cases, and kept in small bags. Wherever there is a certainty of finding drift-wood, I would recommend, as Back does, vermicelli or macaroni, which can then be properly prepared. Good strong tea is of the greatest importance, though at first we set little store by it. A small ration of rum daily is almost indispensable in sledge journeys, especially when the temperature is very low. Franklin (1819) and John Ross (1829) both pronounce in favour of the moderate use of this spirit, though they were of opinion that rum, when the crews were leading an inactive life on board ship, promoted scurvy. The provisions we have specified do not altogether correspond with the views of earlier Polar navigators. Pachtussow and Ziwolka provided themselves in their sledge journeys (1835) with the following stores :—Salted meat, barley-meal, grits,

biscuit, butter, tea and sugar ; and Parry's provisions, in 1827, consisted of pemmican, wheat-meal, sweet cocoa-powder, biscuit, and 300 lbs. of concentrated rum.¹ Hayes preferred dried meat, beef-soup, and potatoes to the usual pemmican.

11. The equipment should be supplemented by the following articles :—A small cask of strong rum, a funnel, an india-rubber bottle to measure out the daily allowance of spirit, a snow-shovel, and a stand for surveying purposes. The sketch given below exhibits a sledge laden and packed for a long journey.



THE SLEDGE WITH ITS LOAD.

a, Spirit-can.
f, Axe, Thermometer.
h, Dog-sledge.
z, Cooking-machine.
k, Box of instruments.
m, Tent and sleeping-bags.

n and *z*, Surveying-stand and tent-pole.
o, Sledge-sail.
r, Sacks of provisions.
s, India-rubber bottle.
t, Funnel.
u, Shovel.

12. To obviate the danger of being cut off from the ship by the breaking up of the ice, or to enable the party to push on further, boats have frequently been taken in sledge expeditions. For such purposes, boats of thin metal or of wood are not to be commended ; those made of leather, india-rubber, or waterproof sailcloth, are preferable. But even when their wooden frame-work is made as light as possible, their weight is not less than 300 or 400 lbs. The addition of this weight, and the difficulty of lading them, are so much felt on such journeys, that the boat is usually left behind at a little distance from the ship, as was the case in Kane and Hayes' journeys up Smith's Sound. The case is different, however, in journeys which have to be carried out partly on the ice and

¹ *Narrative, &c.* Intro. p. xiv.

partly—and, indeed, chiefly—on the sea. In such cases, boats of sufficient size to carry both the crews and the baggage are requisite. The whale boat of the Norwegian whalers, carrying seven or eight men, is best adapted for this purpose; although, in long reaches of deep snow, they have their inconveniences, as almost double the number of men is then needed to drag them along. The boats in such expeditions are transported over the ice when the snow road is good, or only passably good, by means of the largest of the sledges we have described; but, if the snow be very deep, it would be advisable to use sledges with three runners underneath, boarded over, so as to prevent the load from sinking into the snow.¹

13. As the sledge party has to endure for several weeks all the horrors of Arctic weather, the article of clothing demands special care and consideration. Abundance of woollen under-garments and light furs best answer this purpose. The woollen under-garments should not fit too closely, so as to hinder the circulation of the blood; and the fur coat should be wide, and reach half-way down the leg. It would be a great mistake to take the clothing of the northern nomad as our pattern. Our powers of enduring the severities of Arctic climate are inferior to theirs, so that we cannot attempt to imitate their hardihood; but our own industries enable us to surpass all their resources. During the march, a long garment of lamb's-wool, to which a belly-band is sewn, two stout linen shirts, one or two pairs of woollen drawers, strong cloth trousers, a pair of common mittens, and a light hood, are sufficient for all temperatures. Wind, especially if it be accompanied with drifting snow, necessitates fur coats, with hoods attached, two pairs of woollen gloves, and a band of flannel to protect the nose, buttoned on to the hood. Wind-guards, made of strong leather serving to protect the face against wind and frost, must not be neglected. Flannel masks, with holes cut for nose and mouth, are of little use, as they are completely frozen in a few hours. A shawl wrapped round the mouth is, after all, the best protection against cold wind, and the least hindrance to respiration. As the shortest beard is converted at once

¹ See description of Parry's Boats—*Narrative*, &c. Intro. pp. xi.-xii.

into a glacier by the freezing of the breath, it is necessary to cut it off. The accompanying figure exhibits the Arctic sledger prepared for the eventualities of cold. It need scarcely, however, be remarked, that no absolutely general rules can be laid down in the matter of clothing, which depends on the different capacities of resistance in individuals, and also on the variations of the weather. When the temperature is not more than 2° or 13° below zero F., some diminution of the garments enumerated above may safely be allowed. Knitted woollen hoods are sufficient protection for the head in almost



THE DRESS OF THE ARCTIC SLEDGER.

all cases. Gloves, not intended to be used in drawing and in handling the instruments, should be made of lamb's-wool, and the fingers lined with flannel. The stockings also should be strengthened with flannel at the heels and toes, and should be kept as dry as possible; because wet feet are inevitably frozen when the cold is excessive. Hence, also, the stockings must be changed at night and dried, by being laid on the chest during sleep.

14. In the matter of furs, no better can be selected than buffalo-skin, or wash-leather made of bear's hide; though no

covering can surpass that which is made from the skins of birds—Eider-ducks, for example—which is equally good for either summer or winter, during the march, or even during sleep, and which need be exchanged for furs only when the temperature during a night-camping falls 35° to 58° below zero F. Sheep-skin and wolf-skin are too heavy; and the reindeer-skin, though so light and warm, is not suitable, as it at once loses the hair when exposed to damp, and does not last a winter with constant use; but of these, the best are those of the young reindeer killed in autumn. Some Arctic travellers, in the absence of furs, have used an extra covering of light sailcloth, as a protection against the drifting snow, which penetrates the clothes and stiffens them. We have tried this experiment, but were not convinced of its success. In Parry's second expedition, his people are said to have worn their furs next to their bodies, and to have found this warmer than the wearing of woollens next the skin; but this I am inclined to regard as a mistake. When furs are worn during the march, their congelation and consequent increase of weight are diminished by wearing the furs sometimes inside and sometimes outside. The inhabitants of Lapland and Kamschatka constantly wear the fur outside; and some Eskimo tribes wear double furs—one turned inside, the other outside. If cloth clothes are worn, their surface should be smooth, so as not to harbour the driving snow; and all buttons should be of a large size, as frozen fingers find it easier to manage them.

15. The covering for the feet of a sledge-party should be sailcloth boots, lined with flannel, and soled with stout felt; and it is not advisable to strengthen the soles by plaiting them with string, as the boot thereby loses that perfect pliability which is indispensable to preserve the foot from the danger of frost-bite. Hence also any covering of india-rubber is objectionable. Leather boots must not be used in sledging; because they become utterly unpliant at a low temperature, and make frost-bites inevitable; and when once put on they cannot be pulled off without being cut to pieces. All boots should be so large and their legs so wide, that they may be put on conveniently over the trousers; and sailcloth boots especially, because of their

shrinking from frost, should be so wide, that they can be put on easily over three pairs of strong woollen stockings. The Eskimo, the inhabitants of Lapland, Kamschatka, and other northern nomad tribes, wear the dried grass of *Cyperacites* as their foot-coverings; and this might be recommended, if it did not also involve the use of skin-coverings for the feet, in which no European can make long marches, without their being inflamed. Because, in the Arctic regions, the condensation of moisture in the shape of ice is an enemy constantly to be guarded against, all stuffs are to be avoided which tend to harbour moisture, especially the linings of coats, pockets, and so forth, made of cotton instead of pure wool. India-rubber garments must never be used, as they prevent evaporation from the body.

16. If dogs are used to draw the large sledges along with men, they ought to be harnessed in the way which the sketch on a preceding page represents. The dog-sledge should be laid across the hinder part of the principal sledge, and made fast to it. If, however, dogs alone are employed, and at walking-pace, they are harnessed in pairs, one pair behind the other. Each dog should draw by a single trace, as we can only thus avoid the constant entangling of the rope-traces. If more than four dogs be employed, they cannot well go in pairs one before the other, but must be harnessed to the sledge in a row, side by side, and the traces must be long, so as to enable the most powerful and best-trained dogs, which are placed in the middle, to be somewhat in advance of the others. The dogs should be selected according to the special purpose for which they are to be employed; for, while an Eskimo dog will run, but shirks the effort of drawing heavy loads, a Newfoundland submits to its load, but goes at a foot's-pace. In the Hudson's Bay territory a cross between a wolf and a dog is regarded as the best animal for draught, because it surpasses the dog proper in strength and courage. Newfoundlands of pure breed are, on the whole, most to be recommended, and next to them, the Eskimo dog, which has a good deal of the character of the wolf, though he is difficult to hold. These dogs, too, although they are indescribably thievish, voracious, and ill-tempered, in consequence of their harsh treatment and bad feeding, have this further

distinguishing quality, that they will stick to a retreating bear with wonderful pertinacity till the hunter comes up to kill it. European dogs are only to be taken when an expedition has not the opportunity of procuring dogs of the kinds we have mentioned; but, if they be employed, they should be strong and hardy, with long hair and thick coat. The purity of their breed is of less consequence than their being good-tempered, as fights between large dogs end in the destruction of the weaker. The Ostjaks, in the neighbourhood of Obdorsk, are the nomad tribes nearest Europe who use dogs for sledges; and their breed of dogs is far superior to any other, either in Lapland or Northern Russia. The dogs of Russia in Europe were employed in the expedition



TOROSSY IN HARNESS.

(1839) of Ziwolka and Mojsjew to Novaya Zemlya; but it does not appear that they answered the expectations which had been formed. In sledge-expeditions the dogs are allowed to sleep in the open air; but they must be fastened to stakes, lest the scenting some animal should tempt them to run off. We ourselves, however, allowed a small tent, weighing little, for the few dogs which accompanied us. Dogs whose paws have not been early hardened by long marches on the ice, easily hurt their feet, which do not heal during the journey; and wounds can only be prevented from getting worse by a daily application of collodion and brandy, and by a protection of flannel; and this is the treatment we pursued to Jubinal in the journey we are about to describe. Whenever a dog is exhausted by dragging, it is generally blooded in the tail or ear after the fashion followed by the Siberian tribes.

CHAPTER IV.

THE FIRST SLEDGE JOURNEY

1. FROM the preceding remarks on the equipment of a sledge, the reader will, perhaps, have gained a pretty clear notion of the procedure by which we are enabled to travel for weeks in Arctic wastes. This description will have shown him the various and manifold contingencies against which a leader has to provide, if he is to conduct an expedition safely and successfully, especially if he commands a body of men, who are neither so careful nor so observant as those who accompanied me in the sledge journeys I am about to describe.

2. I now pass to the first of these, the object of which was to determine the position and general relations of the new Land, which still remained a mystery to us, to reconnoitre a route for its exploration towards the north, and to ascertain what we could of the character of the intervening regions. I regarded the ascent of the high mountain—Cape Tegetthoff—which we had seen before us for months, as the preliminary step towards the attainment of these ends. Its great distance from the ship had rendered abortive all the attempts to reach it which had been made at the end of last autumn. With the beginning of March (1874) the sledging was now to commence in reality. Though the sun had returned on the 24th of February, it was seldom visible in the remaining days of that month; a heavy water-sky overspread the southern heavens, and the only cheerful precursors of spring were the birds which once more appeared in our neighbourhood. The snow had been distressingly soft, but the north-east winds which prevailed during the first days of March hardened it. When these winds fell, the temperature also

fell, and although the beginning of March is regarded as a time little favourable for sledge travelling on account of the excessive cold, our impatience for action overcame all doubts and fears, and on the 9th one of our larger sledges stood ready, laden and packed for an expedition, equipped for a week. It carried an extra quantity of provisions, which were intended to form depôts. From the general store we took 39 lbs. of hard bread, 5 lbs. of pemmican, 16 lbs. of boiled beef, $6\frac{1}{2}$ lbs. of lard, 1 lb. of pea-sausage, $\frac{1}{2}$ lb. of salt and pepper, 6 lbs. of rice, 2 lbs. of grits, 5 lbs. of chocolate, 5 gallons of rum, 1 lb. of extract of meat, 2 lbs. of condensed milk, and 8 gallons of alcohol. The rest of the baggage consisted of such articles as we have described above. We had besides 3 breech-loaders and 100 cartridges, of which 40 were fired away.

3. I selected for my party six men and three dogs, Gillis, Torossy and Sumbu. As I reserved the picked men of our crew for the contemplated longer journey towards the north, some of the above were not altogether adequate to the work. My two Tyrolese, however, Haller and Klotz, possessed great endurance, Lukinovich and Cattarinch in a lesser degree; as for Pospischill and Lettis, they would have done credit to Falstaff's corps. As Pospischill suffered from lung disease, Lukinovich from palpitation of the heart, Haller from chronic rheumatism, and Lettis from a tendency to bronchial catarrh, it may be inferred how necessity alone enabled them to do what they did, when the temperature fell lower than we expected.

4. On the morning of the 10th of March we left the ship, and the "Flag of the sledge journeys," which had hung for so long a time over my berth, now fluttered in the fresh breeze which blew from the north-west. So much had this "at last," excited me, that I could not sleep a wink, and those who were starting on the expedition as well as those who remained behind were as much agitated, as if the conquest of Peru or Ophir were contemplated, and not the exploration of lands buried under snow and ice. With indescribable joy we began the mechanical drudgery of dragging the sledge, each of us at first wearing a mask, like the members of the "Vehmgericht," until we became habituated to the withering

effects of the wind. As we moved along the level surface of the land ice of the preceding autumn, after forcing our way through the hummocky ice, which had formed itself on the north of the ship, we saw behind us some black spots approaching at full speed. These were the dogs we had left behind, which insisted on travelling with us, and much craft and force, supplemented by the logic of a few shots, were needed to force them to return to the ship. My companions interpreted the conduct of the dogs refusing to remain with the ship as a sign foreboding the death of our engineer. As the lading of our sledge amounted to about 6 or 7 cwts. and the snow was favourable for sledging, we were able to advance at the unusual rate of 100 paces in a minute, and in two hours we passed the south-west Cape of Wilczek Island. Close to this Cape we saw an iceberg which had fallen on the ice and crushed it all round, and sheltering ourselves from the wind under the lee of another, we took our mid-day rest, with the thermometer at -15° F. As the sun at noon was so little above the horizon that we got uncertain results for the determination of the latitude, I preferred during this journey to begin the surveying and, at the same time, the determination of the localities of Franz-Josef Land, by a triangulation of elevated points, to which the measurement of a base was afterwards to be added. Hence the ascent of high mountains formed part of our programme.

5. We continued our march till the ship disappeared from our eyes, and the route now lost its level character and assumed the appearance of a very chaos of ice. In the evening we reached a high rocky promontory of Wilczek Island, near which rose some stranded icebergs, and against which the ice-sheet of the sea, impelled by the waves, was dashed and broken. Close in shore the ice was in violent motion, and as we passed over the "ice-foot," to the amazement of all, three of our men fell into a fissure. All through the night we heard in our tent, which we erected on the land, the cracking and crashing sounds emitted by the ice. Next day—March 11th—making a very early start, the thermometer at -14° F., we saw a water-sky to the south, and, after ascending a height, close before us lay the sea, covered with young ice. Heavy mists were ascending from fissures,

and the level surface of the young ice glowed with the colours of the morning. Immediately under the coast of the island lay a narrow band of piled-up ice, with traces of recent pressures, and thinking that the interior was impassable to a laden sledge, we began our toilsome march along its rocky coasts.

6. We were in no mood to observe the picturesque character of our route, for our labours in dragging the sledge over the hummocky ice were excessive. We had frequently to unload the sledge or dig away an obstacle which could not be evaded. The conduct of the dogs was not quite faultless; and as for my companions, if one of them turned round, or if a bird flew past, this was enough to make the rest pause in their pulling, with the ready excuse of surprise at the circumstance. If in such cases Klotz failed to exert his strength, the sledge at once came to a standstill. We pressed on through icebergs on each side of us, shattered by the frost, and amid a constant noise of cracking and splitting produced by the increasing cold. At length, after several hours, we came out on an open level and crossed the gentle slope of a snow-covered spit of land. The rugged mountainous front of Hall Island, and the long glacier walls of M'Clintock Island, now rose before us. Our course lay clearly marked out: it ran in a north-westerly direction over a snow-covered level of old ice towards Cape Tegetthoff. Soon, however, the mist began to rise and floated over the wide expanse of ice, and so obscured every object that we were able to continue our journey in the twilight only by means of the compass. We determined our course by the aid of small hummocks of ice, which rose above the general level surface, but so great was the difficulty of keeping a definite line in the mist, that we were compelled to halt every four hundred paces, and correct our route by the larger compass, which often showed that we had deviated 20° to 40° in azimuth from the true line, and in some cases the error amounted to even 90° . To add to all this, snow began to fall, so that we were almost blinded, and hence it was that a bear for some time followed our footsteps, unseen by any of the party. When we first sighted him, though he was at a little distance off, he looked enormously large in the mist. We quickly seized our rifles, and one of our men firing

precipitately, the bear disappeared, leaving no track of blood to show whether it had been wounded. But bears, even when severely wounded, often leave no such trace ; hence doubtless the origin of the assertion, that a wounded bear can dress its own wound, using its paw to apply snow to the injured part.

7. It was our practice in this, as well as in the following expeditions, to rest at noon for an hour or two, and putting up the tent take a meal of hot boiled beef. But the inferiority of an untrained to a well-trained sledge party was seen even in such operations. Much time was wasted ; in like manner and from the same cause, the coffee-making in the morning, the preparation for the march, the taking down of the tent, the loading of the sledge, occupied my party for hours, and the smallest snow-drifting sufficed to blow away all their moral force. As we left the tent, the bear stood again before us, but disappeared as suddenly when we seized our rifles. In the course of a few hours we passed some icebergs shaped like huge tables, and when the wind rose and lifted up the mist for a few moments, we saw the rocky heights of Cape Tegetthoff towering above us at no great distance. The snow began to drive directly in our faces, and meanwhile the bear had followed our steps, often hidden from our sight by the vehement gusts of snow, sometimes on our flank, sometimes in our rear, keeping at about 200 paces distance from us. By feigning unconcern we hoped to stimulate his courage to attack us, reckoning on converting him into food. Suddenly, however, he ran towards us, and our apparent indifference disappeared. In a moment we stood ready to receive him ; the sledge was drawn across the line of his advance, and each casting off his drag-rope, knelt and aimed over the sledge. The directions were to aim at the lower part of the skull, and to fire only when he was quite close to us. The dogs were moved to the further side of the sledge, and covered with its sail. Of the other four men, two held the dogs, a third laid hold of a revolver, and the fourth provided himself with some cartridges ready for contingencies. After the completion of these preparations, no one either moved or spoke. The bear meanwhile, moved steadily towards us, stopping for a moment at the spot where a piece of bread had

intentionally been placed. Just as he stopped to examine it, three shots in rapid succession went off, and the bear, hit in the head and chest, lay dead on the ground. The dogs, being let loose, rushed on their fallen foe and began to tear his shaggy skin. While we were cutting the bear up, they sat down and watched us, occasionally dipping their tongues in the warm red blood and snapping up the morsels which were thrown to them. The bear we had shot was a female, six feet in length; and after cutting off the tongue and the best portions for meat, we continued our march in the teeth of the driving snow. One of our people had cut his finger badly in dressing the bear, and as the application of chloride of iron did not suffice to stop the violent bleeding, we were compelled to halt and erect our tent about six o'clock in the evening.

8. When we set out again on the morning of the 12th (the thermometer marking -26° F.) all round us was a red undulating waste, and the driving gusts of snow, which hid from our view the nearest rocky heights, pricked us as if with countless sharp-pointed darts. Such drifting snow, although it greatly impedes travelling, cannot be compared with the tremendous snow-storms I had experienced in Greenland. The same precursory signs were, however, common to both—extraordinary refractions, brilliant auroras, perfect calms, and a dull close atmosphere. In taking down the tent, which was covered with wreaths of snow, every article which fell in it was at once buried under its drifting waves. Of all the tests of endurance in Arctic journeys none exceeds that of continuing the march amid driving snow at a low temperature. Some of my company who had not been accustomed to walk in such tremendous weather, in attempting to button on their wind-screens and nose-bands and fasten up their coats after we had left the tent, at once had their fingers frozen. Our sail-cloth boots were as hard as stone, and every one took to stamping to preserve his feet from frost-bite. Under such circumstances the sledge is not packed with that precision which is the only preservative against the loss of the various articles of its contents. To watch against this contingency is the special business of the man who pushes the sledge from behind. Hurry and confusion were visible in the bag of

provisions being left open. At last everything was ready: the march began, men and dogs, dragging the sledge along, all coated with snow and entirely covered except the eyes. In a momentary lull of the wind, we discovered that our march the day before had led us far too much to the south, and Cape Tegetthoff now lay before us directly north. Thither we now directed our steps, and as the wind still came from the north-west, we struck our sledge sail. As a consequence of this marching against the wind, which is most severely felt by the leaders of the team, all, even Klotz, had their noses frost-bitten. We had much difficulty in persuading him to rub his with snow, urging that his nose did not belong to himself alone, but that seven noses and fourteen feet were under the general supervision of the leader, and that each had a share in this general property.

9. As we came under the land, the violence of the snow-drifting somewhat abated, and in about two hours a calm set in. Close before us lay the plateau of Cape Tegetthoff, with its steep precipitous sides. From its summit a line of basalt rocks descended towards the east, ending in two columns, each about two hundred feet high. We reached them just before noon, and the weather being propitious we determined the latitude by observation and found it to be $80^{\circ} 6' \text{ N.L.}$ The force of the tide not being able to raise or burst the bay-ice, the thaw-water of the spring collects itself on the coast-edge in small lakes. Close under one of these towers of dark-coloured basalt, we set up our tent; and while our cook was preparing our dinner of bear's flesh we lay in the sun under the rocks in order to dry our clothes, which were coated all over with ice.

10. About one o'clock I set off with the Tyrolese to the plateau of Cape Tegetthoff. Those who remained behind spent their time in rubbing their feet with snow. Lettis had reserved for us the unpleasant surprise that his feet had been frost-bitten for three hours, and that he had lost all feeling in them. We marched for an hour on the snow, which lay in tender azure-blue shadow under the long line of basalt rocks, and after climbing for another hour over rosy-coloured masses of snow lying between crystallized rocks, we reached the highest point of the undulating plateau. No ascent could be

more interesting, made, as it was, in a country so utterly unknown. Haller and Klotz were born mountaineers, and during my surveys in Tyrol I had made a hundred ascents of mountains of 10,000 feet, without the tension of expectation I now experienced, as I mounted this summit. The ascent was not without difficulty, and it taxed the extraordinary dexterity of the two Tyrolese to climb up steep icy precipices in their sail-cloth boots. It was about three o'clock in the afternoon when we reached the summit; the temperature had fallen to -30° F. (in the tent the thermometer at the same time marked -24° F. and in the ship -20° F.). By a barometrical measurement we found the height to be 2,600 feet. Contrary to expectation the view from the top proved to be



CAPE TEGETHOFF.

limited. In a northerly direction, the atmosphere, laden with innumerable ice crystals, possessed so little transparency that Cape Berghaus, at no distance off, appeared to be covered with a thick veil, and all distant objects were enveloped in a dense mist. Fogs lay over the interior to the west, and banks of reddish vapour covered the icy ocean to the south. Some narrow strips of open water sparkled in the sun. After making a sketch of all that could be distinctly seen, and determining the bearings of some points, we returned to the tent. Here we found Lettis and Cattarinch engaged in rubbing with snow the hands of Lukinovich, which had been frost-bitten, while he was occupied in rubbing the feet of Lettis.

11. Nothing except the wind makes men so sensitive to cold as the want of exercise. The fall of the temperature had been felt far more by those who remained behind, than by ourselves. Even the wonderful beauty of the snow-clad summit bathed in rosy light failed to modify their severe judgment of Franz-Josef Land. Instead of greeting us with supper ready at the appointed hour, which he ought to have prepared without the use of spirit, the bewildered cook was vainly endeavouring to roast bear's flesh over smoky chips and sticks, and we got our supper only after I had served out a bottle of alcohol. We then went to rest in the common sleeping bag, but soon began to shake with cold, which threw Pospischill, who took oil twice a day for lung-disease, into a fever. When I left the tent to look at the thermometers, the mercury in one had gone down into the bulb and was frozen, and the spirits of wine in the other showed 41° below zero (C.). Some hot grog, for which a whole bottle of strong rum was used, put us all right, raising the temperature of our bodies by one or two degrees. After this refreshment we all fell into a deep sleep, which was incommoded only by the increasing dampness of our clothes.

12. We started again about six o'clock on the morning of March 13. The sun had not risen, the spirit of wine thermometer indicated nearly 44° (C.) below zero, and a piercingly cold breeze met us from the land. Even on board the ship the temperature at the same time marked 37° (C.) below zero, a difference to be ascribed to the influence of the land in lowering the temperature. In Greenland we observed still greater deviations of this nature, which seem to show that climatical influences are subject to great variations, even in places which are in close proximity. Cape Berghaus was our goal. From its summit a general view of the distribution of the land under 80° N. lat. was reasonably to be expected. Long before the rise of the sun, the hard snowy plains were tinted with a pale green reflected light, and the icebergs wore a dull silvery hue, while their outlines constantly changed and undulated. Our road was formed from millions of glittering snow crystals, so hard that the sledge glided over them with difficulty and with a creaking noise, and after three hours, the exertion of dragging had so exhausted us that we determined to unload the sledge,

and, after melting some snow, to wet its runners with water. A layer of ice was immediately formed on them, which greatly facilitated the labour of dragging, till it was rubbed off. A broad inlet surrounded by picturesque mountains—Nordenskjöld Fiord—had opened out on our left, and as a large glacier formed the background of this fiord, we took a westerly direction in order to study the ice-formation. The heights surrounding this fiord seemed equally as well fitted as Cape Berghaus for the object we had in view. The further we penetrated into it, the deeper became the layer of fine powdery snow which the wind had deposited in this hollow. At noon



MELTING SNOW DURING A HALT NEAR CAPE BERGHAUS.

we reached the high precipitous termination of Sonklar-Glacier, and pitched our tent by an iceberg.

13. In the afternoon, accompanied by the Tyrolese, I ascended a mountain—Cape Littrow—whose height, by means of an aneroid barometer, we ascertained to be 2,500 feet. From its summit we had a view of the mountains of Hall Island, and of the islands which lay to the east. Not a breath of wind was stirring, and the atmosphere was clearer than usual, so that, without suffering in the least degree from cold, I could work for three hours, first in sketching our surroundings and then in taking observations. From south-west

to north-east the peaks of distant mountains rose above the summits of those in the foreground. This view, while it assured us that the land we had named after our monarch must be of great extent, stimulated our impatience to know its extent, and the nature and relation of its constituent parts. The Wüllersdorf Mountains were the extreme limits of what could be known for the present, and their three peaks glowed in the setting sun above the dark edges of the terraces of the Sonklar-Glacier, whose broad terminal front over-hung the frozen bay of Nordenskjöld Fiord. It was eight o'clock in the evening when we returned to our tent, not, however, before we had made suitable preparations for the observation of the movement of the glacier. Sumbu and Torossy were our companions; but we had to tie them with a rope both in going up and coming down, and we ourselves only mastered the great steepness of the cone of the mountain by steps which Klotz, who went on before, hewed with incomparable dexterity and precision in the ice. During the night the temperature fell to 46° below zero (C.) (-47° F. in the ship), and I do not believe that we could have passed through it without the help of grog. We drank it as we lay close together muffled up in our sleeping bag. It was boiling hot, and so strong, that under other circumstances it must have made us incapable of work, yet in spite of the grog, we suffered much all through the night from cold and our frozen clothes.

CHAPTER V.

THE COLD.

1. THE coldest day we had during this expedition was the 14th of March. By six o'clock on the morning of that day the Tyrolese and I stood on the summit of the precipitous face of the Sonklar-Glacier. The others remained behind to clear the tent of snow, and to bury a small depôt of provisions in an iceberg which was close at hand. The sun had not yet risen, though a golden gleam behind the glaciers of Salm Island indicated his near approach. At last the sun himself appeared, blood-red, glowing with indistinct outline through the mists, and surrounded with parhelia, which generally occur when the cold is great. The tops of the high snowy mountains were first touched with rosy light, which gradually descended and spread over the icy plains, and the sun like a ball of fire shone at length clearly through the frosty mist, and everything around seemed on fire. As the sun even at noon was but a few degrees above the horizon, this wonderful colouring lasted throughout the day, and the mountains, whose steepest sides were covered with a frosty efflorescence, shone like glass in this radiant light. The alcohol thermometer soon after we came on the glacier fell to $59^{\circ} 1'$ (F.) below zero,¹ and a light breeze blowing from the interior, which would have been pleasant enough on a March day in Europe, exposed me, while engaged in the indispensable work of drawing and measuring, to such danger, that though I worked under the shelter of my Tyrolese companions as a protection against the cold, I was constantly compelled to rub

¹ This was the maximum of cold I observed during my three Polar expeditions.

my stiffened and benumbed hands with snow. We had taken some rum with us, and as each took his share, he knelt down and allowed another to shake it into his mouth, without bringing the metal cup in contact with his lips. This rum, though it was strong, seemed to have lost all its strength and fluidity. It tasted like innocent milk, and its consistence was that of oil. The bread was frozen so hard that we feared to break our teeth in biting it, and it brought blood as we ate it. The attempt to smoke a cigar was a punishment rather than an enjoyment, because the icicles on our beards always put them out, and when we took them out of our mouths they



ON THE SONKLAR-GLACIER.

were frozen. Even the shortest pipes met the same fate. The instruments I used in surveying seemed to burn when I touched them, and the medals which my companions wore on their breasts felt like hot iron.

2. The phenomena of cold which we had the opportunity of observing during this journey, and which I immediately recorded, will perhaps justify a short break in my narrative while I attempt to describe them. The horrors of a Scythian winter are an ancient belief, and it used to be counted wisdom to shun the zones where men were frozen, as well as the zones where men

were scorched. But it has been assumed, with great exaggeration, that a hot climate makes men sensual and timid, while a cold climate renders them virtuous and bold. There is far more truth in the opinion held by some observers, and especially by Polar navigators, that cold is depressing in its influence, and enfeebles the powers of the will. At first it stimulates to action, but this vigour is quickly followed by torpidity; exertion is soon succeeded by the desire to rest. Persons exposed to these alternations of increased action and torpor feel as if they were intoxicated. From the stiffness and trembling of their jaws they speak with great effort, they display uncertainty in all their movements and the stupor of somnambulists in their actions and thoughts. Most of the circumpolar animals escape, as much as they can, the horrors of the frost: some migrate; others, burying themselves in holes, sleep throughout the winter. The fish, which are found in the small pools of sweet water on the land are frozen in when these pools freeze, and awake to life and movement again only when the pools are thawed.

3. The human body, with an inner warmth amounting to 95° – 100° F., is exposed in the wastes of North America and Siberia to frightful cold, the extremes of which have been noted by many different observers. Back recorded in Fort Reliance, Jan. 17, 1833, the temperature -67° F.; Hayes, March 17, 1861, -69° F.; Nevérow, in Jakutzk, Jan. 31, 1838, -74° F.; Kane, -69° F.; Maclure, Jan. 1853, -73° F.; John Ross, 1831, -56° F.; and Parry, 1821, -55° F.; while the lowest temperature which has hitherto been observed in the Alpine countries of Europe is only -24° F. In consequence of the difficulty of observing the extremes of cold, lower temperatures than these can scarcely ever have been registered.

4. In order to illustrate the effect of an extraordinarily low temperature on the human frame, the best point to start from is the imagination of a man exposed without clothes to its influence. At 37° or 50° (C.) of cold a misty halo would encompass him, the edges of which would have, under certain circumstances, the colours of the rainbow. It is evident that the moisture of the body rapidly coming forth and becoming visible in the cold air would cause this mist, which would

decrease with the heat of the body, and disappear on the death of the frozen man. The purpose of clothing is to counteract as much as possible this twofold loss of warmth and moisture, which is the principal cause of the fearful Arctic thirst. But even clothed men exposed to so low a temperature present a strange appearance. When they are dragging a sledge on the march their breath streams forth like smoke, which is soon transformed into a mass of needles of ice, almost hiding their mouths from view; and the snow on which they tread steams with the heat which it receives from the snow beneath. The countless crystals of ice, which fill the air and reduce the clearness of day to a dull yellow twilight, make a continual rustling noise; their fall in the form of fine snow-dust, or their floating as frosty vapour, is the cause of that penetrating feeling of damp which is so perceptible when the cold is intense, and which receives accretions from the vapours issuing from the open places of the sea. Notwithstanding all this, there is an indescribable dryness in the atmosphere, strongly contrasting with the feeling of dampness. Heavy clouds are impossible; the heavens are covered only by mists, through which the sun and the moon, surrounded by halos, glow blood-red. Falls of snow, as we understand the expression, altogether cease; the snow crystals, under the influence of cold, are so minute as to be almost invisible. The land, the real home and source of cold, acts as the great condenser of vapour, and snow and moisture of every kind, and lies under a deep covering of frozen snow till the colour of its walls and precipices reappears in April. The soil, in the stricter sense of the word, is frozen as hard as iron wherever it appears through the snow, and the mean temperature of Franz-Josef Land (about 3° F.) makes it highly probable, that the frost penetrates to the depth of a thousand feet. Great cold, calm weather, and clear atmosphere combined, are the characteristics of the interior of Arctic countries. The nearer we approach the sea, the rarer is this combination. Light breezes sometimes occur with a temperature 37° (C.) below zero,¹ but the atmosphere is then less transparent.

5. It is well known that sound is propagated far more freely

¹ Hayes mentions a storm occurring at -27° F.; but this is probably an error of the press.

in Polar regions than with us. When the cold was great, we could hear conversations, carried on in the usual tone of voice, distinctly at the distance of several hundred paces. Parry and Middendorf both assert that the voice is more audible at a distance in cold weather. The propagation of sound seems to find less hindrance from the irregular masses of ice and cushions of snow, than from the curtains of our woods and the carpets of our vegetation. In the mountainous districts of Europe many of the characteristics of Polar regions, besides intense cold, are met with; yet it is a fact, that the report of a gun can scarcely be heard in those situations. Cold, however, can scarcely be regarded as the essential condition of this phenomenon; for the propagation of sound, though in a less striking degree, may be observed even in the summers there.¹ It would seem rather that the amount of moisture in the atmosphere has a more decided influence in the production of this phenomenon.

6. When the snow becomes hard as rock, its surface takes a granular consistence like sugar. Where it lies with its massive wreaths frozen in the form of billows, our steps resound, as we walk over them, with the sound as of a drum. The ice is so hard that it emits a ringing sound; wood becomes wonderfully hard, splits, and is as difficult to cut as bone; butter becomes like stone; meat must be split, and mercury may be fired as a bullet from a gun.²

7. If cold thus acts on things without life, how much more must it influence living organisms and the power of man's will! Cold lowers the beat of the pulse, weakens the bodily sensations, diminishes the capacity of movement and of enduring great fatigue. Of all the senses, taste and smell most lose their force and pungency, the mucous membrane being in a constant state of congestion and excessive secretion. After a time a decrease of muscular power is also perceptible. If one is exposed suddenly to an excessive degree of cold, involuntarily one shuts the mouth and breathes through the

¹ In Greenland I once heard at the distance of 800 paces a conversation between Børgen and Copeland carried on in the usual tone.

² Sir John Ross frequently did this, sending the bullet through a solid board. The freezing point of quicksilver is -40° F. It varies however between -40° and -45° F., according to the purity of the metal.

nose; the cold air seems at first to pinch and pierce the organs of respiration. The eyelids freeze even in calm weather, and to prevent their closing we have constantly to clear them from ice, and the beard alone is less frozen than other parts of the body, because the breath as it issues from the mouth falls down as snow. Snow-spectacles are dimmed by the moisture of the eyes, and when the thermometer falls 37° (C.) below zero they are as opaque as frost-covered windows. The cold, however, is most painfully felt in the soles of the feet, when there is a cessation of exercise. Nervous weakness, torpor, and drowsiness follow, which explains the connection which is usually found between resting and freezing. The most important point, in fact, for a sledge party, which has such exertions to make at a very low temperature, is to stand still as little as possible. The excessive cold which is felt in the soles of the feet during the noon-day rest is the main reason why afternoon marches make such a demand on the moral power. Great cold also alters the character of the excretions, thickens the blood, and increases the need of nourishment from the increased expenditure of carbon. And while perspiration ceases entirely, the secretion of the mucous membranes of the nose and eyes is permanently increased, and the urine assumes almost a deep red colour. At first the bowels are much confined, a state which, after continuing for five and sometimes eight days, passes into diarrhœa. The bleaching of the beard under these influences is a curious fact.

8. Although theoretically, the fat endure cold better than the lean, in reality this is often reversed. Somewhat in the same way it might be argued that the negro would have an advantage over the white man, for the former as a living black bulb thermometer is more receptive of the warmer waves of heat. But blackening the face or smearing the body with grease are experiments which could only be recommended by those who have never been in a position to try them. The only protection against cold is clothing carefully chosen, and contrivances to avoid the condensation of moisture. All articles of dress are made as stiff as iron by the cold. If one puts off his fur coat and lays it down for a few minutes on the ground, he cannot put it on again till it be thawed. The fingers of woollen

gloves become as unpliant as if they belonged to mailed gauntlets, and therefore Arctic travellers, except when engaged in hunting, prefer to use mittens.

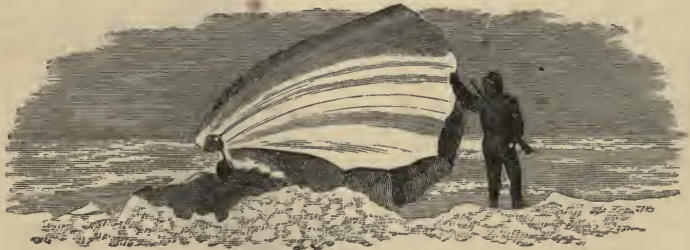
9. Constant precautions are needed against the danger of frost-bite, and the nose of the Arctic voyager especially becomes a most serious charge. But no sooner has its safety been secured, than the hands which have rubbed it with snow are threatened with the same fate. The ears, however, are well protected from frost by the hood. Frost-bite, which is caused by the stoppage of blood in the capillaries, evinces itself by a feeling of numbness, which, if not immediately attended to, increases to a state of complete rigidity. Slight cases are overcome by rubbing the part affected with snow. When the cold is excessive, feeling accompanied with a prickling sensation only returns after rubbing for hours. Under all circumstances, freezing water with an infusion of hydrochloric acid is the best means of restoring circulation. When the frost-bitten member is immersed in this, it is at once overspread with a coating of ice, but as the temperature of the water slowly rises the frozen limb is gradually thawed. The longer persons are exposed to a low temperature, the greater becomes their sensitiveness under it. Their noses, lips and hands swell, and the skin on those parts becomes like parchment, cracks, and is most sensitive to pain from the least breath of wind. In cases of neglected frost-bite, the violet colour of a nose or hand is perpetuated, in spite of all the efforts made to banish it. Frost-bites of a more severe character will not yield to mere rubbings with snow, but should be treated with the kind of cold bath we have described, continued for some days. The formation of blisters, the swelling of the parts affected, great sensitiveness and liability to a recurrence of the malady, are the consequences. In many cases a sensitiveness to changes of temperature lasts for several years. Amputation is inevitable in severe and neglected cases. When circulation has been restored, a mixture of iodine and collodion—10 grains to an ounce—may, according to the experience of Dr. Kepes, be advantageously applied to reduce the inflammation which generally results.

10. It is remarkable that great heat as well as great cold

should generate the great evil—thirst. It is also remarkable how rapidly the demoralisation produced by thirst extends when any one of the party begins to show signs of suffering from it. Habit, however, enables men to struggle against thirst more successfully than against hunger. Many try to relieve it by using snow; which is especially pernicious when its temperature falls considerably below the point of liquefaction. Inflammation of the mouth and tongue, rheumatic pains in the teeth, diarrhoea, and other mischiefs, are the consequences, whenever a party incautiously yields to the temptation of such a momentary relief. It is in fact a mere delusion, because it is impossible to eat as much snow—say a cubic foot—as would be requisite to furnish an adequate amount of water. Snow of a temperature of 37° to 50° (C.) below zero feels in the mouth like hot iron, and does not quench, but increases thirst, by its inflammatory action on the mucous membranes of the parts it affects. The Eskimos prefer to endure any amount of thirst rather than eat snow, and it is only the Tschuktschees who indulge in it as a relish with their food, which is always eaten cold. Snow-eaters during the march were regarded by us as weaklings, much in the same way as opium-eaters are. Catarrhs of every kind are less frequent in Polar expeditions, and the chills to which we are exposed by passing suddenly from the cold of the land journey to the warmer temperature of the ship, have no evil consequences. It deserves to be investigated whether this arises from the difference of the amount of ozone in the atmosphere of the respective latitudes.—Now let us return to our journey.

II. After crossing over the Sonklar-Glacier and measuring its slight inclination of $1^{\circ} 6'$, we climbed an elevation to ascertain the most promising route for penetrating in a northerly direction; and none seemed better suited than that which lay over its back, which seemed free from crevasses. But we looked in vain for the fancied paradise of the interior, which had existed only in our desire to clothe in glowing colours the Land, from which we had been so long held back. The true character, however, of Kaiser Franz-Josef Land, so far as it could be explored in this and the following sledge expeditions, will be the subject of the next chapter. The

accompanying sketch represents a block of snow, about the height of a man, at the foot of the Sonklar-Glacier, to which the winds had given a fanlike shape. In the afternoon, after inspecting the stakes which we had fixed for measuring the motion of the glacier, we came back to the tent and began our return march to Cape Tegetthoff and the ship. A cutting wind compelled us to make constant efforts against frost-bites. With a heavy creaking noise the sledge was dragged over the hard snow, and to our reduced strength it seemed to be laden with a double load. The night is generally the hardest part of such expeditions, and our camping out during the night under the cliffs of Cape Tegetthoff was especially bitter. Happy was he who, exhausted by the labour of dragging, fell asleep at once. As usual, we dug a deep hole in the snow



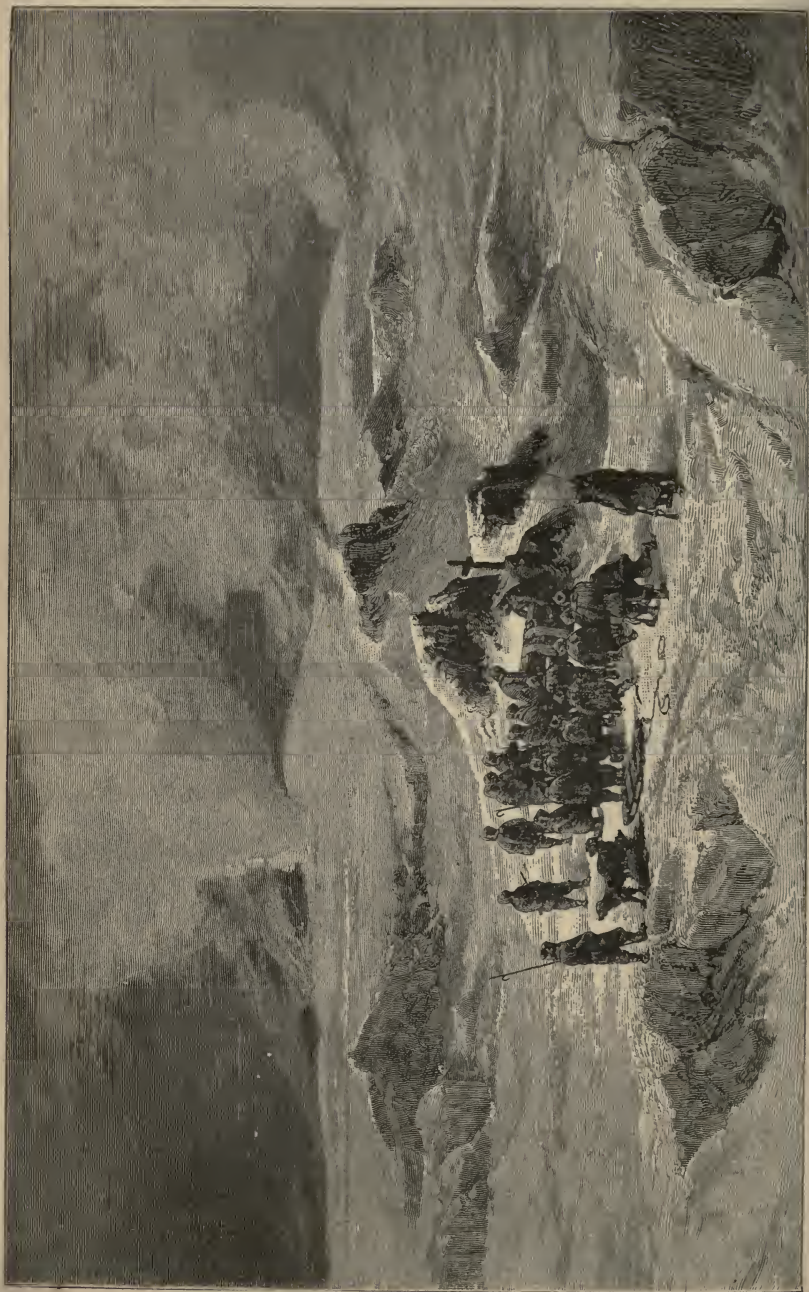
BLOCK OF SNOW.

and loosened it as much as possible, so that we might profit by its property of being one of the worst conductors of heat. In a short time the inside of the tent was covered with rime frost, and we ourselves with ice. The tongue only seemed to recover its former mobility with those who bewailed their loss of knives, stockings, gloves—yea, of everything, even their place in the tent. They ate their portion of bear's flesh much as if they had been chloroformed, and dropping asleep in their stiffened icy coat of mail, they were awoke by its gradual thawing, to reiterate without cessation how cold it was; a fact which no one present was prepared to dispute. The alcohol thermometer stood at -56° F. (-48° on board the ship), and when the warmth produced by the exercise we had taken and by the effects of supper was gone, the feeling of cold was so intense that it seemed far more probable that

we should be frozen to death than that we should sleep. The cook therefore received orders to brew some strong grog, and forthwith six spirit-flames burnt under the kettle filled with snow; but to make snow of such extreme coldness boil quickly we should have had to place the kettle over Vesuvius itself in the height of an eruption.

12. We now slept without stirring a limb, and about five o'clock in the morning of the 15th of March we started to compass the twenty miles which lay between us and the ship in one march, without encountering the suffering of another night's camping out in the snow. The weather was as clear as it is possible to be at a temperature of -52° F., and going along with a light breeze from the north, we made use of our sledge sail to such advantage that we reached the gentle ascent of the west point of Wilczek Island after a march of seven hours. We formed a second depôt of provisions on the summit of a rocky promontory, whence we discerned with a telescope the masts and yards of the ship lying behind an iceberg, and our fears and anxieties lest it should have drifted away in our absence were dissipated by this glad view. Our return to the ship could no longer be a matter of choice; it had become a necessity. Lettis had been unable for some days to take any share in the labour of dragging, and walked along in shoes made of reindeer hide, on account of his frost-bitten feet. Haller also wore similar shoes to save his swollen feet; Cattarinch's face was frost-bitten, and he too suffered from lameness; Pospischill, who could no longer wear his shrunk-up fur coat, so suffered from frost-bite in both hands, that I sent him on to the ship, that he might have the help of the doctor as soon as possible. It was with much effort that we made the last six hours' march; and when at length, stiff with ice, we passed between the hummocks that lay around the ship, Weyprecht, Brosch, Orel, and eight sailors came to meet us, who, alarmed at the inability of Pospischill to speak in answer to their questions, had set out from the ship in order to find us.

13. As I entered my berth I heard the hard breathing of our poor comrade Krisch. For more than a week he had lain without consciousness; yet death had not come to relieve him. On the afternoon of the 16th of March a sudden cessation of



THE BURIAL OF KRISCH.

8

all sound told us that he was no more! Next day, his body, placed in a coffin, was brought on deck, and our flag hoisted half-mast high. On the 19th, when the thermometer was at -13° F., the body was committed to its lonely grave in the far north. A mournful procession left the ship, with a sledge, on which rested the coffin covered with a flag and cross, and wended its way to the nearest elevation on the shore of Wilczek Island. Silently struggling against the drifting snow, we marched on, dragging our burden through desolate reaches of snow, till we arrived, after a journey of an hour and a half, at the point we sought on the island. Here, in a fissure between basaltic columns, we deposited his earthly remains, filling up the cavity with stones, which we loosened with much labour, and which the wind, as we stood there, covered with wreaths of snow. We read the prayer for the dead over him who had shared in our sufferings and trials, but who was not destined to return home with us with the news of our success; and close by the spot, surrounded with every symbol of death and far from the haunts of men, we raised as our farewell a simple wooden cross. Our sad and solemn task done, there rose in our hearts the thought, whether we ourselves should be permitted to return home, or whether we too should find our resting-place in the unapproachable wastes of the icy north. The wind blowing over the stiff and stark elevation where we stood, covered us all with a thick coating of snow, and caused the appearance of frost-bite in the faces and hands of some of our party. The decoration of the grave of our comrade with a suitable inscription was therefore deferred till the weather proved more favourable. We found considerable difficulty in returning to the ship through an atmosphere filled with snow.¹

¹ It may easily happen in such weather that travellers on the ice should have great difficulty in finding the ship, though they should pass by it at less than 200 paces distant. The direction of the wind contributes but little towards the ascertaining of their position; amid hummocks of ice the wind constantly changes. On the 6th of March, Haller and I wandered about for hours amid drifting snow-storms. Pekel, who came to us from the ship, guided us rightly.

CHAPTER VI.

A GENERAL DESCRIPTION OF KAISER FRANZ-JOSEF LAND.

IN now presenting a general view of those parts of Kaiser Franz-Josef Land which were explored by us, I must be allowed to anticipate the order of my narrative which describes the subsequent sledge expeditions, by which our knowledge of the discovered country was so considerably enlarged.

1. The country, even in its already ascertained extent, is almost as large as Spitzbergen, and consists of two main masses—Wilczek Land on the east, and Zichy Land on the west, between which runs a broad sound called Austria Sound, extending in a northerly direction from Cape Frankfort till it forks at the extremity of Crown-Prince Rudolf's Land, $80^{\circ} 40'$ N. L. One branch of it, a broad arm running to the north-east—Rawlinson Sound—we traced as far as Cape Buda-Pesth. Wilczek and Zichy Lands are both intersected by many fiords, and numerous islands lie off their coasts.

2. A continuous surface of ice extends from the one land to the other. At the time of our exploration, this expanse was formed of ice, for the most part not more than a year in growth, but crossed in many places with fissures and broad barriers of piled-up ice. Throughout its whole extent we saw many icebergs, which we never did in the Novaya Zemlya seas; whence it is to be inferred that they sail away in a northerly direction.¹ Our track lay over this ice-sheet. As

¹ There are no glaciers on the coast of Siberia, and the glaciers of Spitzbergen are not, it seems, large enough to detach icebergs. May not, therefore, the icebergs which gather at Hope Island, as well as those which are met with on the northern coasts of Siberia, originate in the glaciers of Franz-Josef Land? Barentz saw, in August, 1596, on the northern coasts of Novaya Zemlya, as many as 400 icebergs.

long as it remains unbroken, every fiord might serve as a winter harbour; but if it should break up, not a single locality suitable to form one presented itself along the coasts we visited, which had no small indentations.¹

3. The map of this country, which we present, was designed and constructed from fifteen observations of latitude, from many observations made with the azimuth compass, from drawings, and from a system of triangulation, which, from the nature of the circumstances under which it was formed,² makes no pretensions to absolute exactitude. The heights of the mountains were determined by the aneroid barometer. Near the ship a base of 2170·8 mètres was measured by Weyprecht and Orel, and connected trigonometrically with the nearest promontories. This work of theirs formed the basis of my surveys.

4. It has always been a principle and a practice with Arctic explorers to name their discoveries either after the promoters of their special expeditions, or after their predecessors in the work of discovery. Though they are never likely to become important to the material interests of mankind, the naming the lands we discovered after those who promoted our expedition, was, we considered, the most enduring form by which we could express our gratitude for their efforts in furtherance of a great idea. The localities, I may add, were named during the work of surveying.

5. As I have had the privilege of visiting all the Arctic lands north of the Atlantic, I have been able to compare them and observe their resemblances as well as their differences. West Greenland is a high uniform glacier-plateau; East Greenland is a magnificent Alpine land with a comparatively rich vegetation and abundant animal life. How and where the transition between these opposite characters takes place in the interior is as yet utterly unknown. We may form some notion of Spitzbergen and Novaya Zemlya, if we imagine a mountain-range, like that of the Oetzthal with its glaciers, rising from the level of the sea, if that level were raised about

¹ This of course does not exclude the possibility of finding appropriate winter harbours in those Sounds we were unable to visit; most probably such occur in Markham Sound, which abounds in fiords.

² This applies especially to the region lying to the north of 81° 10'.

9,000 feet. There is more softness, however, in both these countries than is usual in the regions of the high north. But Franz-Josef Land has all the severity of the higher Arctic lands; it appears, especially in spring, to be denuded of life of every kind. Enormous glaciers extend from the lofty solitudes of the mountains, which rise in bold conical forms. A covering of dazzling whiteness is spread over everything. The rows of basaltic columns, rising tier above tier, stand out as if crystallized. The natural colour of the rocks was not visible, as is usually the case: even the steepest walls of rock were covered with ice, the consequence of incessant precipitation, and of the condensation of the excessive moisture on the cold faces of the rock. This moisture in a country whose mean annual temperature is about 3° F., seems to indicate its insular character, for Greenland and Siberia are both remarkable for the dryness of their cold, and it was singular that even north winds occasioned a fall of temperature in Franz-Josef Land. In consequence of their enormous glaciation, and of the frequent occurrence of plateau forms, the new lands recalled the characteristic features of West Greenland, in the lower level of the snow-line common to both, and in their volcanic formation. Isolated groups of conical mountains and table-lands, which are peculiar to the basaltic formation, constitute the mountain-system of Franz-Josef Land; chains of mountains were nowhere seen. These mountain forms are the results of erosion and denudation; there were no isolated volcanic cones. The mountains, as a rule, are about 2,000 or 3,000 feet high, except in the south-west, where they attain the height of about 5,000 feet.

6. The later Arctic expeditions have established the existence of vast volcanic formations in the high north, and of very recent deposits in their depressions. In fact, a vast volcanic zone seems to extend from East Greenland, through Iceland, Jan Mayen and Spitzbergen, to Franz-Josef Land. The geological features of the latter are at any rate in harmony with those of North-east Greenland. The tertiary Brown-coal sandstone of East Greenland is also found in Franz-Josef Land, though Brown-coal itself is met with only in small beds, which, nevertheless, may be reckoned among the many indications that the climate of Polar lands must once have been

as genial as the climate of Central Europe at the present day. The kind of rock which predominates is a crystalline aggregation called by the Swedes "Hyperstenite" (Hypersthene), identical with the Dolerite of Greenland; but the Dolerite of Franz-Josef Land is of a coarser-grained texture, and of a dark yellowish green colour; according to Professor Tschermak (the Director of the Imperial Mineralogical Museum at Vienna), it consists of Plagioclase, Augite, Olivine, titaniferous Iron and ferruginous Chlorite. The mountains of this system forming table-lands, with precipitous rocky sides, give to the country we discovered its peculiar physiognomy.

7. The Dolerite of Franz-Josef Land greatly resembles also the Dolerite of Spitzbergen. After the return of the expedition I saw in London some photographic views of the mountains of North-East Land, Spitzbergen, taken by Mr. Leigh-Smith, and I was at once struck with the resemblance between their forms and those of Franz-Josef Land. I learnt also from Professor Nordenskjöld, the celebrated explorer of Spitzbergen, as I passed through Sweden, that the rock of North-East Land was this same Hyperstenite (Hypersthene). Hence the geological coincidence of Spitzbergen and Franz-Josef Land would seem to be established; and this geological affinity, viewed in connection with the existence of lands more or less known, appears to indicate that groups of islands will be found in the Arctic seas on the north of Europe, as we know that such abound in the Arctic seas of North America. Gillis' Land and King Karl's Land are, perhaps, the most easterly islands of the Spitzbergen group; for it is not probable that these and the lands we discovered form one continuous uninterrupted whole.

8. Amygdaloids, so common in Greenland, were never found by us in Franz-Josef Land; and while the rocks in the southern portions of the country were often aphanitic and so far true basalt, in the north they were coarse-grained and contained Nepheline. The other rocks consisted of a whitish quartzose sandstone, with a clayey cement, and of another finely-grained sandstone, containing small granules of quartz and greenish-grey particles of chlorite, and also of yellowish finely-laminated clay slate. Erratics, so far as my opportunities permitted me to judge, were of rare occurrence;

but we found many smaller pieces of petrified wood, allied to lignite.

9. Some of the islands of the Spitzbergen and Franz-Josef Land group must be of considerable extent, because they bear enormous glaciers, which are possible only in extensive countries. Their terminal precipices, sometimes more than 100 feet high, form generally the coast-lines. The colour of all the glaciers we visited inclined to grey, we seldom found the dull green-blue hue; the granules of their ice were extraordinarily large; there were few crevasses; and the moraines were neither large nor frequent. Their movement was slow; and the snow-line commences at about 1,000 feet above the level, whereas on the glaciers of Greenland and Spitzbergen the like limit is generally 2,000 or even 3,000 feet, and in these countries also, all below that line is free from snow in summer. Franz-Josef Land, on the contrary, appears even in summer to be buried under perpetual snow, interrupted only where precipitous rock occurs. Almost all the glaciers reach down to the sea. Crevasses, even when the angle of inclination of the glacier is very great, are much less frequent than in our Alps, and in every respect the lower glacier regions of Franz-Josef Land approach the character of the *névés* of our latitudes. There only was it possible to determine the thickness of the annual deposits of snow and ice. In these lower portions, the layers were from a foot to a foot-and-a-half thick; fine veins, about an inch wide, of blue alternating with streaks of white ice ran through them, which occurred with peculiar distinctness at the depth of about a fathom. On the whole, this peculiar structure of alternating bands or veins was not so distinctly marked as it is in the glaciers of the Alps, because the alternations of temperature and of the precipitations are very much less in such high latitudes.

10. The glacier ice of Franz-Josef Land was far less dense than the glacier ice of East Greenland; whence it appears that movement, as a factor in the structure of the glacier, predominates in Franz-Josef Land more than the factor of regelation. Even at the very end of the glaciers, granules an inch long are distinctly traceable in its layers, and in the *névé* region especially the glacier ice is exceedingly porous. The great tendency of the climate of Franz-Josef Land to

promote glaciation is manifested in the fact, that, all the smaller islands are covered with glaciers with low rounded tops, so that a section through them would present a regular defined segment of a circle ; hence many ice-streams descending from the summits of the plateaus spread themselves over the mountain-slopes and need not to be concentrated in valleys and hollows in order to become glaciers. Yet many glaciers occur—the Middendorf Glaciers, for example—whose vertical depth amounts to many hundred feet. Their fissures and the height of the icebergs show this. It was unfortunately impossible for us to explore the Dove Glacier, the largest of all we saw, owing to its great distance from the line of our route. Evaporation from the surface of the glacier goes on with great intensity during those summer months when the daylight is continual, and deep water-courses show that streams of thaw-water then flow over it.

11. The comparison of the temperature of the air within the crevasses of the glaciers with the external air, invariably proved, that within the crevasses the temperature was higher. The traces of liquefaction in the glacier during winter, arising from the warmth of the earth, could not be observed, because the sides and under-edge of the glaciers were inaccessible from the enormous masses of snow, and the icicles of the terminal arches and precipices could be ascribed only to the freezing of the thaw-water of the preceding summer.

12. The plasticity of the glaciers was so great, that branches of them, separated by jutting-out rocks, flowed into each other again at their base, without showing any considerable crevasses. We could only in a few cases judge of their movement by direct measurement, and we had never more than one day to test it. One observation made on the Sonklar Glacier in the month of March did not seem to support the notion of the advance of the glaciers ; but the repetition of similar experiments, some weeks later, made on two glaciers on the south of Austria Sound, gave the mean of two inches as the daily movement. It is very probable that their movement begins in the Arctic regions somewhat later than in our latitudes, perhaps at the end of July or beginning of August, because the period of the greatest liquefaction then ends, while it is at its minimum in March and the beginning

of April. The signs of glacier-movement were apparent in the detachment of icebergs in the month of March, but more frequently in the month of May—as at the Simony Glacier—and in the crashing-in of the ice-sheet at their base in the month of April—as at the Middendorf Glacier; and the appearance of “glacier dirt,” where there is no material to furnish a moraine,—as on the Forbes Glacier—must be regarded as a sign of its onward movement or lateral extension. The infrequency of moraines may be explained by the resistance which Dolerite offers to weathering, and may also be regarded as a sign of the slow movement of the glaciers. Red snow was seen once only, in the month of May, on the precipices westward of Cape Brünn. We never met with glacier insects, although they are common in Greenland; and however diligently I looked for them I never saw unmistakable traces of the grinding and polishing of rocks by glacier action.

13. It is well known that the north-east of Greenland as well as Novaya Zemlya and Siberia are slowly rising from the sea, nay, that all the northern regions of the globe have for ages participated in this movement. It was, therefore, exceedingly interesting to observe the characteristic signs of this upheaval in the terraced beaches, covered with débris containing organic remains along the coast of Austria Sound. The ebb and flow, which elevates and breaks up the bay-ice only at the edge, is to be traced on the shores of Austria Sound by a tidal mark of two feet.

14. The vegetation was everywhere extremely scanty, crushed, not so much by the intensity of the cold as by its long continuance, and is far below the vegetation of Greenland, Spitzbergen, and Novaya Zemlya. It resembled, not indeed in species but in its general character, the vegetation of the Alps at an elevation of 9,000 or 10,000 feet, while the Alpine region corresponding to the vegetation of East Greenland lies a thousand feet lower. We found neither the stunted birches and willows, nor the numerous phænogamous plants of East Greenland, Spitzbergen, and Novaya Zemlya. The rare appearance of soil chiefly contributes to this extremely sparse vegetation, the detritus of the country resembling the meagre “dirt” layer on an old moraine, here

and there enlivened by a small patch of green. Although we visited Franz-Josef Land at the season in which vegetation begins to stir, nowhere could there be seen a patch of sward, even a few feet square, to recall the features of our latitudes, although we examined depressions very favourably situated and free from snow. Some level spots showed patches of thin meagre grasses of *Catabrosa algida* (Fries), a few specimens of *Saxifraga oppositifolia* and of *Silene acaulis*, rarely *Cerastium alpinum* or *Papaver nudicale* (L.). Thick, cushion-like tufts of mosses were more frequently discovered. There were abundance of lichens: *Imbricaria stygia* (Acharius), *Buellia stigmatea* (Körber), *Gyrophora anthracina* (Wulfen), *Cetraria nivalis* (Acharius), *Usnea melaxantha* (Acharius), *Bryopogon jubatus* (Körber), *Rhizocarpon geographicum* (Körber), *Sporastatia Morio* (Körber)—and the *Umbilicaria arctica* of winter, which we found in Greenland at an elevation of 7,000 feet. These specifications I owe to the kindness of Professor Fenzl, director of the Botanical Garden in Vienna, and of Professor Reichardt. The museum of this institution accepted the small collection of plants I was able to bring to Europe. Of some of these there remained nothing but withered roots, so that it was impossible to determine their character. Nature in those regions, unable to deck herself with the colours of plants, produces an imposing effect by her rigid forms, and in summer by the glare of the ice and snow; and as there are lands which are stifled by the excess of Nature's gifts and blessings, so as even to defy efforts of civilization, here in the high North another extreme is displayed—absolute barrenness and nakedness, which render it quite uninhabitable.

15. Drift-wood, chiefly of an old date, we frequently found, but in small quantities. On the shore of Cape Tyrol, we once saw a log of pine or larch one foot thick and several feet long, lying a little above the water-line, and which might have been driven thither by the wind; as the *Tegetthoff* was. The fragments of wood we found—the branches on which showed that they did not come from a ship—were of the pine genus (*Pinus picea*, Du Roy), and must have come from the southern regions of Siberia, as the large broad rings of growth showed.

16. Franz-Josef Land is, as may be supposed, entirely uninhabited, and we never came on any traces of settlements. It is very questionable whether Eskimos would have been able to find there the means of subsistence, and if anywhere most likely on the western side of Wilczek Island, where an "ice-hole" of considerable extent remained open for a great part of the year.

17. In the southern parts it is destitute of every kind of animal life, with the exception of Polar bears and migratory birds. North of Lat. 81° , the snow bore numberless fresh tracks of foxes, but though their footmarks were imprinted on the snow beyond the possibility of mistake, we never saw one. Once we found their excrements, and on Hohenlohe Island those of an Arctic hare. The scanty vegetation forbade the presence of the reindeer and musk-ox. It is not, however, impossible that there may be reindeer in the more



LIPARIS GELATINOSUS.

westerly parts of the country, which we did not visit. The character of that particular region approximates to that of King Karl's Land and Spitzbergen, on the pastures of which herds of these animals live and thrive.

18. Of the great marine Mammalia, seals only (*Phoca groenlandica* and *Phoca barbata*) abounded; although we saw some White Whales. Walruses we saw twice, but not close to the shore; it is, however, probable that the absence of open water prevented us from seeing the walrus nearer the shore, for the character of the sea-bottom would present no obstacle to its existence.

19. Of fish we saw only the species *Liparis gelatinosus* (Pallas) and a kind of cod (*Gadus*), which were taken with the drag-net.

20. The birds, which we found in the region between Novaya Zemlya and Franz-Josef Land were of the following species:—the long-tailed Robber Gull (*Lestris*, K.); the black

Robber Gull without the long tail-feathers; the Burgomaster Gull (*Larus Glaucus*, B.); the Ice or Ivory Gull (*Larus eburneus*); the Kittiwake (*Rissa tridactyla*, L.); the Seawallow (*Sterna macrura*, N.); the Arctic Petrel or Malle-moke (*Procellaria glacialis*); Ross's Gull (*Rhotostetia rosea*); two species of Auks (*Uria arra*, P., and *Uria mandtii*, L.); the Greenland Dove (*Grylle columba*, Bp.); the Rotge (*Mergulus alle*, V.); the Lumme (*Mormon arcticus*); the Eider-duck (*Somateria mollissima*, L.); the Snowy Owl (*Strix nivea*); the Iceland Knot (*Tringa canutus*); the Snow-bunting (*Plectrophanes nivalis*, M.). Most of these occurred also on the coasts of Franz-Josef Land.

21. We can here only allude generally to those forms of animal life which were taken by the drag-net on the south of Franz-Josef Land, and brought to Europe in the collection of Dr. Kepes, and of which I made seventy-two drawings. To Professor Heller, of Innsbruck, and Professor Marenzeller, of Vienna, the expedition is indebted for the naming and arrangement of those specimens, and while I refer my readers to their fuller account in the *Mittheilungen* of the Imperial Academy of Sciences of Vienna, I limit myself here to a few of the results of their observations. The investigation of the invertebrate Fauna of the sea through which we passed was necessarily limited from the moment that the course of the *Tegetthoff* ceased to be under our control. We had, in the first place, no zoologist on board, and from the drifting ship nothing more could be done than letting down the net almost daily during the weeks of summer—which Lieutenant Weyprecht did—and dragging it for some hours. The greater part of the animals so taken were immediately sketched by me, in order that, in the event of the loss of the original objects, some sort of representation of the animal world of a region never before investigated might be preserved. The issue justified a caution which must always be kept in view in Polar expeditions.

Of the abundant shrimp-family of the Arctic seas there are four species among the collections we formed, namely:—*Hippolyte payeri*, Heller, n. sp., *Hippolyte turgida* (Kröyer), *Hippolyte polaris* (Sabine), and *Hippolyte borealis* (Owen). The *Hippolyte payeri* was found at the depth of 247 metres,

and was of a beautiful pink colour and had blue-black eyes. There were found besides: *Crangon boreas* and *Pandalus borealis* (Kröyer).

The group of Amphipoda was, comparatively, largely represented among the Crustacea of the Arctic waters; we often called these *Floh-krebse*—flea-crabs—because many of them used their hind legs to hop along. Eleven species of this genus were brought home in our collections; among these



HIPPOLYTE PAYÉRL.

were *Amathillopsis spinigera*, a new species, *Cleippides quadricuspis*, also a new species, both described by Professor Heller; *Acanthozone hystrix* (Owen), &c. The group—Isopoda—is represented by the interesting *Munnopsis typica* (Sars), the *Idothéa sabini* (Kröyer), and by a new variety, *Paranthura arctica*.

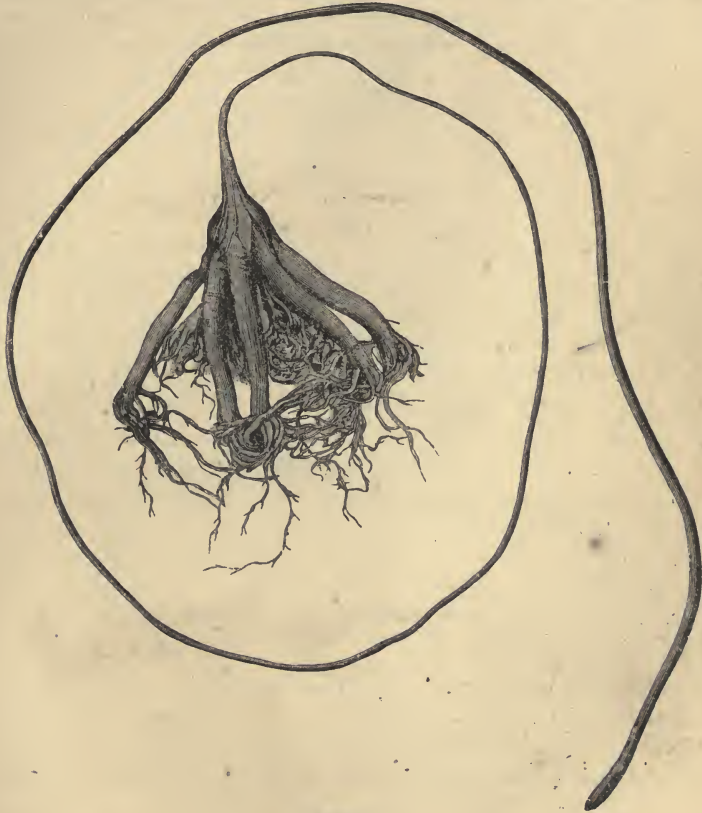


HYALONEMA LONGISSIMUM.

Of the group Pycnogonida, our collection contained three varieties, of which two are new.

Sponges were common; but we were obliged to leave behind the specimens of the larger kinds on account of the room they took up. Among the silicious sponges, those of the genus *Hyalonema* were the largest in size, and included the forms described as *Hyalonema boreale* (Lovén), and *Hyalo-*

nema longissimum (Sars). There was one specimen of the horny sponge, so rare in those parts. The drag-net often brought up *Actinæ*, *Bryareum grandiflorum* (Sars), and June 2, 1873, from a depth of 110 fathoms, a specimen of the extremely rare *Umbellula* described by Mytius and Ellis, 1753. Since that date this animal had been lost sight of,



UMBELLULA.

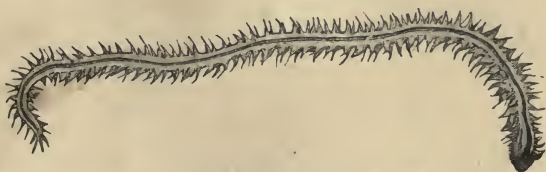
until it was found again by the Swedes—Gladans expedition 1871—in Baffin's Bay, and by the *Challenger*, 1873, between Portugal and Madeira and between Prince Edward's Island and Kerguelen's Land. It may be assumed that our *Umbellula* is identical with the form first described, 1758, by Linnæus as *Isis encrinus*. I regret to say that this, the most

interesting of all the objects we had collected, was left behind in the *Tegetthoff*. The sketch of it made from life will facilitate a comparison with the forms known in other regions and variously named.



KORETHRASTES HISPIDUS.

Hydroid polypes, widely distributed in several varieties in the Atlantic Ocean,—*Asteridæ* and *Ophiuridæ*, the *Korethraustes hispidus* (Wyv. Thomson), a new variety discovered by the *Porcupine* expedition between the Faroe and Shetland islands, *Crinoidæ*, represented by two species never before found so far north, and several *Holothuriæ*, were also among the



NEPHTHYS LONGISETOSA.

acquisitions brought home. Our collection was rich in *Annelides*, containing seven-and-twenty varieties found in Greenland and Spitzbergen. Fourteen varieties of *Bryozoa* were found, and single specimens of *Turbellaria* and *Gephyrea*.

CHAPTER VII.

THE SECOND SLEDGE EXPEDITION.—AUSTRIA SOUND.

1. THE first sledge journey enabled me to draw up a plan for a more extended expedition towards the north. It was not only a cherished scheme of my own, but it became also the dominating interest on board the *Tegetthoff*, although the other scientific investigations were carried on uninterruptedly. Weyprecht and Brosch continued with admirable perseverance the laborious observation of the Magnetic Constants, and measured on the ice close to the ship a base of 2170·8 metres, which served for all my trigonometrical surveys. The meteorological observations also were carried on with the usual regularity.

2. For some days the weather had been bad ; its increasingly stormy character excited our fears, lest the ice should break up and the floe drift away with the ship. The danger of leaving her, in order to explore the extent of the new country, increased also with the longer duration of our proposed second journey. We were convinced, too, that the sea within a few days had broken up the ice almost as far as Wilczek Island, and a heavy water-sky was seen in the south at no great distance from us. Discoveries of importance could only be expected from an expedition of a month's duration. But withal the venture must be made, and leaving the dangers and perils to the chances of the future, I gathered together the picked men who were to accompany me, to lay before them my plans. I explained to them my design of penetrating in a northerly direction as far as possible, and I put before them the danger of our being cut off from the ship. But while I showed the perils, I stimulated them also by the

hope of reward. If the eighty-first degree of latitude were reached, I guaranteed to them the sum of £100; if we attained the eighty-second degree, £250; and I declared that merit, and merit alone, should regulate the distribution of these sums. In order to make sure of reticence on the part of my company and thus obviate ill-feeling among the rest of the crew, which might easily have been called forth by this apparent preference, they were told that the rewards would be forfeited, if any of those who stayed behind in the ship should hear of these rewards. The assembled company agreed also to my request never to mention dangers during the journey, and, in the event of our not finding the ship on our return, to take the whole blame of such an issue on our own shoulders. With regard to the rewards, I must add that never was a secret better kept. Immediately began on board a packing, a tailoring, a preparation as if for a campaign, and under the tent-roof of the ship the rusty runners of the sledges were polished, till they were as smooth as glass.

3. Before we started, there was an interesting interruption in the monotony of our lives, occasioned by a family of bears. While we were absent in our first journey a bear had been shot from the ship, and little Pekel had been wounded in the neck. On the 19th of March another bear came close to us, which was scared away after some unsuccessful shots had been fired at it. Three days afterwards a she-bear appeared accompanied by her two cubs, of a darker colour than their mother, rolling on after her. It was exceedingly interesting to watch the actions of this family. The mother frequently stopped and snuffed the air with uplifted snout; then she would lick her cubs, who fondly crept up to their mother, behaving exactly like young poodles, which they also resembled in size. Six shots were fired at seventy paces distance, and the mother-bear, after running for about forty paces, fell dead. Amazed at the reports of the rifles and the actions of their mother, the little bears sat as if they were rooted in the snow, and looked with astonishment at the dark forms which rushed out from the ship. One of them suffered itself to be shaken by Pekel; and only when they were seized by the nape of the neck and carried on board did they seem to entertain the least surmise of mischief. At first they were

shut up separately in casks set on their end, and growled long and impatiently till they were put together in the same cask. Sumbu alone was slow to understand our suddenly-excited pity for his hereditary foes, and scratched and barked at the cask for hours together, while the cubs growled and threatened retaliation with their little paws. After looking at this for some time, Gillis was moved to side with the bears, and a battle ensued between him and Sumbu, in which the latter got the worst of it. The little animals afforded us much amusement, and the crew were seriously considering the feasibility of training them to draw in the sledge, in the meditated return expedition to Europe. They ate bread, sauerkraut,



THE DOGS DIFFER AS TO THE TREATMENT OF YOUNG BEARS.

bacon—in short, everything that was given them. One morning, however, the little rascals eluded the eye of the watch and got away. They were immediately caught and killed, and appeared roasted on our dinner-table.

4. On the 25th of March our preparations for the extended journey northwards were brought to an end. The sledge with its load weighed about 14 cwt.

	lbs.
The large sledge	150
The dog sledge	37
The provisions, including packing	620
The tent, sleeping bags, tent-poles, alpine stocks	320
Alcohol and rum	128
Fur coats and fur gloves	140
Instruments, rifles, ammunition, shovel, two cooking-machines, drag-ropes, dog-tent, &c.	170
Total	1565

Each of the four sacks of provisions—calculated for seven days and seven men—contained 51 lbs. of boiled beef, 48 lbs. of bread, 8 lbs. of pemmican, 7 lbs. of bacon, 2 lbs. of extract of meat, 4 lbs. of condensed milk, 2 lbs. of coffee, 4 lbs. of chocolate, 7 lbs. of rice, 3 lbs. of grits, 1 lb. of salt and pepper, 2 lbs. of peas-sausage, 4 lbs. of sugar, besides a reserve bag with 20 lbs. of bread. We took boiled beef for the dogs. We counted also on the produce of our guns as a considerable supplement both for ourselves and them.

5. The sledge party consisted of myself, Orel, Klotz and Haller, and of three sailors, Zaninovich, Sussich, and Lukinovich; and we had with us three dogs, Jubinal, Torossy, and Sumbu, and men and dogs together dragged the large sledge. The duties were thus divided: Zaninovich managed the packing and the giving out of the spirit and rum, Haller served out the provisions, Klotz attended to the dogs and the arms, Sussich was responsible for keeping everything in working order, and at night Lukinovich acted as a wind-protector close to the door of the tent. We started on the morning of the 26th of March with the thermometer 6° F. below zero, and amid snow driving from the north-west. For some distance we were accompanied by Weyprecht and the rest of the crew. We had scarcely gone a thousand paces from the ship, before the snow began to drive to such an extent, that we could scarcely see our comrades close to us and keep together. As it was impossible to go on until the storm laid, we preferred, instead of returning to the *Tegetthoff*, which would have been the simpler course, to erect the tent out of sight of the ship behind some ice-hummocks, and pass twenty-four hours in it. Our only employment except sleeping was to thaw the snow, which filled our clothes and especially our

pockets. On the 27th of March (the thermometer varying between 2° and 22° F. below zero) we continued our journey amid a slight fall of snow, and made an early start, in order that our halt of yesterday should remain unknown to the crew of the ship. When we reached the south-eastern point of Wilczek Island we lost sight of the ship, and the driving snow with a falling thermometer increased to such an extent, that Sussich's hands were frost-bitten, and we were compelled to halt for an hour to rub them with snow. Starting again, we all ran the risk of having our faces frost-bitten, meeting as we did a strong wind. The heavily-laden sledge, too, compelled us to make such exertions that our faces were bathed in perspiration. On the 28th of March the wind fell to a calm, and as we passed over the Sound between Salm and Wilczek Islands in a north-westerly direction we advanced at the rate of eighty paces a minute. The track, which we followed, consisted partly of bay-ice a year old and partly of old floes, these together forming a continuous surface, here and there broken by barriers of hummocks, miles in length, due to ice-pressures. After we had passed the headlands south-west of Salm Island, we came in sight of the Wüllersdorf mountains, which we had hitherto seen only from a great distance, hoping from their summits to determine the route which we should take northwards.

6. At the distance of some miles right ahead of us lay several rocky islands, with their outlines scarcely discernible owing to the dull thick state of the atmosphere; but as they lay in the direction of our course, we made for them. We now passed some icebergs and saw on their southern sides the first signs of the process of liquefaction—new icicles. By and by a wind from the south-west set in, raising the temperature gradually to 6° F. and bringing with it fogs and then heavy snow-storms. Covered with snow and running before the wind with a large sledge-sail set, we came under the glacier-walls of Salm Island, among icebergs frozen fast together, trudging along through wind and whirling snow. Occasionally the wind was so strong, that the sail alone sufficed to impel the heavy sledge, while a man in front, guided by a whistle from those behind, kept it in its proper course. After a march of sixteen hours, the wind having

increased to a storm, which rendered it impossible to keep the track, we determined to halt. Our clothes appeared to consist of nothing but snow, our eyes were iced up, and our strength exhausted. In great haste we erected the tent and took refuge within it; but our misery now properly began. One scraped the thawing snow from the clothes of another, or turned inside-out the pockets of his own trousers, filled with dissolving snowballs. At last the cooking-machine was lighted, and we began to steam, and heartily wished that our miseries had arisen from cold instead of moisture. The temperature in the tent rose at the distance of three feet from the flame to 80° F., and twenty minutes after the production of this artificial heat it fell seven degrees below zero. Early in the morning of the 29th of March (Palm Sunday) the wind abated and the temperature rose to 24.5° F., so that it began to rain in the tent as we were preparing our breakfast. During the march of that day we ascended the rocky heights of Koldewey Island, at the foot of which we had put up the tent for the purpose of surveying. These rocks consisted of Dolerite, over-spread with a close network of Lichens (*Cetraria nivalis*) and in the clefts we found *Silene acaulis*.

7. From the summit of this island we suddenly beheld, in the field of view of the telescope of the theodolite, a bear, which had seized Torossy and severely wounded him. But almost immediately again the bear disappeared in the snow, and when we came to the place of his disappearance, we discovered the winter retreat of a family of bears. It was a cavity hollowed out in a mass of snow lying under a rocky wall. The bear had shown herself only once, but resisted all our efforts to seduce her to leave the shelter she had chosen, nor had we any special desire to creep on all fours into the narrow dark habitation. Sumbu only was bold enough to follow her, but he too saw things which led him to return very quickly. From the snow which had been thrown up at the entrance of this hole, we inferred that this had been the work of the bear in her efforts to close the approach to her abode. It was the first time that we came upon a family of bears in their winter quarters, or had the chance of adding anything to our scanty knowledge as to the winter sleep of those animals. Middendorff does not admit that they sleep during the winter;

he considers the bear far too lean to be able to do so. According to Dr. Richardson it is only pregnant females who hibernate in a snow-hole, while the males roam over the Arctic seas in search of places free from ice.

8. As we advanced further, we went round Schönau Island¹ so remarkable for its columnar structure and environed by ice which had been raised up by pressure. In a cleft of its precipitous rocky walls we buried a depôt of provisions and a supply of alcohol for two days, together with some articles of clothing, covering them up with four feet of snow. We could not, however, conceal from ourselves the danger of placing a depôt within sight of a bear's hole, and greatly deplored that



THE WINTER HOLE OF A BEAR.

we were not able, like the fox in the fable, to obliterate the marks of our footsteps. Towards evening the temperature fell to -10°F. , and the tent was frozen as stiff as a board. On the 30th of March the temperature fell to -22°F. , and a strong north wind was blowing as we came out of the tent, and curling billows of snow, reddened by the rising sun, rolled round us, hiding from us at last even the sun himself. A march in the teeth of a wind at so low a temperature is quite useless and only exposes to the great danger of frost-bite. This was now clearly seen when, the tent being taken down as usual immediately after breakfast, the laggards, imperfectly clad,

¹ Schönau, near Teplitz in Bohemia, my birthplace.

faced the wild weather. One was binding a stocking round his face with his braces, because his frozen fingers would not permit him to button on his nose-band and wind-guard; another had put on reindeer shoes instead of boots after a vain attempt to thaw them; a third had put on the wrong boot, and I myself was obliged to wind a long rope round my body, because I was unable to fasten my coat. Such a state of things is opposed to order and safety, and may degenerate into serious mischief. There was nothing for it therefore but to set up the tent again and to get back into our sleeping-bag. But the damp tent was frozen hard, and we felt much as if we were lying between two plates of cold metal. It would be difficult to say whether we suffered more from cold than from vexation. Zaninovich spread the sail over us, and shovelled down the snow from the walls of the tent;—who could be so serviceable as this comrade of ours, who on every occasion displayed such hardihood against cold? Orel and I made vain attempts to shorten the time by reading a volume of Lessing which we had brought with us; but we soon renounced the effort, finding that we could not fix our attention in such a situation. We had some compensation, however, in the amusement of listening to the Dalmatians learning to speak German with Klotz, who was far from the weakness of uttering a single word in Italian. As usual, when the weather was bad, the dogs gathered close to the wind-sheltered side of our tent. Sumbu forcing himself in among us had to be driven out, for he growled if he had the faintest suspicion that we meant to move or to smoke; but failing to make himself comfortable among the other dogs, he avenged himself by again rushing in among us, shaking the snow from his coat, and forced us to admit him.

9. On the 31st of March, the weather having cleared, we continued our journey northwards, halting as usual at noon to refresh ourselves with soup. We measured the meridian altitude of the sun with a theodolite, and surveyed and sketched our surroundings. When we came to $80^{\circ} 16'$ N.L. we found a broad barrier of hummocks piled one upon another. This was succeeded by older ice, whose undulating surface was broken by numerous icebergs and high black basaltic cliffs. Here ended the possibility of determining the



LIFE IN THE TENT.

route to be taken; for although there was an opening between Cape Frankfurt and the Wüllersdorf mountains, we could not enter it, until we ascertained whether it led northwards. In order to settle this point Haller and I left the sledge and made a forced march to Cape Frankfurt, whence we hoped to discover the direction of our course. Meanwhile Orel and the rest of the party dragged the sledge with great exertions between hummocks and icebergs towards the north-east. Cape Frankfurt is a promontory of Hall Island, 2,000 feet high and surrounded with glaciers. The small difference of level in the sea-ice at the base of its cliffs showed that the tide did not rise high. Its glaciers flowed towards Markham Sound and Nordenskjöld fiord. When we arrived at the



CAPE FRANKFURT, AUSTRIA SOUND, AND THE WÜLLERSDORF MOUNTAINS.

summit everything lay steeped in the rosy mists of evening. Flocks of birds flew from its massive basaltic crown, and as it was evident that they had not come there to breed, we inferred that open water was not far off.

10. Our attention was directed, however, especially to the configuration of the country, and great was our delight when we beheld beneath us a broad inlet, which promised to be of considerable extent and to run towards the north. This inlet was covered with icebergs and could be traced up to the faint outlines of a distant promontory (Cape Tyrol). It now appeared certain, that we could reach the eighty-first degree of latitude on an ice-covered sea, and the measurement of some angles furnished us with a provisional guidance for penetrating into

these new regions. The coasts of Wilczek Land appeared to run in a northerly direction, and then to trend gradually to the north-east. At a great distance below us we saw a dark point moving over the dimly-seen plain of sea-ice. Its advance was discernible only when for a short time it disappeared behind an iceberg, and again reappeared. It was Orel with the large sledge; but neither the snowy mountains bathed in carmine light, which surrounded our point of view with picturesque effect, nor the crimson veil spread over them, nor the profound solitude of the wastes that lay around us, could so rivet our attention as that little point in which lodged forces apparently so insignificant, but yet made potent by human will. With pain and toil we descended the mountain in our canvas boots between steep precipices of ice, and pressed on for six miles in the rapidly-waning light over hummocky-ice to rejoin our companions, whose position we had marked by the stars, from the elevation we had ascended. We reached our friends before midnight and our news excited great joy.

II. On the 1st of April (the thermometer marking -20° F.) we penetrated by Cape Hansa into the newly-discovered passage, which was covered with heavy ice; I called it Austria Sound. The nearer we approached the coast of Wilczek Land, the more unquestionable did it appear that the Wüllersdorf mountains extended far into the interior; but it would have cost more time than the attempt was worth to ascend them. The latitude taken at noon was $80^{\circ} 22'$. Nothing can be more exciting than the discovery of new countries. The combining faculty never tires in tracing their configuration, and the fancy is restlessly busy in filling up the gaps of what is as yet unseen, and though the next step may destroy its illusions, it is ever prone to indulge in fresh ones. Herein lies the great charm of sledge expeditions, as compared with the tiresome monotony of life on board ship—a charm which is only then diminished when we have to wander for days over wastes of snow, with the coasts at such a distance, that they do not change sufficiently rapidly, or leave scope for indulging in surmises and fancies of what is coming. The discomforts incident to this mode of travelling are in this case doubly felt. The sledge is dragged

with great difficulty in the hours of the early morning, for the hard edges of the snow crystals have not yet felt the smoothing effects of evaporation under the power of the sun. The goal itself appears as if it were never to be reached, because the limited horizon of the travellers constantly retreats. Thirst and languor then set in. The small quantity of water which we were able to prepare during the march had no more effect than a drop on a plate of hot iron. Klotz felt unwell to-day, and cured himself by swallowing his ration of rum at one gulp. Even the dogs seemed languid, and crept along with drooping heads and their tails between their legs.

12. The land on our right was a monotonous waste of ridges and terraces of parallel raised beaches, partially covered with snow. Following its line as we marched onwards, we passed iceberg after iceberg. Towards evening I ascended one of these, and made the joyful discovery that Austria Sound stretched in a northerly direction at least as far as a cape—afterwards called Cape Tyrol. In the midst of my observations Orel called to me from below that a bear was coming near us. We awaited his approach with the greed of cannibals, for his flesh would be priceless while we were making such great exertions and had only the insufficient nourishment of boiled beef. I promised Haller and Klotz the bear-money of 30 gulden, usual in Tyrol, if the bear should be bagged. The animal received three shots at the same moment and at first stood stock still, but then began to drag himself slowly off. We rushed after him, and to save our cartridges struck him with the butts of our rifles, and finished him by thrusting our long knives into his body. We appropriated 50 lbs. of his flesh to our own use, and gave the rest of his carcase to the dogs, and deposited 50 lbs. of boiled beef on the iceberg, close by which we erected our tent.

13. On the 2nd of April (the thermometer marking —11 F.) we again started with renewed vigour, though in the face of a strong north wind. I myself left the sledge in order to examine the raised beach for some distance. It was for the most part bare of snow, and exhibited laminae of brown-coal sandstone amid the Dolerite. Close beside the scanty remains of some drift-wood, I was surprised to find a circle of large

stones resembling those erections which I had seen in East Greenland in deserted Eskimo villages. As, however, there were no other marked traces of former settlements, this circle of stones was no doubt something accidental. The magnitude of Franz-Josef Land seemed to grow before our eyes, as we saw the broad Markham Sound opening up towards the west, and ranges of high mountains stretching away towards Cape Tyrol. The coasts abounded in fiords, and glaciers were everywhere to be seen. Wilczek Land disappeared under ice-streams, and only reappeared again in the rocky heights of Cape Heller and Cape Schmarada, opposite Wiener-neustadt Island. In the evening we reckoned that we had reached latitude $80^{\circ} 42'$.

14. On the 3rd of April (the thermometer standing at -9° F.) we should have reached Cape Tyrol, had not snow-storms from the south kept us in the afternoon in our tent: a delay with which Lukinovich was by no means displeased, for this being Good Friday he had counted on a day of complete rest,—for our friend Lukinovich was prone to turn his eyes to heaven, spoke constantly of the saints, could mention their festivals as they occurred in the calendar; but, alas! was a snow-eater, and could march not a whit better than Falstaff. On the 4th of April the temperature, with constant driving storms of snow from the south, rose from -4° to 23° F.; and the snow accumulated to such an extent even in the tent, that it had to be shovelled out. It was towards the afternoon before we could continue our march, the delay made being not so much on account of the cold, as from dread of the moisture. Our start proved, however, useless, for the snow began to drive so furiously, that, as we dragged, those behind could scarcely see the men in front. We again travelled by the compass and used our sledge-sail; but we constantly deviated from the right course, though we pressed on, passing Cape Tyrol without seeing it, and entered an unknown region in which we were guided by mere chance—expecting every moment to stumble on a fissure in the ice or open water. This day we sustained a painful loss—the loss of my dog Sumbu. For two long years he had been almost our only source of amusement by his cunning and his impudence. He had long been the rival of the frolicsome Torossy, in

dragging the sledge ; and it was often almost touching to see how at evening he would sink down exhausted in the snow, in the very spot where he was unharnessed. It cannot well detract from the merit of such services—and after all they were rendered in the interests of science!—that they were those of an animal and sprang from attachment.¹ To this vigorous lively animal, what more natural than that he should be almost beside himself if in one of these vast solitudes he



HOW SUMBU WAS LOST.

should get sight of a living creature? So it happened to-day. A gull flew over his head, and Sumbu burst away from the sledge. In hot pursuit of the bird he disappeared from our sight and never returned again. All our shouts were thrown away. Our track was soon covered over by the drifting snow, and there cannot be a doubt that our faithful companion, after wandering about for days, either died of hunger or fell a victim to a bear.

¹ Sumbu and Pekel were my own dogs.

15. April 5, after a short rest, we again started about midnight in order to economize our time (the thermometer being at 19° F.). The weather had greatly improved. Klotz, who was the first to step out of the tent, startled us by the information that some high land barred our further progress. But when we followed him into the open air, we found that Klotz had looked to the west instead of to the north, and we discovered the true state of things, that Zichy Land ran on our left in a northerly direction, while Wilczek Land trended towards the north-east. We pursued, therefore, our course on the vast icy wastes, over which hung Cape Easter ($81^{\circ} 1'$), and Cape Hellwald shining in the sun, and hoisted the flag on the



CAPE EASTER AND STERNEK SOUND.

sledge to celebrate our passage of the eighty-first degree of north latitude, and in commemoration of Easter Sunday.

16. During our march, spying us at a great distance, a bear approached us at a rapid pace, but when he came within forty paces he fell, receiving three bullets in his head. The accompanying illustration shows how we received bears when they attacked us on our journey; it represents also the fine forms of Cape Tyrol in the background. A few hours afterwards, we observed a she-bear about 400 yards from us, apparently diligent in burrowing in the snow; but as soon as she got wind of us she suddenly turned, reared herself on her hind legs, and began to snuff the air. She then came towards us, but as she advanced she rolled herself over with evident



HOW WE RECEIVED BEARS. CAPE TYROL IN THE BACKGROUND.

pleasure on her back several times, then pushed on with her snout and belly close to the ground, perfectly unconscious of the three rifles which were levelled at her. At fifty paces distance we fired, and brought her down. We immediately examined the place where we had seen her so busy. We did not find poor Sumbu, as we half expected, but a partially-consumed seal, and close to it a hole in the ice, into which the creature no doubt would plunge when danger threatened; but the bear had been sharper and cleverer than the seal, and had probably seized it when asleep on the ice. Bear-flesh now formed our principal food, and the sledge was heavily laden



DINING ON BEARS' FLESH.

with it. We ate it both raw and cooked, and when the flesh was badly cooked—especially if it were the flesh of an old bear—it was less palatable than when uncooked. It may be tolerable food for sea-gulls, but it is a diet hardly fit even for devils on the fast-days of the infernal regions. Arctic lands certainly do not furnish delicacies to gratify a refined taste; the best things they have to offer are coarse and oily, and if ever they are eaten with relish, it is a relish which comes from hunger alone. The desolate shores of these lands are truly the very home of hunger, and nowhere else are the calculations of travellers so much influenced and determined by the

stomach and its needs. Remains or fragments are unknown in Arctic regions. The dead are consumed by the living, and the living find their never-ceasing occupation in the toilsome search for food. In my three Arctic expeditions, I very seldom indeed found the remains of animals, never the remains of a bear or a fox. The man who visits these wastes must do homage to the principle of eating everything, and throwing away nothing. Franklin was unsurpassed in this, but I believe we were little behind him. Franklin and his people found the flesh of a white fox as pleasant to the taste as young geese—a proof how entirely they had forgotten how geese taste. They preferred foxes, too, to lean reindeer; and they considered the flesh of a grey bear exceedingly palatable, though even the Eskimos eat it only in dire necessity. Reindeer marrow, even raw, was to them a great delicacy, and they ate animals in a state of decomposition. Barentz and his crew were very modest in their tastes; they compared whale-flesh to beef, and foxes to rabbits, as articles of diet; bears' meat they utterly detested. Once only it seems they partook of the liver of a bear, and three of his men became exceedingly ill in consequence, their skin peeling off from head to foot. Kane was prejudiced against bear, notwithstanding the great straits to which he was reduced, and complains of this food as being absolutely uneatable. The testimony of Dunér is more favourable. "If," says he, "a bear has not been eating walrus or seal in a state of semi-putrefaction before he is killed, his flesh, though somewhat coarse, is yet palatable, and not at all prejudicial to health." Parry thought whale-flesh and walrus-flesh equally distasteful: he makes an exception in favour only of the heart of the walrus; but he speaks of the tenderness and excellence of the flesh of young seals. As for ourselves, we disdained nothing that we could get hold of, after the manner of Sir John Ross, who thought the fox the best of all food, better than the gull (*Larus tridactylus*).

17. The continued moisture of the last few days had completely saturated our canvas boots; and those of several of us were besides nearly worn out, and in the morning when completely frozen, to put the foot into one was as bad as putting it into an ice-hole, so that we were obliged to thaw

them over a spirit-flame, and to knock their heels with a hammer continually during the march. Sussich had made himself a pair of new boots out of a cloth jacket. It would, however, be a mistake to think that we should have been any better off with leather boots. In fact, we could not have put them on, and in the increasing cold of the following weeks our feet would certainly have been frost-bitten. Our clothes were completely saturated in like manner, and whenever the temperature fell they became stiff with ice. I suffered the least of any, for my bird-skin garments were the best preservatives against the penetration of moisture.

18. No kind of snow opposes such hindrances to sledge-dragging as the snow with the thermometer not much below freezing-point, for at this temperature it balls. This impediment we now encountered. The air, too, became oppressively heavy; land and sky were suddenly overspread with darkness; and, from behind thunderlike clouds, red rays of the sun fell on the conical mountains of Kane Island. Falls of snow, calms, and violent gusts of wind rapidly succeeded one another, and just before we erected our tent it again became clear. Far to the north we saw two white masses—Becker and Archduke-Rainer Islands, and an extensive inlet—Back Inlet; but only within Austria Sound could we count on pursuing our journey northwards without making any detours. On Easter Monday, April 7th (the thermometer varying between 9° and 19° below zero [C.]), we approached Becker Island; but the atmosphere was on this day so moist and thick, though without mist in the proper sense, that its existence might be asserted or disputed according as the light changed; and it was only when we were not further off than 100 paces that we could be positive of the existence of land, rising gently at an angle of $1^{\circ} 7'$. Over this ice-covered island we now dragged, and, full of expectation, mounted its highest point. To the north lay an indescribable waste, more utterly desolate than anything I had ever seen, even in the Arctic regions, interspersed with snow-covered islands, all, big and little, of the same low, rounded shape. The whole, at a distance, presented the appearance of a chaos of icehills and icebergs scattered over a frozen sea. One thing only in this view gave us much satisfaction. Austria Sound still stretched

uninterruptedly towards the north. Could we have forgotten how the *Tegetthoff* had drifted towards Franz-Josef Land, that Sound would have seemed to us the true road to the Pole. Nor could we doubt that in the immediate north open water would be found, for in no other way could we interpret the indications we had observed in the course of the last few days—the great moisture and high temperature, the dark colour of the northern sky, the frequent flights of Auks, and Divers, grey and white Gulls, which flew from the north southward, or *vice versâ*.

19. After crossing Becker Island, we went on again on the frozen sea, which was rough and undulating for some distance. From behind one of the hummocks a bear suddenly emerged, and came towards us without any fear or hesitation, his yellow colour forming a strong contrast with the gleaming hills of ice. When he was thirty paces off we fired; but though severely wounded he managed to get away. On the 7th of April (the thermometer varying between 16° and 25° below zero (C.), and with a light south-west wind), we passed close to Archduke-Rainer Island, a heavy rime frost seriously impeding our progress. We were able, however, to turn to good account the clear sunny weather of this day. We dried our clothes and tent furniture, spreading them out in the sun over the sledge or suspending them to its mast and yard. We had almost reached Cape Beurmann at noon, and having taken our observations, we found our latitude to be $81^{\circ} 23'$. We had consequently gone beyond the latitude reached by Morton; Hayes only having reached a slightly higher latitude than this. About this time of the day the horizon towards the north became exceedingly clear, and the steep rocks of Coburg Island were distinctly visible, and behind them now rose the faint outlines of mountains—Crown-Prince Rudolf's Land.

20. At this latitude it seemed as if Wilczek Land suddenly terminated, but when the sun scattered the driving mist we saw the glittering ranges of its enormous glaciers—the Dove¹ Glaciers—shining down on us. Towards the north-east we could trace land trending to a cape lying in the grey distance—Cape Buda Pesth, as it was afterwards called. The prospect

¹ Named after Dove, the celebrated German physicist.

thus opened to us of a vast glacier land, conflicted with the general impression we had formed of the resemblance between the newly-discovered region and Spitzbergen; for glaciers of such extraordinary magnitude presuppose the existence of a country stretching far into the interior. As it appeared to us that Crown-Prince Rudolf's Land and Karl Alexander's Land formed a continuous whole, we left Austria Sound and diverged into Rawlinson Sound, and directed our course towards Cape Rath. It was my intention, if this headland should be reached, to leave behind the remainder of the party and push on with the dog-sledge and two companions. We could count on finding deep snow-wreaths behind the hummocks, and to dig out a snow-house would have been the labour of an hour for three men. Previous experience had convinced us that such a night encampment is warmer than the shelter which a tent can afford. But though we were filled with zeal to extend our discoveries as much as possible, we now felt that the excessive exertions we had made had reduced our strength. We had slept on an average but five hours a day, and marched the rest of the day, or at any rate had been occupied with all manner of work. Our appetite too had increased with our labours, and the partaking of bears' flesh began to tell on some of us. The restricted use of bread-stuff was especially felt, and the almost exclusive use of flesh produced diarrhoea and general debility. Nothing is more prejudicial to those engaged in extended sledge journeys than great exertion with insufficient sleep. The urgent reasons we had for losing no time in order that we might return as soon as possible to the ship, constrained us to depart from the rule of a ten hours' sleep to a seven hours' march on sledge journeys. In consequence of our peristent adherence to this principle during our return to Europe after abandoning the *Tegetthoff*, the labours incident to it were far more easily performed. We did not lose but gained strength; and some of us even grew stouter during it.

21. On the 8th of April we continued our journey, making an early start as usual. Our track lay between countless hummocks, some of which were forty feet high, while the depressions between them were filled with deep layers of snow, and as we advanced into Rawlinson Sound, high icebergs towered

over a monotonous chaos of ice-forms. The ice resembled that which surrounded the *Tegetthoff* during our first winter, and indicated a periodical, perhaps even an annual, breaking up. There was nothing, however, to entitle us to infer that Rawlinson Sound was navigable in summer. Like many of the passages of the northern coast of North America, Austria and Rawlinson Sounds are too narrow for the purposes of navigation. They are, however, well calculated for sledge travelling. For some time we made use of our sledge-sail; but when the wind shifted to E.S.E., it drove the sledge so much



CUTTING UP THE BEARS.

from its true course, that we took it down. Our noses had become so susceptible, that we were glad to put on our wind-protectors to save them from frost-bite. Then followed snow-storms, alternating with brilliant sunshine which, however, illuminated, partially only, some reaches of the hummocky ice, while the distant land lay in shadow. It cost us excessive labour to get the sledge on; we had occasionally to dig a lane for it, and we ran some risk of breaking it. Our advance was one continual zig-zag, due to the confused character of

the ice on which we travelled and the untrustworthiness of the compass in high latitudes. It seemed too, as if the declination of the magnetic needle had considerably diminished since we left the ship. Our labours were diversified by the visit of a bear, who, when we first observed him, was standing on the top of one of the many ice-hummocks about 300 paces distant. He then approached us, as was usually the case, under the wind, and we at once drew up to receive him. He took no notice of the bread we had laid down to gain his attention, but still pressed on till he received three bullets in his head. Notwithstanding this he ran for about seventy yards and then fell. To make sure, another bullet was fired into his body, and thinking him dead, we forthwith began to cut him up; but when his belly was being opened, he raised his head in a fury, seized the butt-end of my rifle with his teeth and tore it from my hand. My companions soon despatched him. The bear was eight feet long, and therefore of unusual size. We might have cut off two or three cwt. of flesh from his carcase, but in consideration of the heavy lading of the sledge, we contented ourselves with appropriating sixty pounds. Both Rawlinson and Austria Sounds were equally rich in fresh traces of bears, which seemed to be those of whole families and not of individual animals.

22. Our latitude from a meridian observation was found to be $81^{\circ} 38'$ —and though the sun shining dimly through the clouds might account for an error of two or three minutes, we had certainly passed beyond the latitude $81^{\circ} 35'$ reached by Hayes in Smith's Sound in 1861.¹ Having no conception at the time that Hall's American expedition had penetrated; the year before we achieved this result, to $82^{\circ} 9'$ on the land and $82^{\circ} 22'$ at sea, we hoisted our sledge-flag to commemorate our success. The character of the ice now became so wild and confused that we wandered 45° from one point of the compass to the other. We constantly expected to come upon open fissures, and could not conceal from ourselves how easily its loose connection might be broken up by a storm, and our return to the ship exposed to great risks. The transport of our travelling gear became increasingly difficult, and great were our fears lest, through the constant heavy shocks which

¹ Parry reached, on the frozen sea to the north of Spitzbergen, $82^{\circ} 45'$ N.L.

the sledge encountered, the case of spirit should be crushed and destroyed. The difficulties too to be overcome amid the multitude of hummocks were more depressing than the occurrence of snow-storms, inasmuch as their number almost destroyed the possibility of progress; and the monotonous uniformity which tired the eye tended also to depress the spirits.

23. On the 9th of April (the thermometer standing at 10° F., and a light breeze blowing from the east) we continued our work of dragging between the hummocks till noon. We then ascended an iceberg, and discovered that the hummocks of ice in Rawlinson's Sound appeared to stretch on without end. We therefore altered our course and took a north-westerly direction, in order to come under Crown-Prince Rudolf's Land, whose noble mountain forms and mighty glaciers shone forth in the light of the sun. We expected to find smoother ice on its coast-line; but we were deceived in this expectation, for the character of the ice remained unchanged. We were compelled therefore to cross this Sound in a westerly direction to Hohenlohe Island, and to select the rocky pyramid—visible from a great distance—of Cape Schrötter as the point where our expedition should divide into two parties; the larger party to remain behind, the smaller to penetrate further towards the north over the glaciers of Rudolf's Land. By noon of this day we reached 81° 37' N. L. and in the evening arrived at Cape Schrötter. All the labours and efforts of the last few days had consequently been without result.

CHAPTER VIII.

IN THE EXTREME NORTH.

1. IMMEDIATELY after reaching Cape Schrötter, the east end of Hohenlohe Island, we ascended the summit of this Dolerite rock, which was quite free from snow, and covered with a sparse vegetation. We were surprised to find here the excrement of a hare. The prospect which lay before us convinced us of the necessity of our proposed temporary separation. The mountains of Crown-Prince Rudolf's Land, separated from us by an arm of the sea covered with level ice, were so high (about 3,000 feet) that we saw at once that we could pass over them only with the small dog-sledge. The walking powers, moreover, of two of my companions had greatly deteriorated, and for them rest was not an indulgence, but a necessity. Austria Sound appeared to stretch still further to the north, but its western coasts turned sharply to the left in the precipitous cliffs of Cape Felder and Cape Böhm. The blue jagged line of mountains, towering above snow-fields lying in the sun, stretched away to the north-west till they were lost in dark streaks on the horizon, which our experience led us to interpret as a water-sky above open spaces of the sea.

2. I was greatly delighted by Orel's readiness, though he was suffering from inflamed eyes, to take part in the expedition to the extreme north; and it only remained for us to select the fittest among the party and to calm the apprehensions of those who were to remain behind. On our return to the foot of the rocks, where the tent was already pitched, we found the rest of the party sitting close to each other at the rocky wall on which the sun was shining, in order

to warm themselves,—like crickets on the wall of a house. The success of an expedition like that we projected depends chiefly on the mutual good feeling among its members, and he who commands it, besides participating personally in all the labours to be endured, must show himself a sympathetic friend even in cases where strict duty does not enjoin it, so that confidence in him may grow into a kind of belief in his infallibility. There could not be more devoted or enduring men than those who were here lying in the sun, and whom we now joined, in order to decide the question of the hour. I explained to them the plans I meant to follow,—that I should be absent from five to eight days, that if I should not return to them within fifteen days they should march back to the ship with the sledge—sawn through the middle—and the stock of provisions which should be placed at their disposal would suffice for this emergency. I then asked each of them whether he could dismiss fear, and remain behind in this desolation. Sussich answered: “*Se uno de lori resta indietro, mi non go paura.*” so said the rest. By the expression, however, “*uno de lori*” they meant Orel or one of the two Tyrolese, and specially with an eye to the bears which might be prowling about. I left it free to Klotz and Haller to decide which of them was the fittest and most serviceable to accompany me: “You,” answered Haller, “you, Klotz, are the better man to drag the sledge and endure fatigue.” Accordingly Sussich and Lukinovich remained under Haller’s command. These three were ordered not to go more than 300 yards from Cape Schrötter, to remain on the defensive if attacked by bears, to spend their time in drying their clothes and repairing their torn boots, and to go about in wooden shoes to save wear and tear. Haller received as Governor of Hohenlohe Island a pocket-compass, a watch, an aneroid barometer, and a thermometer, and to them we left also our little medicine-chest. If Dr. Kepes had once tried to make a doctor of me in one hour, in now repeating the experiment on Haller I confined myself to ten minutes.

3. On the morning of the 10th of April (the thermometer standing at 5° F.) we divided the tent; one half was put on the dog-sledge, the other was pitched, with its open side close under the rock. Before a caravan takes the desert, the camels are

watered, and we too, though in a very different kind of desert, exposed to the constant evil of thirst, would gladly have been treated in like fashion. But we had to content ourselves with a pint of boiling water, served out to each of us every morning, reminding us, indeed, of coffee, for 2 lbs. of it were boiled in 105 gallons of water in the course of thirty days. The provisions were divided, and enough for eight days was dealt out to the party starting to the north, Orel, Zaninovitch, Klotz, myself, and two dogs. The special requirements of our expedition, among which were a rifle and a revolver, raised the weight of our sledge to about 4 cwt., which it was the business of the dogs to draw without any assistance from us, and this they did over the level snow with such zeal, that we had some trouble in keeping up with them.

4. The merits of our dogs I have hitherto left unnoticed, in order emphatically to assert that we owed the passing beyond the eighty-second degree of north latitude not to our own exertions, but to the endurance and courage of these animals. No kind of life among dogs is comparable for hardships with the life of a dog in an Arctic sledge. His tent is scarcely the pretext of a shelter, and his natural coat is generally covered by a thick rime. The snow when it drifts completely covers him, though he constantly but vainly seeks to shake it off. He draws his breath with difficulty, hunger gnaws at his bowels, and his wounded feet colour the snow with blood. Often, too, these poor animals amid the great cold must keep still; then they lift up their paws alternately, to prevent frost-bite. The two dogs, which accompanied us to the extreme North, were the noblest animals ever employed in a sledge expedition, and when I recall the great services they rendered us, both now and afterwards in the return to Europe, their sad end fills me with sincere sorrow. Jubinal and Torossy were dogs of remarkable size and strength, and escaped the epidemic diseases¹ which attacked the dogs of Hayes and Kane; and though it has been thought that the

¹ Kane's dogs died principally in consequence of being fed chiefly on salt meat, and Hayes's from a disease among dogs which spreads over all West Greenland. Epidemics of this kind break out among the dogs of the Eskimos and of the Siberian tribes. Middendorf mentions, however, that canine madness never occurs among the dogs of the latter.

dogs of the Eskimo and of the Siberian people were alone adapted for Arctic expeditions, our experience with our own dogs, most of them brought from Vienna, proves that they were not a whit less useful. Our dogs had only one defect: they had not been trained to sledge-drawing from their youth, but had been broken to it only during our expedition, and were therefore not always amenable to discipline. When left to themselves in dragging the sledge they went on, without turning to the right or left, from cape to cape, and if they found themselves on a wide plain of ice, and far from all striking landmarks, they ran either towards the sun or moon,



ICEBERGS AT THE BASE OF THE MIDDENDORF GLACIER.

or some remarkable star. It was against the grain with them to have to drag in the teeth of the wind, and if they had to push on amid hummocks of ice, they immediately began to growl. They were fed in the morning, and more particularly in the evening, and they showed a delicacy of taste in discriminating between bear's flesh and the despised seal's flesh. While they carefully avoided coming near us before our start, provided they were not very hungry, in order to escape being harnessed, yet when harnessed nothing could exceed their vigour and persistence in dragging.

5. As we approached the promontory on the south of Crown-Prince Rudolf's Land, we came upon innumerable icebergs, from one hundred to two hundred feet high, which made an incessant cracking and snapping sound in the sunshine. The Middendorf glacier, with an enormous sea-wall, ran towards the north to a great distance. Deep layers of snow and great rents in the sea-ice, the consequence of the falling-in of icebergs, filled the intervening spaces between them. Into these fissures we were continually falling, drenching our canvas boots and clothes with sea-water. But the aspect of these colossal fragments of glaciers engrossed us to such an extent, that we wandered a long time with unflagging interest among these pyramids, tables, and cliffs. It was only when I sent on Klotz to mark out by his footsteps a path by which we might ascend the Middendorf glacier, that we came to a more open region, and, all putting their strength to the work of dragging, we gained its summit, crossing in our progress many crevasses bridged over with snow. Three of these yawned across the lower part of the glacier, needing but a slight movement of the ice to detach them and transform them into icebergs. Further on, the glacier appeared smooth and free from crevasses, although its inclination amounted to several degrees. Towards the north it seemed as if it might be crossed without excessive exertion, if all took part in the work of dragging. But before we began this part of the day's work we rested, and recruited ourselves with dinner, and setting up our little tent at about 400 paces above the edge of the glacier, we looked down with feelings of delight on its semi-circular terminal precipice and the gleaming host of icebergs which filled the indentations of the coast. While we were sitting in the tent Klotz made the fatal communication to me, that he was not the man he should be, that for some days his foot had swollen and ulcerated, so that he could walk only in shoes made of hide. However vexatious this mishap, there was nothing for it but to send him back to Hohenlohe Island. Laden with a sack and carrying a revolver, he set off, and soon disappeared from our eyes in the labyrinth of icebergs beneath us.

6. We had meanwhile again packed the sledge, harnessed the dogs, and fastened the traces round us, when, just as we

were setting off, the snow gave way beneath the sledge, and down fell Zaninovich, the dogs, and the sledge, and from an unknown depth I heard a man's voice mingled with the howling of dogs. All this was the impression of a moment, while I felt myself dragged backwards by the rope. Staggering back, and seeing the dark abyss beneath me, I could not doubt that I should be precipitated into it the next instant. A wonderful providence arrested the fall of the sledge; at a depth of about thirty feet it stuck fast between the sides of the crevasse, just as I was being dragged to the edge of the abyss by its weight. The sledge having jammed itself in, I



THE SLEDGE FALLS INTO A CREVASSE ON THE MIDDENDORF GLACIER.

lay on my stomach close to the awful brink, the rope which attached me to the sledge tightly strained, and cutting deep into the snow. The situation was all the more dreadful as I, the only person present accustomed to the dangers of glaciers, lay there unable to stir. When I cried down to Zaninovich that I would cut the rope, he implored me not to do it, for if I did, the sledge would turn over, and he would be killed. For a time I lay quiet, considering what was to be done. By and by it flashed into my memory, how I and my guide had once fallen down a wall of ice in the Ortler Mountains, 800 feet high, and had escaped. This inspired me with confidence

to venture on a rescue, desperate as it seemed under the circumstances. Orel had now come up, and although he had never been on a glacier before, this gallant officer dauntlessly advanced to the edge of the crevasse, and, laying himself on his stomach, looked down into the abyss, and cried to me, "Zaninovich is lying on a ledge of snow in the crevasse, with precipices all round him, and the dogs are still attached to the traces of the sledge, which has stuck fast." I called to him to throw me his knife, which he did with such dexterity, that I was able to lay hold of it without difficulty; and as the only means of rescue, I severed the trace which was fastened round my waist. The sledge made a short turn, and then stuck fast again. I immediately sprang to my feet, drew off my canvas boots, and sprang over the crevasse, which was about ten feet broad. I now caught sight of Zaninovich and the dogs, and shouted to him, that I would run back to Hohenlohe Island to fetch men and ropes for his rescue, and that rescued he would be, if he could contrive for four hours to keep himself from being frozen. I heard his answer: "Fate, Signore, fate pure!" and then Orel and I disappeared. Heedless of the crevasses which lay in our path, or of the bears which might attack us, we ran down the glacier back to Cape Schrötter, six miles off. Only one thought possessed us—the rescue of Zaninovich, the jewel and pride of our party, and the recovery of our invaluable store of provisions, and of the book containing our journals, which, if lost, could never be replaced. But even apart from my personal feeling for Zaninovich, I keenly felt the reproaches to which I should be exposed of incautious travelling on glaciers; and it gave me no comfort to think that my previous experiences in this kind of travelling over the glaciers of Greenland appeared to justify my proceedings. Stung with these reflections, I pressed on at the top of my speed, leaving Orel far behind me. Bathed in perspiration, I threw off my bird-skin garments, my boots, my gloves, and my shawl, and ran in my stockings through the deep snow. After passing the labyrinth of icebergs I saw the rocky pyramid of Cape Schrötter before me in the distance. The success of my venture depended on the weather. If snow-driving should set in, and footprints should be obliterated, it would be impossible to find Hohenlohe Island. All around

me it was fearfully lonely. Encompassed by glaciers, I was absolutely alone. At last I saw Klotz emerge from behind an iceberg at some distance off, and though I continued to shout his name till I almost reached him, I failed to rouse him from his usual reverie. When at last he saw me breathlessly pushing on, scarcely clothed, and constantly calling, his sack slipped from his back, and he stared at me as if he had lost his senses. When the hardy son of the mountains came to understand that Zaninovich with the sledge was buried in the crevasse, he began to weep, in his simplicity of heart taking the blame of what had happened on himself. He was so



KLOTZ'S AMAZEMENT.

agitated and disturbed, that I made him promise that he would do himself no mischief, and then, leaving him to his moody silence, I ran on again towards the island. It seemed as if I should never reach Cape Schrötter; with head bent down I trudged on, counting my steps through the deep snow; when I raised it again, after a little time, it was always the same black spot that I saw on the distant horizon. At last I came near it, saw the tent, saw some dark spots creep out of it, saw them gather together, and then run down the snow-slope. These were the friends we had left behind. A few words of explanation, with an exhortation to abstain from

idle lamentation, were enough. They at once detached a second rope from the large sledge, and got hold of a long tent-pole. Meantime I had rushed upon the cooking-machine, quickly melted a little snow to quench my raging thirst, and then we all set off again—Haller, Sussich, Lukinovich, and myself—to the Middendorf glacier. Tent and provisions were left unwatched; we ran back for three hours and a half; fears for Zaninovich gave such wings to my steps, that my companions were scarcely able to keep up with me. Ever and anon, I had to stop to drink some rum. At the outset we met Orel, and rather later Klotz, both making for Cape Schrötter, Klotz to remain behind there, and Orel to return



THE ALARM OF THE HOHENLOHE PARTY.

with us at once to Middendorf glacier. When we came among the icebergs under Cape Habermann I picked up, one by one, the clothes I had thrown away. Reaching the glacier, we tied ourselves together with a rope. Going before the rest, I approached with beating heart the place, where the sledge had disappeared four hours and a half ago. A dark abyss yawned before us; not a sound issued from its depths, not even when I lay on the ground and shouted. At last I heard the whining of a dog, and then an unintelligible answer from Zaninovich. Haller was quickly let down by a rope; he found him still living, but almost frozen, on a ledge of snow

forty feet down the crevasse. Fastening himself and Zaninovich to the rope, they were drawn up after great exertion. A storm of greetings saluted Zaninovich, stiff and speechless though he was, when he appeared on the surface of the glacier. I need not add that we gave him some rum to stimulate his vital energies. It was a noble proof how duty and discipline assert themselves, even in such situations, that the first word of this sailor, saved from being frozen to death, was not a complaint, but thanks, accompanied with a request that I would pardon him if he, in order to save himself from being frozen, had ventured to drink a portion of the rum, which had fallen down in its case with the sledge to his ledge of snow. Haller again descended, and fastened the dogs to the rope. The clever animals had freed themselves from their traces in some inexplicable way, and had sprung to a narrow ledge, where Haller found them, close to where Zaninovich had lain. It was astonishing how quickly they discerned the danger of the position, and how great was their confidence in us. They had slept the whole time, as Zaninovich afterwards told us, and he had carefully avoided touching them, lest they should fall down deeper into the abyss. We drew them up with some difficulty, and they gave expression to their joy, first by rolling themselves vigorously in the snow, and then by licking our hands. We then raised Haller by the rope some ten feet higher than the ledge on which Zaninovich had lain, so that he might be able to cut the ropes which fastened the loading of the firmly wedged-in sledge. At this moment Orel arrived, and with his help we raised one by one the articles with which the sledge was loaded. It was ten o'clock before we were convinced that we had lost nothing of any importance in the crevasse.

7. We now left the glacier and the icebergs, and by midnight had reached Cape Habermann. Here we slept, and the dogs with us, as uncomfortably as possible. On the morning of the 11th of April (the thermometer marking 3° F.), we started at an hour when we would much rather have continued to sleep. Our thirst was so great that we felt ourselves equal to drinking up a stream. Haller, Sussich, Lukinovich had during the night returned to Cape Schrötter. Before they started Haller earnestly besought me to come

back as soon as possible ; for the recent event, he said, had not been without its disquieting effects on the men. On the whole, we might congratulate ourselves on being able to continue our journey, without having received any serious damage, though no longer over the treacherous glacier.

8. A sharp turn to the left brought us to the west coast of Crown-Prince Rudolf's Land, along which we pursued our route northwards. When we reached Cape Brorock, where by an observation we found our latitude at noon to be $81^{\circ} 45'$, the weather became wonderfully bright, and the warm sunlight lay on the broken summits of the Dolerite mountains,



HALT UNDER CROWN-PRINCE RUDOLF'S LAND.

which, though covered with gleaming ice, were free from snow. To the north-west we saw at first nothing but ice up to the horizon ; even with the telescope of the theodolite I could not decide for the existence of land, which Orel's sharp eye discovered in the far distance. In the Arctic regions, it often happens that banks of fog on the horizon assume the character of distant ranges, for the small height to which these banks rise in the cold air causes them to be very sharply defined. It is very common also to make the same mistake in the case of mists arising from the waste water of enormous glaciers. We marched on northward close under the land, and for the first time over smooth undulating ice, in high spirits at the increasing grandeur of the scenery and at the happy issue of

our adventure of yesterday. Thirst compelled us frequently to halt in order to liquefy snow ;¹ sometimes we melted it as we marched along, and our sledge with smoke curling up from the cooking-machine then resembled a small steamer.

9. By and by we came to more snow, and the ice, through which many fissures ran, became gradually thinner, but when we reached the imposing headland, which we called Cape Auk, the ice lay in forced-up barriers. A strange change had come over the aspect of nature. A dark water-sky appeared in the north, and heavy mists rolled down to the steep promontories of Karl Alexander Land ; the temperature rose to 10° F.,² our track became moist, the snow-drifts collapsed under us with a loud noise, and if we had previously been surprised with the flight of birds from the north, we now found all the rocky precipices of Rudolf's Land covered with thousands of auks and divers. Enormous flocks of birds flew up and filled the air, and the whole region seemed alive with their incessant whirring. We met everywhere with traces of bears and foxes. Seals lay on the ice, but sprang into the water before we got within shot of them. But notwithstanding these signs of a richer animal life, we should not be justified in inferring, from what we saw in a single locality, that life increases as we move northwards. It was a venial exaggeration, if amid such impressions we pronounced for the nearness of an open Polar sea, and without doubt all adherents of this opinion, had they come with us to this point and no further, would have found in these signs fresh grounds to support their belief. In enumerating these observations, I am conscious what attractions they must have for every one who still leans to the opinion that an open ocean will be found at the Pole ; subsequent experience, however, will show how little is their value in support of this antiquated hypothesis.

10. Our track was now very unsafe ; it was only the icebergs which seemed to keep the ice in the bays. A strong east wind would certainly have broken it up and cut off our return, at least with the sledge. There were no longer the

¹ Snow-water was for two years the only water we used, and as none of us became goitred, we were a living refutation of the opinion shared by many that its constant use generates this disease in the inhabitants of the Alps.

² On board the ship the temperature at the same time was - 20° F.



CAPE AUK.

connected floes of winter, but young ice only, covered with saline efflorescence, dangerously pliable, and strewn over with the remains of recent pressures. The ice was broken through in many places by the holes of seals. It was expedient therefore to tie ourselves together with a long rope, and each of us, as he took his turn in leading, constantly sounded the ice. Passing by Cape Auk, which resembled a gigantic aviary, we followed the line of Teplitz Bay, into which a stream of glaciers, descending from the high mountains in the interior, discharged itself. Icebergs lay along the terminal glacier wall which formed its shore. Ascending one of these masses, we found granite erratics on its surface and saw the open sea stretching far to the west. There seemed to be ice only on the extreme horizon. As the ice-sheet over which our track lay became thinner and more pliable, and constantly threatened to give way under us, the height and length of its piled-up barriers increased also, and because the high glacier walls made it impossible to travel over the land, we had no other resource than to open up a track through the hummocky ice by pick and shovel. At last even this expedient failed to help us; our sledge, constantly damaged, and as constantly repaired, had to be unloaded, the dogs unharnessed, and everything transported separately. Evening had now arrived; ahead of us lay the two rock-towers, which we called Cape Säulen, and open coast-water here began.

II. Beautiful and sublime was this far-off world. From a height we looked over a dark "ice-hole," studded with icebergs like pearls, and over these lay heavy clouds through which the sunbeams fell on the gleaming water. Right over the true sun shone a second, though somewhat duller sun; the icebergs of Crown-Prince Rudolf's Land, appearing enormously high, sailed through the still region amid rolling mist and surrounded by vast flocks of birds. Close under Cape Säulen (the Cape of Columns) we came upon the steep edge of the glaciers and dragged up our baggage with a long rope. While Orel got ready our encampment for the night in the fissure of a glacier, and completed as usual his meteorological observations and soundings, I ascended a height to reconnoitre our track for the next day. The sun was setting amid a scene of majestic wildness; its golden rays shot through dark banks of mist



CAPE SÄULEN.

and a gentle wind, playing over the "ice-hole," formed ever-widening circles on its mirror-like surface. Land was no longer visible towards the north, it was covered with a dense "water-sky." A bird flew close past me; at first I took it for a ptarmigan, but it was probably a snipe. It ought to be remarked that during the two days which we spent near this "ice-hole" we never once saw a whale. As soon as with half-closed eyes we had eaten our supper, we fell fast asleep, for our longing to sleep was yet greater than our exhaustion and our thirst. The dogs availed themselves of this opportunity to devour several pounds of bear's flesh and empty a tin of condensed milk, which, however, did not prevent them from barking impudently the next morning for more.

12. The 12th of April was the last day of advance in a northerly direction. Though the weather was not clear, yet it was clearer than it had been for some time. When we started we buried our baggage in the fissure of the glacier where we had slept, in order to protect it from bears, which roamed about on all sides. Our march lay over snowy slopes to the summits of the coast range—from 1,000 to 3,000 feet high. The masses of mist lying on the horizon had retreated before the rays of the morning sun, and all the region with its lines of ice-forms was bathed in light; and southward, open water stretched to the shores of Cape Felder. As we followed this lofty coast range, mountains with glaciers sloping down their sides towards the sea seemed to rise before us. An hour before noon we reached a rocky promontory 1,200 feet high, afterwards called Cape Germania. Here we rested, and from a meridian observation we found our latitude to be $81^{\circ} 57'$. Following the coast as it trended towards the north-east, we came on a glacier with a steep inclination and frequent crevasses, which compelled us to leave the sledge behind before we attempted to cross it. But the increasing insecurity of our track over fissures, our want of provisions, and the certainty that since noon we had reached $82^{\circ} 5' N. L.$ by a march of five hours, at last brought our advance northward to a close. With a boat we might certainly have gone some miles further.

13. We now stood on a promontory about 1,000 feet high, which I named Cape Fligely, as a small mark of



THE AUSTRIAN FLAG PLANTED AT CAPE FLIGELY.

respect and gratitude towards a man of great distinction in geographical science. Rudolf's Land still stretched in a north-easterly direction towards a cape—Cape Sherard Osborne—though it was impossible to determine its further course and connection. The view we had from this height was of great importance in relation to the question of an open Polar sea. Open water there was of considerable extent and in very high latitudes: of this there could be no question. But what was its character? From the height on which we stood we could survey its extent. Our expectations had not been sanguine, but moderate though they were, they proved to be exaggerated. No open sea was there, but a "Polynia" surrounded by old ice, within which lay masses of younger ice. This open space of water had arisen from the action of the long prevalent E.N.E. winds. But of more immediate interest than the question of an open Polar sea was the aspect of blue mountain-ranges lying in the distant north, indicating masses of land, which Orel had partially seen the day before, and which now lay before us with their outlines more defined. These we called King Oscar Land and Petermann Land; the mountainous extremity on the west of the latter lay beyond the 83rd degree of north latitude. This promontory I have called Cape Vienna, in testimony of the interest which Austria's capital has ever shown in geographical science, and in gratitude for the sympathy with which she followed our wanderings, and finally rewarded our humble merits.

14. Proudly we planted the Austro-Hungarian flag for the first time in the high North, our conscience telling us that we had carried it as far as our resources permitted. It was no act asserting a right of possession in the name of a nation, as when Albuquerque or Van Diemen unfurled the standards of their country on foreign soil, yet we had won this cold, stiff, frozen land with no less difficulty than these discoverers had gained those paradises. It was a sore trial to feel our inability to visit the lands lying before us, but withal we were impressed with the conviction that this day was the most important of our lives, and ever since the memory of it has recurred unbidden to my recollection.

15. The Dolerite of this region was of a very coarse-

grained character, and its rocks rose in terraces from out of the white mantle of snow; *Umbilicaria arctica*, *Cetaria nivalis*, and *Rhizocarpon geographicum* were the sole ornaments of its scanty vegetation. The following document we inclosed in a bottle and deposited in a cleft of rock:—

“Some members of the Austro-Hungarian North Pole Expedition have here reached their highest point in 82°5' N. L., after a march of seventeen days from the ship, lying inclosed in ice in 79° 51' N. L. They observed open water of no great extent along the coast, bordered by ice, reaching in a north and north-westerly direction to masses of land, whose mean distance from this highest point might be from sixty to seventy miles, but whose connection it was impossible to determine. After their return to the ship, it is the intention of the whole crew to leave this land and return home. The hopeless condition of the ship and the numerous cases of sickness constrain them to this step.

“Cape Fligely, *April 12th, 1874.*

“(Signed) ANTONIO ZANINOVICH, *Seaman.*

“EDWARD OREL, *Midshipman,*

“JULIUS PAYER, *Commander.*”

CHAPTER IX.

THE RETURN TO THE SHIP.

I. THIS done, our thoughts now turned to the ship, between which and ourselves lay 160 miles. But, the *Tegetthoff*—did she lie still where we had left her, or had she drifted away? Fastened together by a rope, we began our return by re-crossing the glaciers, and on reaching the stores we had deposited at Cape Germania, the first thing we did was to prepare some water, for the beverage we had taken with us in an india-rubber bottle, made of coffee, rum, and extract of meat, had only aggravated thirst, without adding to our strength. It was late in the evening when we reached our night-encampment near Säulen Cap (Cape Columns), in a state of great exhaustion, cheered and alleviated by the thought of our success. The utter loneliness of our position could not suppress the satisfaction we felt. After digging up our still untouched stores, we went to rest for three hours. Longer we dared not sleep; the least breeze might break up the ice and drive it out of the bight on the north of Cape Auk. The insecurity of our position therefore impelled us to make a very early start on the morning of the 13th of April, with the thermometer at 12° F. As we started, we awoke also to the extreme difficulties of the return route, difficulties which the excitement of our advance had made light of. Orel, suffering from snow-blindness, marched along with closed eyes, and want of sleep now began to tell on us all. Even our dogs were all worn out, and whenever a halt was made they lay down exhausted in the snow. The sledge had constantly to be unloaded and reloaded, and its fractures repaired. The surface of the

smooth ice, encumbered by the snow-slush which had accumulated on it, rendered our progress very burdensome. The dull dreary weather, however, did not prevent the sea-birds from gathering and wheeling around us in enormous flocks. During our noon-day halt, utterly distraught, I cooked our dinner with sea-water; not one of us could touch it. Our road through wastes of snow from Cape Brorock to Cape Schrötter, seemed as if it would never end. However rapidly we advanced, constantly counting our steps as we went along,



MELTING SNOW ON CAPE GERMANIA.

that Cape remained for hours the same dark spot on the gloomy and snowy horizon. It was evening before we approached it, and as we came within 300 paces of his frontier, we were received and welcomed by ambassadors from Haller. It was curious and also characteristic to observe how a few days without active employment and without discipline had demoralised our old companions; the party we left behind were scarcely recognisable. Blackened by the oil used in cooking, wasted with diarrhœa, these men crept out of their tent listlessly to greet us on our arrival; a few more days would have sufficed to prostrate them with sickness. Yet

they had strictly followed the directions I had given them, and had used with moderation their stock of provisions. As I have already mentioned, I had furnished them, before I started on my expedition northward, with all the means of ascertaining their position by observations, and of enabling them to begin their return to the ship, in the event of my failing to appear at the end of fifteen days; but when I now asked them what direction they would have taken in order to reach the *Tegetthoff*, to my horror they pointed, not to Austria, but to Rawlinson Sound!¹

2. The observations of temperature which Haller furnished me with, scrawled in hieroglyphics on a peas-sausage case, showed a difference of about $4\frac{1}{2}^{\circ}$ in favour of the extreme north, and this difference was still more marked, when we came to compare the readings which had been recorded on board ship. The open water to the north was doubtless the cause of this. But the same influence extended southward, and as the snow-drifts over which we walked broke under us with a dull, heavy sound, we began to fear lest the season when the snow suddenly thaws and the land-ice breaks up had begun, and that our return would be a matter of extreme difficulty. If there had been nothing else, this would have sufficed to quicken our movements, but to this was added the discovery that our stock of provisions, independent of depôts, would last only ten days more. By ridding ourselves of all but absolutely necessary baggage, and leaving behind our common sleeping bag and the tent for the dogs, we lightened our sledge, so as to enable us to extend our day's march considerably.

3. On the 14th of April, the thermometer marking 4° F., we left Hohenlohe Island in very bad weather, and made for the Coburg Islands, which were scarcely visible. Our route ran between hummocks, which gave the dogs an opportunity they were not slow to use, of taking it easy after their recent exertions. It had been our intention that the large sledge should keep the same line which we had taken in our journey northward, while I with the dog-sledge should visit places to

¹ It might have been expected that seamen would have been acquainted with the use of the compass, though the instruments they had at their command were too small to determine the declination with precision.

the right and left. This plan, however, was found unfeasible; for in addition to the difficulties and impediments incident to the march, we had an accumulation of evils to contend with. Klotz's foot had become much worse, and all those who had been left behind at Cape Schrötter were more or less snow-blind, though hitherto our party had suffered little from eye diseases. It was surprising that our dogs did not suffer from this affection, close as they were to the glare of the snow and without any protection against it. Snow-blindness occurs even in Alpine regions. The severity of the attack depends on the character of the snow; the harder and smoother it is, the greater is the reflection and the danger of inflammation; the retina of the eye is at last injured by the dazzling whiteness of the snow. Various remedies have been employed to mitigate this evil; even the rough-and-ready one of throwing snuff into the eyes has been tried. In Europe, snow-blindness is cured in a day or two by wet applications, but in the low temperatures of the high North such a remedy cannot be applied; poultices are hardly possible in the tent, and a simple bandage worn during the march is no preservative against the constant burning sensations common to this affection. It is clear that the range of remedies during a sledge expedition must be very limited. The crew of Sir James Clark Ross suffered in an unusual manner from this cause in their land expeditions. Richardson and Nordenskjöld dropped a weak tincture of opium twice a day into the eye, and in about twenty-four hours the patient recovered, provided he were not compelled to march. Parry on board ship used a solution of sugar of lead and cold water, applied constantly for three or four days—a somewhat questionable remedy, as it is apt to injure the cornea of the eye. Another mode of treatment, which should take effect in six hours, is unhappily not available in a North Pole expedition, as it requires white of egg, sugar, and camphor, beaten up till it becomes frothy, and laid as a compress on the eye. Some tribes of North America use the steam of hot water, the Creek Indians a decoction from the resinous buds of the Tacamahac—an application which causes much suffering. The only real preservative is the constant use of coloured spectacles, the metal mountings of which should be covered

with wool, on account of the cold. The ordinary network at the side should be avoided, as this dims the glasses even when the cold is not considerable; whereas open spectacles are only exposed to this inconvenience at very low degrees of temperature, and can easily be cleared by the hand.

4 But to return to our journey. It was evening when the Coburg Islands ($81^{\circ} 35' N. L.$) were reached. The Dolerite rock of this small cluster of islands was of a remarkably coarse-grained crystalline texture. We had frequently come across the traces of bears and foxes during the march of this day, though we actually saw neither bear nor fox. On the



ENCAMPING ON ONE OF THE COBURG ISLANDS.

15th of April, after a severe march, we got clear of the region of ice-hummocks, and continued our southerly course with our sledge-sail before the wind. We encountered a bear this day, which, being allowed to approach within the distance of thirty paces, fell dead under our fire. In a few minutes we loaded the sledge with fresh meat, and again pursued our journey. But excessive exertion, the want of sleep, and the exclusive use of a meat diet, were meanwhile telling their tale of reduced strength, though our appetites were great almost beyond belief. The excessive consumption of animal food¹ without bread-stuff excited hunger and lowered our

¹ Franklin, speaking of his experience during his first journey, says that their diet of animal food had rather weakened than strengthened their powers. An

muscular power, while it irritated our nervous system. Our supply of bark was rapidly decreasing, and Haller, Sussich, and Lukinovich, who could not endure bear-flesh, were often attacked with giddiness during the march, and placed on "half-diet." In the following week our miseries were intensified by insufficiency of sleep; in fact, we could not spare time to sleep it out. Hence the afternoon hours of the march were especially oppressive, and though the sledge with its load was positively lighter, our strength to drag it had diminished in still greater measure. It would be a great mistake to imagine that exercise of itself, without necessary rest, increases the capacity of marching. The loss of strength is almost suddenly experienced, especially in return journeys, when the excitement of discovery has passed away, and nothing is left but the animal-like employment of dragging.

5. Our course lay under Andrée Island; we crossed over the flat ice-dome of Rainer Island, and on the west saw Back's Inlet filled with many icebergs. From this elevation we once more beheld the snowy ranges of Crown-Prince Rudolf's Land in the far distance, which soon, however, disappeared in an ocean of mist, whose white waves rolled over the intervening ice-levels. As we again descended to the icy surface of the sea, to our great astonishment we fell into a hole covered over with snow, and got thoroughly wet, and, after much wandering about, we found, towards evening, a dry place ($81^{\circ} 20' N. L.$) on which to pitch our tent. On the 16th of April we found our latitude by an observation taken at noon to be $81^{\circ} 12'$, and when we reached, in the evening, a point four miles to the north of Cape Hellwald, those whose appetite had failed them could not march a step further.

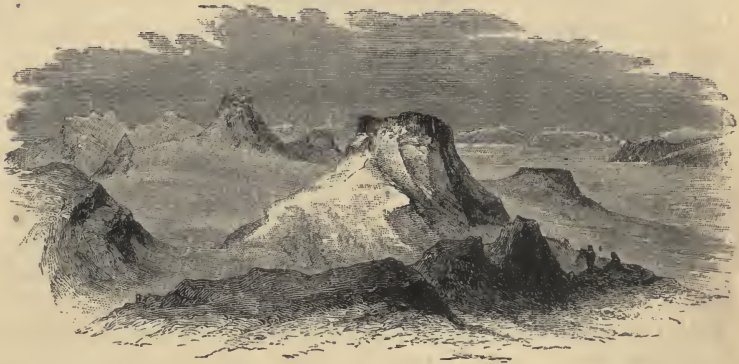
6. On the 17th of April, Orel, with the large sledge, continued the march southwards, while I went on with the dog-sledge, in order to ascend Cape Hellwald. The temperature had fallen in the morning to $-18^{\circ} F.$, and the outlines of the icebergs vibrated and undulated under the influence of refraction. Ice-hummocks, on the distant horizon, insignificant in

Eskimo, on the other hand, often consumes 20 lbs. of the flesh of a seal in a day, and seems to thrive on it—a proof how the mode of living of a savage is no rule for civilized man.

size, were magnified into gigantic proportions; then again many of these phantasmagoria seemed to form a long line, which broke up at the next step forward. Unyoking the dogs on the shore of the island, I left the sledge behind, and climbed the steep sides of a precipice of clay-slate, with its laminae firmly frozen into a mass, and reached the summit of the lofty promontory—Cape Hellwald—about 2,200 feet above the level of the sea. On the tops of its basaltic columns great flocks of divers congregated, which flew round me without fear as I set up my theodolite, and then settled close to me on the snow. I might have killed half-a-dozen of them at a single shot. By and by, these birds, scared by the appearance of the dogs, who soon joined me, took refuge on some inaccessible rocks, but were not in the least disturbed when I fired at them. My lofty point of view enabled me to have a general survey of the mountainous country lying on the north-west, and to ascertain that I stood on an island separated from lands on the west by Sternek Fiord. Meantime Orel, far below me, was moving on with the sledge, but so great is the advantage of dog-sledging, that I descended and arrived at the same time as he did at Cape Easter. By an observation taken at noon we found our latitude to be 81° . In the afternoon the dogs in their own sledge dragged half of our baggage, and notwithstanding got on more quickly than we did with the large sledge. Henceforward the order of the day was fasting, more or less absolute; for our stock of provisions consisted of bread and bear's flesh for two days and a half, and the dogs could no longer be favoured as they had been.

7. At a few miles' distance there rose before us the rocky cones of Wiener Neustadt Island, with large glaciers descending their sides. As it was beyond a doubt that the ascent of one of these conical heights would open up an extensive prospect, I fixed on the imposing Cape Tyrol as the most promising for an ascent. Accordingly, on the 18th of April Haller and I started, and after a toilsome march over glaciers, reached its dark, weather-worn summit, 3,000 feet above the level of the sea. Even here we perceived the traces of excrements of the fox, from whose craft the birds were protected by the inaccessibility of the places where they bred. Though

we had cut up some bullets into slugs, we refrained from shooting at the auks and divers perched on the rocks, as we saw that our game could not be bagged even if we killed them. Over our heads was spread the bright sky, below us a very sea of mist, in which, though invisible to us, Orel was wending his way towards the south. The distant glacier wastes of Wilczek Land towered aloft on the east; a cloudy shade separated the heights of the peninsula of La Roncière from the colourless icy wastes of Lindemann Bay, and beyond the picturesque Collinson Fiord there seemed to be a maze of inlets and bights, bare rocks and broad table-lands. We bitterly deplored that the necessity of returning to the ship



THE VIEW FROM CAPE TYROL. COLLINSON FIORD—WIENER NEUSTADT ISLAND.

prevented us from penetrating into this labyrinth of mountains and sounds.

8. In our descent we passed over three basaltic terraces, and came upon a rocky ledge covered with a thick carpet of *Usnea melaxantha*—a fresh example of the great capability of lichens to bear extremes of temperature, the great cold of winter and the burning heat of the rock in summer. The mists now began to rise, and for the first time a greenish landscape without snow gleamed out of the depth, on which lay the warm glow of the sun. The scenery seemed to belong to the Alps, and not the 81st degree of North Latitude. The contrast became the more striking, when the mists rolled away and unveiled the icebergs and the ice-filled sound. When we reached these green mountain slopes we found ourselves

among grasses, the lower stalks of which were already beginning to be green; the few flowering plants (*Saxifraga oppositifolia*, *Silene acaulis*, *Papaver nudicale*) were clustered together in dense masses. We were now able to form some conception of what summer might be here. Countless streams issuing from the snow would force these spots to put on the livery of summer, and rapid torrents would precipitate themselves down gorges of snow and rock; but at present all was stiff and stark, save that stunted green herbage seemed to show that we were in the fancied paradise of Franz-Josef Land, though when compared even with other Arctic lands it was but a scene of desolation. Closer to the shore above the level of the sea, in a belt of yellow sandstone, we found much lignite firmly frozen in the ground, resembling drift-wood a century old.

9. The search for our companions was for some time fruitless; and a driving snow might have separated us from them for ever. At last, however, we found them gathered together in the tent near Forbes' Glacier, in about $80^{\circ} 58' N.$ L., and as the party had been without tobacco for a fortnight, they greeted Haller's collection of lichens as a welcome substitute.

10. During the last few days the cold had sensibly increased, and we therefore determined to sleep during the day, and to walk during the night. Our march in the night of April 18 was a memorable one to us. We were trudging along in the face of a strong south-wester—which was extremely distressing to our highly sensitive frozen noses—and striving to protect the soles of our feet by the rapidity of our movement from being frost-bitten. After succeeding to a certain extent in this, we began to find the snow very deep, and so soft that we sank in at every step. This grew worse and worse; water rose in the deeper layers of snow and penetrated our boots, and as this could not be explained by the state of the temperature, we had to step with distrust and hesitation, in constant fear of unseen depths. At first we believed that the water arose from streams flowing from underneath the glaciers, or from the movement of these glaciers breaking up the surface of the ice. Hence we kept at a distance from their terminal walls. But that the ice-sheet of the sea itself had broken up, that unseen fissures surrounded us, and that the

water under the snow was nothing but the water of the sea forcing its way in—of this we had not the least conception, till the sudden immersion of the leader of the party left no doubt about the matter. Once Haller would have utterly disappeared unless he had been quickly rescued. As we picked our way along, even with a long pole we found every now and then no bottom. Klotz now took the lead with a long "alpenstock," guiding us with the greatest dexterity among these fissures, though often himself falling in. Greatly did we rejoice when we reached unbroken footing. Some of the party on this occasion were frost-bitten in the feet, but we



BREAKING IN.

could do little more for them than rub their feet with snow and improve as we could their foot-covering. The sun was now visible at midnight, and the mountains of Markham Sound were tinged with rosy light.

II. Ahead of us in the south lay a dark water-sky, while the land on either side was veiled in mist and fog. We tried to persuade ourselves that this phenomenon might be explained otherwise than by open water. Soon, however, we heard the unambiguous sound of ice-pressure and of the beating of the surf at no great distance, and when we went to

rest, in $80^{\circ} 36'$ N. L., it was with the feeling that we needed new strength to meet the dangers which unquestionably awaited us. We slept soundly for some hours in spite of all our anxious fears, till we were aroused by the increasing noise. We now advanced along the old sledge-track upon which we had fallen. Orel and I went first, and after we had gone a few hundred paces the truth burst upon us: we saw the sea ahead of us and no white edge beyond. Walls of forced-up ice surrounded this water, which, stirred by a heavy wind, threw up crested waves; the spray of its surf dashed itself for a distance of thirty yards over the icy shore. Forthwith ascending an iceberg, we looked over the dark waste of water, in which the icebergs, under which we had passed a month before, were now floating; the more distant of them stood out against the arch of light on the horizon, and those nearer to us shone with a dazzling brilliancy under the dark water-sky. That on which lay our depôt of provisions was floating in the midst of them; and here we were, without a boat, almost without provisions, and fifty-five miles distant from the ship! A strong current was running southwards at the rate of three or four miles an hour; fragments of ice were driving before the wind, as if they meant to delight us by their movements, and as if there were no change for the worse to a handful of men, who stood in reality before an impassable abyss.

12. But what were we to do; what direction were we to follow? If we killed and ate our dogs and broke up our sledge to find wood to melt the snow, we might live for eight days longer. In this case we must ourselves carry our baggage. But the most important question was, Whither? In what direction did the ice lie still unbroken? Did the land on the west afford a connected route to the ship? Did the sea before us communicate further south with the sea where the *Tegetthoff* lay? There was but one alternative—escape by land and over land; and because open water could be traced to the north-west beyond the bare reefs of the Hayes Islands, and heavy clouds over Markham Sound seemed to indicate that the ice had broken up in it also, I decided to try the way over the glaciers of Wilczek Land. Everything depended on the unbroken state of the ice in the southern parts of Austria Sound. Dejected as I was, I finished my sketch of this dreadful



ARRIVAL BEFORE THE OPEN SEA

scene, while Orel went back to caution the men against venturing on the young ice and to tell them to keep to the old ice under the land. While the men were struggling with the great sledge in the snow, I descended from my higher point of view, and, soaked through by the surf, went along the ice-strand in a south-easterly direction towards Wilczek Land. The others followed, and though we came on many fissures merely covered with snow, we yet reached *terra firma* in safety, Orel skilfully guiding the movements of the sledge according to the signs agreed on.



DRAGGING THE SLEDGE UNDER THE GLACIERS OF WILCZEK LAND.

13. But soon afterwards everything was veiled in mist; the temperature rose to 7° F., then came driving snow, which gradually increased to a snow-storm, and in order not to be cut off we were obliged once more to keep together. Dreadful as the weather was, we could not venture to put up the tent; march we must, in order to escape before the wind destroyed the ice-bridges on the way back. We trudged along under enormous glacier walls, enveloped in whirling snow. Sounding all round, we escaped the abysses with difficulty. We could scarcely even breathe and make head against the wind. Our clothes were covered with snow, our faces were

crusted with ice, eyes and mouth were firmly closed, and the dark sea beneath us was hidden from our view. We ceased to hear even its roar, the might of the storm drowning everything else. Haller, a few paces ahead, continually sounded, so as to keep us clear of fissures. We could scarcely follow him or recognise his form. We saw nothing even of the enormous glacier walls under which we toiled along, except that at times we caught a glimpse of them towering aloft. At every hundred paces we halted for a few minutes to remove the ice which formed itself on our eyes and round our mouths. We stilled our hunger with the hope, that we should find and dig out the body of the bear which we had shot a month ago. But we dared not rest, nor await the abatement of the storm, until we had crossed the glacier and felt the firm ground, free from ice, beneath our feet. This we compassed after a march of seven hours. Utterly exhausted, we then put up the tent on a stony slope, got beneath it, white with snow, wet through and stiffened with ice; notwithstanding our hunger, we lay down to sleep without eating. Not a morsel of bread could we venture to serve out from the small stock of provisions that remained. Our prospects were gloomy in the extreme. If open water, or even a broad fissure at Cape Frankfort, separated us from the ship, we must inevitably perish on the shores of Wilczek Land.

14. The snow-storm still continued to rage; hunger, cold, and moisture forbade sleep, and the dogs, covered with snow, lay in front of the tent. On the 20th of April (the thermometer marking 3° F.), after a breakfast more suited for a patient under typhus fever than for men hungry as wolves, we left the tent in our still wet clothes, and while standing on its sheltered side to wait till it was cleared, our clothes froze into coats of mail. As we went on, the terrible weather blew out of us almost all that remained of our courage and resolution. It was evening before the storm abated, but we had the good fortune to find the iceberg with our last depôt in its former position close to the shore. There were the 45 lbs. of boiled beef, and there, too, the bear lying two feet deep in snow. It took us an hour to dig him out and load our sledge with this frozen mass, which we were glad to call provision. After each of us had devoured 3 lbs. of boiled beef and bear's



THE SLEDGE IN A SNOW-STORM.

flesh, on we went. To our inexpressible joy the open water had retreated to the west, and we were able to get round it by making a considerable bend. The numerous fissures which crossed our path we succeeded in evading, and by ascending icebergs were able to pick our way, till at last we arrived safely at Cape Frankfort ($80^{\circ} 20' N. L.$). At its base we found, to our great satisfaction, the land-ice running without break towards the ship. This amounted, in fact, to deliverance, and we celebrated our joy at the event by a glass of grog. The next thing to be done was to search for the depôt of provisions on Schönau Island.



DIGGING OUT THE DEPÔT.

15. On the 21st of April (the thermometer marking $-7^{\circ} F.$) Orel led with the large sledge, while I remained behind with the dog-sledge, in order, from an elevation at Cape Frankfort, to complete the measurement of certain angles indispensable for the maps I was constructing. We joined company again nearly opposite Cape Berghaus, and together crossed a broad reach covered with ice-hummocks. The weather was clear, and brilliantly-marked parhelia hung over the dark blue background of the mountains. We again came on very deep snow, and as we advanced with much difficulty and great exertion, we got rid of the bear, after we had cut off from it

every portion that could be used for food. The relief, however, was not great, and we were repeatedly compelled to halt and rest. Lukinovich and the much-enduring Zaninovich were taken with fainting-fits, the consequence of their excessive exertions. Indeed we were all more or less faint and emaciated. During one of these halts, in order to quicken their failing energies, I held forth to them on the astonishing example of MacClintock's sledge journeys. The Dalmatians freely expressed their admiration of those Englishmen, but the Tyrolese were rather slow to believe.

16. Soon after midnight on the 22nd of April (the thermometer standing at -6° F.) we reached Schönau Island, round which the ice had broken up, so that we frequently fell into the fissures. As we erected our tent, the sun was setting behind the violet-coloured edges of the ice-hummocks, while the lofty pinnacle of Cape Berghaus stood out sharply marked against the sky. The situation of the island we had reached being extremely favourable, on the highest point of it, I took some observations, which completed the surveys which I had made during this expedition. Close to the eastward of us, the ice had broken up round Hochstetter Island. Orel had meanwhile put up the tent, and Klotz had dug out the depôt of provisions, which, to our great joy, we found had not been disturbed by bears. The danger of starvation was at an end, and after satisfying the claims of hunger we enjoyed a delicious sleep of seven hours, and again set forth. We were still twenty-five miles from the ship. This distance I now determined to compass with the dog-sledge with all the speed possible, in order to ascertain whether the *Tegetthoff* remained where we left her. Orel was to follow close with the large sledge. The day was of unusual brightness. All the land, which a month ago had been the home of storms and enveloped in snow, now shone in the sunlight, and the walls of rock wore their natural brown colour. My route lay close under Koldewey and Salm Islands. At first every fragment which had fallen from a glacier on either of these islands was used as a pretext by the dogs for turning out of the course, and the trail of a bear seemed quite to distract them. It was to little purpose that I went on first to show them the way. No sooner was the least liberty allowed them, than they used it

to make now for Cape Tegetthoff, then for Cape Berghaus, and, in preference to every other point, for the sun! Ever and anon Torossy dragged Jubinal out of the road, and this unruliness lasted till we came on the old sledge track, which was almost obliterated by the snow. Suddenly they seemed to feel as if they had entered on a familiar region. With their heads raised, and tails in the air, they now rushed along at the rate of 180 paces in a minute, though I had now taken my place on the sledge. The south-west corner of Salm Island was beset by a crowd of apparently stranded icebergs.



THE MIDNIGHT SUN BETWEEN CAPE BERGHAUS AND KOLDEWEY ISLAND.

Under the sheltered side of one of these colossal masses I made a short halt, and lighted the cooking-machine to thaw some boiled beef, and enjoy a meal in common with my canine companions, who regarded all my movements with fixed attention. Just as I was intently observing a small dark point on the horizon advancing in my direction—it was Orel and his party—the iceberg, in whose stability I was placing complete confidence, suddenly capsized, and, rolling on to the ice, shivered into fragments. In an instant I was surrounded by fissures, pools of water, and rolling pieces of

ice. Seizing the cooking-machine, which I had lighted, I escaped with great difficulty. I had often observed, that icebergs were surrounded by circles of shattered surface-ice, with sea-water standing in their fissures. The overturning of icebergs, which occurs, I apprehend, more frequently than is generally imagined, easily accounts for the fact. It is therefore advisable to shun the immediate neighbourhood of an iceberg when the tent has to be erected, and to avoid using the iceberg itself as a place for a depôt of provisions.

17. When I turned into the narrow passage between Salm and Wilczek Islands, Orgel Cape, visible at a great distance,



THE "TEGETTHOFF" DESCRIBED.

was the only dark spot in the scene. At once the dogs made for it, and about midnight I arrived there. A few hundred steps further, and I should stand on the top of it, and see the ship, if ship were there. With an anxious, heavy heart, I then began the ascent. A stony plateau stretched before me. With every advancing step, made with increasing difficulty, the land gradually disappeared, and the horizon of the frozen sea expanded before me—an immeasurable white waste. No ship was to be seen—no trace of man for thousands of miles, save a cairn, with the fragments of a flag fluttering in the breeze, and a grave covered with snow-drifts. Still I climbed

on. Suddenly three slender masts emerged—I had found the ship: there she lay about three miles off, appearing on the frozen ocean no bigger than a fly. The snow-drifts and icebergs around her had hitherto concealed her from my eye. I directed my telescope towards her, and every spar and sail I saw seemed to promise a happy conclusion to our expedition. I held the heads of the dogs towards the ship, and pointed with my arm to where she lay, that they might share in my joy. We soon descended, and took our way towards her. At about a hundred yards off the watch detected us. All on board but the men who composed it were asleep, for it



KLOTZ.

was night. At first they were exceedingly alarmed to see me alone, but having calmed their apprehensions, I went down at once into the cabin to awaken the sleepers. Great was the joy caused by the account of the high latitude we had reached, and of the discoveries we had made, which I endeavoured to explain by the rough outline of a map which I sketched. In a few hours the stock of questions was answered and exhausted, and everyone now left the ship to welcome the approaching party, which was soon descried with the sledge-flag flying. Hearty and joyful were the mutual greetings; and the appetite of the emaciated adventurers occupied this night and for a week afterwards, all the attention of the rest of the crew.¹ We formed a strange group to look upon, but

¹ Our food, which we always took as hot as possible, had made our tongues and gums as hard as leather, so that we could not discriminate what we ate. Our great desire was not for flesh, but for white bread, potatoes, and milk.

Klotz carried off the palm from us all. He had never shown any weakness in counteracting the effects of weather and exposure on his motley garments. His cap, a wondrous piece of patchwork, resembled the winged helmet of a knight-errant, and of his boots nothing remained but the feet, over which hung the legs of them in shreds and tatters. Carlsen, when he saw him stepping along proudly and silently, forgot for a moment his walruses, and compared him to Saint Olaf, who could find only one horse in "Gulbrandsdalen" strong enough to carry him.

18. During our absence the greatest activity had reigned on board ship. Weyprecht and Brosch had finished their magnetical observations, and measured on the ice the base, which I have already mentioned, for the trigonometrical portion of my surveys. The crew had begun the equipment of the boats for our return to Europe, and packed up the provisions in water-tight cases. The number of the sick had diminished; the frost-bites had yielded to a persevering course of poultices and baths. The only unpropitious circumstance was the accident which had befallen Stiglich, who had shattered his right arm by accidentally discharging a rifle. Sores and wounds in Arctic regions are difficult to heal, and especially during the winter. Thanks to the care of our physician, Stiglich's severe wound healed more quickly than many a slighter injury during the cold period of the year. The sanitary condition had essentially improved, owing to the rich supplies of fresh meat afforded by the chase. Even before our arrival the ship's company had killed several bears. Scarcely a day now passed without a bear coming near the ship. On the 25th of April we shot one in the act of tearing down with his fore-paws a cask sticking in the ice, and on the following day another fell a victim to the curious attention with which he was regarding some meat packed in a tin case. Birds also, especially divers, appeared in greater numbers; the cliffs of Wilczek Island were no longer desolate as before. Hence it was that we indulged in dishes of stewed birds and roasted bear's-flesh. We had brought with us seven bears' tongues; each day brought an accession, and our culinary art exercised itself on the refined preparation of bears' tongues, which, together with the brains of this animal, were esteemed

the greatest delicacies. Weyprecht, according to agreement, had caused a boat and provisions for three months to be put on shore, intended for the use of the sledge-party in the event of the ship being driven from her moorings. As these precautionary measures could now be dispensed with, the boat and all these provisions were removed to the ship. Later experience proved that the exploring party could not have escaped in this manner, for the united strength of three-and-twenty men was required to raise and place such a boat on a sledge.

CHAPTER X.

THE THIRD SLEDGE JOURNEY.

1. THE weather during the last days of April was truly delightful; calms and bright sunshine made work and exercise in the open air exceedingly pleasant, and the temperature never fell below -2° F. But even this amount of cold was sufficient to retard the softening of the snow for some days, and favoured the carrying out of a third sledge expedition. Its intention was the exploration of the western portions of Franz-Josef Land; for the question of its extension towards Spitzbergen was scarcely less interesting than its extension towards the North. I should have liked to devote weeks to the undertaking, but our impending return left a few days only at my disposal.

2. On the 29th of April (the thermometer marking -2° F.) Lieutenant Brosch, Haller, and myself left the ship. Jubinal and Torossy were selected to drag the small sledge, which was equipped for a week's expedition; Pekel accompanied us as a volunteer. The measurement of the angles necessary to complete my survey detained us so long on the heights of Wilczek Island, that we could not make our start on the level ice till the next morning. The power of the sun some days was so great, that the temperature of the tent at noon, when there was no wind, rose to 63° F., while in the two preceding months it was from 10° F. to -13° F. If the temperature during the day did not fall more than 6° below freezing-point, we required no clothes beyond our woollen underclothing and stockings. As we started in the morning of April 30, some snow fell, and the mountains were covered with masses of mist, which lay in horizontal layers half way up their sides.

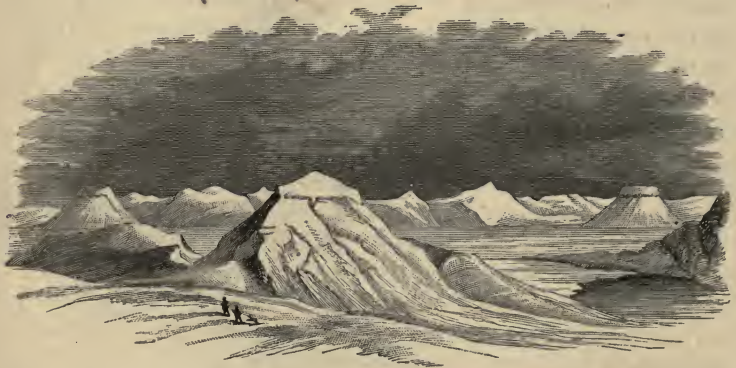
Cape Brünn, however, which was our goal, lay before us, clear and distinct, and the long glacier walls, running to the west of it round the edge of MacClintock Island, were under the constant play of refraction, and could be traced as far as Cape Oppolzer, from which point they seemed to trend to the north-west.

3. The snow-track of the Sound was still firm, so that our dogs needed little help in dragging our baggage, especially after we had buried provision for the return journey in an iceberg. We had scarcely finished this labour when we discovered a bear's hole in the layer of snow at its base, and immediately afterwards we beheld its occupant coming furiously towards us. Several hasty shots were fired at him, but the bear escaped, though evidently wounded. The nearer we approached MacClintock Island, the more frequently we found fissures in the ice running parallel to the coast and communicating with a small "ice-hole" in the south about four miles off. Trusting, however, that during the next few days these fissures would not open so much as to prevent our re-crossing them, we went on and pitched our encampment near the terminal front of one of the glaciers of the island.

4. Our dogs continued now, as before, the implacable enemies of bears. Matotschkin's sad end had not frightened them into prudence and caution, doubtless because they counted on our prowess against the common foe. To them nothing could be a more joyous spectacle than a wounded bear. If in his flight he became faint and exhausted they surrounded him, bit at his legs, and did all they could to prevent his getting away, and courage, as well as love of mischief, was visible in all their actions. Pekel, small as he was, was the leader in all attacks, and Torossy grew under his tuition to be at length a formidable assailant. So things proved now. While we were busily preparing our supper in the tent a young bear appeared on the scene; before we could stop them, out rushed the dogs on our visitor, who at first retreated, while the dogs followed hard on his heels. As it generally happened that the bear, after a time, turned on his pursuers and gave them chase, we were somewhat alarmed for the safety of the dogs, especially of Torossy, who sometimes was

so stupid as not to find his way back to the tent without guidance. Just as we expected, the bear turned and became the pursuer; Torossy taking the lead in the retreat. Our small stock of cartridges and superfluity of bears'-flesh might have induced us to gaze at him while he gazed on us, if he had only kept at a respectful distance; but he would come too near, and reluctantly we found ourselves under the necessity of killing him and depriving him of the dainty morsel of his tongue. Forster says that the flesh of the Polar bear tastes like bad beef, an opinion which we are able to endorse and confirm, as we had consumed in this expedition about four bears apiece.

5. On the 1st of May (the thermometer standing at 4° F.) we purposed to cross the Simony glacier and ascend the



MARKHAM SOUND, RICHTHOFEN PEAK FROM CAPE BRÜNN.

pyramid-like Cape Brünn, whence we might hope to see at a glance as much of the surrounding country as would have required a journey of several days on the level to discover. Unfavourable weather, however, prevented the execution of this project, and we were obliged to keep in our tent. Lieutenant Brosch, whose duties in taking magnetical observations stood in the way of his accompanying me in the previous expeditions, had now the misfortune to injure his foot; and in consequence of this accident I had to start next morning (May 2) accompanied only by Haller, to attempt the ascent. Fastened together with a rope, we passed over the Simony glacier amid heavy snow-storms from the W.N.W., and

in a zigzag course went up the steep pyramid of Cape Brünn. Never have I made a more disagreeable ascent. A steep, snowy gorge led through a crown of rocks to the summit, which we reached after a march of five hours. By an aneroid observation we found the height to be 2,500 feet.

6. If the ascent of a mountain in the face of wind and penetrating cold demands all the self-command even of men the most inured to fatigues, it required the additional stimulus afforded by the view of an unknown land to give us endurance and energy under such circumstances, to sketch, to take azimuth measurements, and estimate the distances of important localities. To add to our difficulties, the theodolite was constantly shaken by the wind, so that every angle had to be observed repeatedly, in order that an available mean value might be obtained. It was only after several hours of the most severe labour that my work was completed. My attention was directed chiefly to the southern parts of Zichy Land, which formed a vast mountainous region beyond Markham Sound. Half the horizon was bounded by cliffs and heights gleaming with snow. The conical shape of the mountains prevailed here also; the only exception was Richthofen Spitze, the loftiest summit, perhaps, we had seen in Franz-Josef Land, which rose like a slender white pyramid to the height of about 5,000 feet. The land was everywhere intersected by fiords and covered with glaciers. Its boundaries towards Spitzbergen, or Gillis' Land, could not be determined, because even at the distance of seventy or ninety German miles; mountain ranges were distinctly to be traced. It would appear, therefore, that masses of land stretch in this direction to at least the fiftieth degree, perhaps even to the forty-eighth degree, of east longitude. We also discovered, that the lands on the south of Markham Sound were separated by a fiord—Negri Sound. This was already open, and since some darker spots indicated fissures in the ice in Markham Sound, it is probable that sledge-journeys can be only undertaken early in the spring in Franz-Josef Land without the danger of being cut off. At the time when we made our observations, it was utterly impossible that such waters could be navigated by any ship, not even if she could be placed amid these small

unconnected "ice-holes." Haller, whose rheumatic tendencies unfitted him to bear wind and cold, had, meanwhile, posted himself in a cleft of rock sheltered from the wind beneath the summit, but I was quite satisfied with his running to my help, in order to rub my frozen hands with snow, when I was forced to drop the book in which I recorded my labours.

7. But however great our delight at the discovery of these unknown lands—trophies of our endurance—we were much discouraged by the view towards the south. An enormous surface of ice extended before us—a sad outlook, as we thought of our return homeward. Although one single serpentine thread of water, gleaming in the sun, stretched towards the south-east, separating the land-ice from the field-ice, yet it was but too certain that the next breeze from the south would again close it. All save this was a close sheet of ice. We spent some time in exploring the lower glacier region of the island, so that it was towards evening before we reached the tent. Much as we desired to prosecute our explorations, reflection forced us to limit them. In order to penetrate in a north-westerly direction several days would have been needed; but as it had been arranged that we must at once begin our return to Europe, we were constrained to abandon the thought of such a scheme and return at once to the ship. On the night of the 2nd of May we began our forced march of two-and-twenty hours, during which we were often bathed in perspiration, though the temperature on the 3rd of May varied between 5° F. and - 4° F. The dogs alone drew the sledge with ease, though it carried a load of 3 cwt., giving us such a striking example of what they could do, that we felt persuaded that a sledge, with a strong team of dogs, must be the best form, beyond comparison, of sledge-travelling. In the evening we reached the *Tegetthoff*, and our sledge expeditions came to a close, after we had travelled in this fashion about 450 miles.

THE "TEGETTHOFF" ABANDONED:
RETURN TO EUROPE.



CHAPTER I.

LAST DAYS ON THE "TEGETTHOFF."

1. WE could now return with honour. The observations and discoveries we had made could not be wrested from us, and our many anxieties on this ground were at an end, henceforth the greatest evil that could befall us was death on our homeward voyage. The intervening days were given up to the recruiting of our exhausted powers; Klotz called this time the "plundering of the ship." Not very much time, indeed, was left for this, but the short spell of good living, in which we all shared, transformed the ship into an abode of Epicureans. But withal we redoubled our diligence to secure the results of our toils and labours. Lieutenant Weyprecht deposited our meteorological and magnetical readings, the log-books and the ship's papers, in a chest lined with tin, and soldered it down, and a few days afterwards I made exact duplicates of the surveys, and of measurements, which I had taken. I took especial care so to prepare these, that another person might be able to construct from them a map of Franz-Josef Land, should I myself perish on the return journey. These sheets also were packed in a chest lined with tin and soldered, and along with them were placed our zoological drawings and about 200 sketches of the country, of the Arctic Sea and our adventures, the flag too of the sledge journeys, and my journals. Of the zoological collection itself, only a small selection of the specimens most easy of transport could be taken with us.

2. The time passed away with unexpected rapidity; the days had scarcely begun before they seemed to have come to an end. Everyone was busy in getting his clothes ready. In the quarters of the crew, sewing went on without intermission,

and piles of thread disappeared under their fingers, to appear again in the strangest patterns worked on the old garments. Avalanches of cast-off clothes hung over the hull of the ship. The vessel—no longer trim as before—came to wear the look befitting the catastrophe that awaited her. A great number of bears' carcasses lay on the ice,¹ for only the brain, the tongue, and the prime portions of the flesh found their way to the kitchen, the remaining parts lay about half buried under snow-drifts, given up to the dogs to tear to pieces, who now for the first time found themselves exempted from rations served out according to time and circumstances. A month later, and such a field of carnage would have become a very home of pestilence.

3. Short excursions with the dog-sledge enabled us to finish our observations on the motion of glaciers, which the great depth of the snow had hitherto made a matter of much difficulty. The last of these expeditions took place on May 15th. On the spot on which we had first set our foot, we took farewell of the grave of our departed comrade and of the Land to which we had drifted through the happy caprice of an ice-floe, and the discovery of which rendered a return without humiliation possible. But with this farewell the business of the expedition came to an end, all our thoughts were now occupied with getting back to Europe. Of the issue we dared not form the least conception; but whether it were deliverance or destruction, our lot must at any rate be decided within three months, as for this period only we could drag with us the most indispensable provisions.

4. On our equipment Lieutenant Weyprecht and I bestowed much thought and care, and our measures were carried out with the greatest exactness. All these were based on the excellent apparatus for sledging already described; the additional precautions were confined to the more convenient stowing away of the provisions, and to the diminishing, as much as possible, of the baggage. The rapid decrease of the

¹ On May 5 a bear got away from us through a bad shot, but a second was killed just as he had attacked Torossy. May 9, again, a bad shot scared away a bear; on the eleventh one was killed by Herr Orel. This bear had already received a ball in his shoulder, and a second in his head an inch and a half under the right eye.

cold and the consequent rise of the temperature, even above the freezing point, enabled us to reduce our clothing to a minimum without endangering our health; and no more comfortable sleeping-place for Arctic explorers can be conceived than the interior of a dry boat, covered in like a tent and provided with bed-quilts. There was more danger that we should suffer from heat than from cold; the apprehension of insufficient provisions was better founded.

5. Three boats were selected for the return expedition. Two of these were Norwegian whale-boats, 20 feet long, 5 feet broad, and $2\frac{1}{2}$ feet deep. Lieutenant Weyprecht, Dr. Kepes, Lusina, Orasch, Latkovich, Palmich, Vecerina and Klotz, formed the complement of the one; and Zaninovich, Haller, Lukinovich, Scarpa, Stiglich, Pospischill, Midshipman Orel and I, the complement of the other. The third and somewhat smaller boat carried Lieutenant Brosch, Captain Carlsen, Cattarinich, Lettis, Sussich, Marola and Fallesich. Each of these boats rested on a sledge, and was laden with the following articles:—

10 light oars.
 2 long steering oars.
 1 sail and mast.
 1 ice-anchor.
 2 boat-hooks.
 1 harpoon and line.
 1 fishing-line.
 1 small hatchet.
 1 ice-borer.
 1 screw-driver.
 1 caulking-iron.
 1 saw.
 6 reserve sledge screws.
 1 bag of nails.
 2 Lefauchaux rifles.
 1 Werndl rifle.
 1 case with 100 shot cartridges.
 1 case with 50 ditto.
 2 cases of 50 Lefauchaux cartridges.
 25 Werndl cartridges.
 8 sledge traces.
 6 lamps.
 6 weights for measuring provisions.
 2 pairs of reindeer shoes.
 2 oil cans.
 1 bag of nails.

20 boxes of lucifer matches.
 1 steel and tinder.
 1 compass.
 1 sextant.
 1 bundle of wicks.
 1 telescope.
 1 signal horn.
 1 50-fathom line.
 1 box of lard.
 1 pair of tin-cutters.
 1 grindstone.
 3 bungs.

Spare Clothes.

1 pair of drawers.
 1 shirt.
 1 woollen undershirt.
 1 pair of trousers.
 1 spirit measure.
 1 pair of scales.
 1 spirit can.
 1 lever.
 1 funnel.

To each boat was attached a large sledge thus laden :—

	lbs.
Pemmican—4 boxes of 50 lbs.	200
„ 1 box of 25 lbs.	25
„ 4 boxes of 5 lbs.	20
	— 245
Peasmeal—2 chests of 100 lbs. packed in tin	200
„ 1 chest of 100 lbs. packed in paper	100
	— 300
Potted Meat—1 chest of 80 lbs.	80
Boiled Beef—5 chests of 10 tins of 7½ lbs.	375
„ „ 4 „ 7½ lbs.	30
	— 405
Flour—3 boxes of 33 lbs.	99
Bread—2 bags of 83 lbs.	166
Chocolate—3 boxes of 30 lbs.	90
Spirits—3 casks, each weighing 77 lbs.	231
Salt—1 box of 12 lbs.	12
Extract of Meat—2 boxes of 5 lbs.	10
Tea—1 box of 3 lbs.	3
	— 1641
Total	<u>1641</u>

To this must be added 100 lbs. of bread for the dogs, and a shovel and a complete cooking apparatus for each sledge. Our load therefore amounted in provisions alone to about 50 cwt., and including everything, to about 90 cwt. Parry, with twenty-eight men, in 1827 had for his journey of sixty-one days two boats and four sledges, carrying a total weight of 75 cwt.—about 2½ cwt. therefore for each man. Notwithstanding great obstacles from the ice, his expedition was, perhaps, more favoured than ours, for he passed over 1½ degrees of latitude in thirty days.

6. Of our dogs, two only, Jubinal and Torossy, were available to drag the small sledge; 1 cwt. of bread was all we could take for them, and for the rest they had to depend on the product of the chase. Gillis was shot on account of his intractability, and Semlja because of her weakness. Only Pekel was allowed to accompany us; he only of the dogs had the right of going about at liberty; yet his life too was safe as long as our provisions lasted.

7. Our stock of clothes consisted of two woollen shirts, one pair of woollen drawers, three pairs of stockings, leather

water-boots, a cap, and of a fur-coat to sleep in. Clean woollen under-garments were much in request, and many a manœuvre was practised to get possession of them. Each of the party carried besides a large knife, a spoon, and a pair of snow-spectacles. Of luxuries none were permitted to us but a tobacco-pouch to each man ; but filled with such art that it was like a stone in weight. We were not allowed to line our coats with tobacco.

8. Our plan was simple—to reach the depôt of provisions on the Barentz Islands, which lay in an almost directly southerly direction. After replenishing our stores there, we proposed to follow the coast of Novaya Zemlya with the hope of reaching one of those ships which the salmon fishery in the rivers of that country detains there to the beginning of harvest. It was also not impossible that we might be discovered before this, on the more northern coast of Novaya Zemlya, by a Norwegian seal-hunter. The boats were to keep together if possible ; but in case they should be separated, the Wilhelm Islands were fixed on as the place of rendezvous up to the middle of August. At first, night was chosen for the march, and day was devoted to sleep ; the observance, however, of this regulation was constantly prevented by special circumstances. The success of the expedition depended on our crossing the ice-covered sea by the end of August. The greatest difficulties were to be apprehended from the melting of the snow, for although the thermometer at the beginning of May fell 14° and even 17° below zero, and sharp north-east winds somewhat retarded the thaw, the mean temperature during the day approximated to zero, and on May 16 it actually rose above it. Two of our men, Stiglich and Vecerina, were unfit for duty, and had often to be dragged in the sledge. The rest of the men were healthy, and the swelling of the feet, from which the sledge-party had suffered, had disappeared.

CHAPTER II.

ON THE FROZEN SEA.

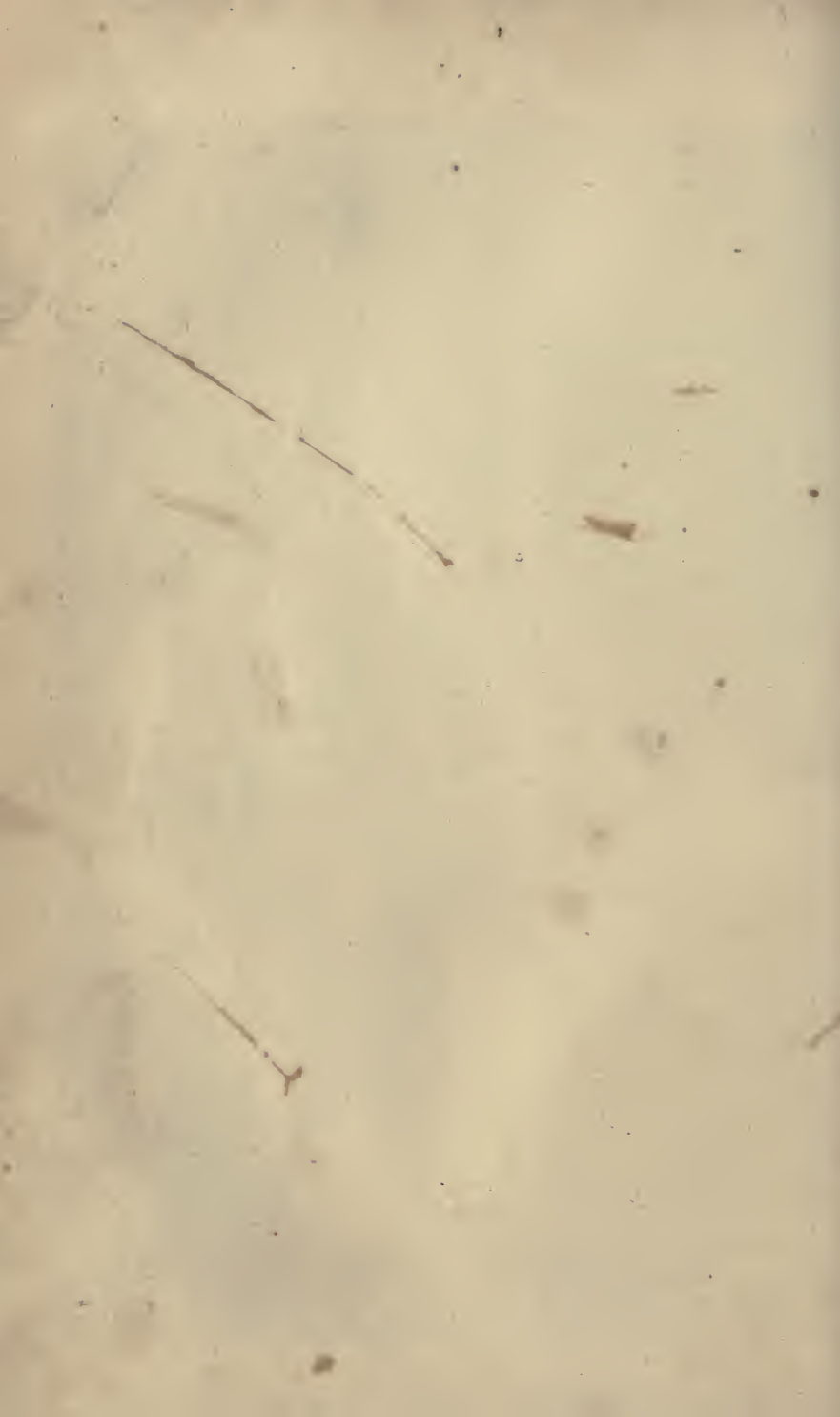
1. THE momentous day came at last—the 20th of May, the very day in 1855 on which Kane abandoned his ship;¹ and we hailed with joy the advent of the hour which was to terminate our life of inaction. Yet we could not see without emotion the flags nailed to the masts of the *Tegetthoff*, and the final preparations to leave the ship, which had been our home for two weary years, and in which we had confronted the perils of the frozen sea, its ice-pressures, its storms, and its cold. These recollections crowded upon us as the moment came to abandon her. Now too we had to part with our Zoological, Botanical, and Geological collections, the result of so much labour; the ample collection of instruments, the books which had helped us over many a weary hour, and the sixty-seven bear-skins which we had so carefully prepared—all these had also to be abandoned. The photographs of friends and acquaintances we hung on the rocky walls ashore, preferring to leave them there rather than in the ship, which must some time or other be driven ashore and go to pieces. A document stating the grounds of our decision was laid on the table of the mess-room.

2. We slept during this day, and in the evening sat down to the last meal we were to enjoy on board the ship. About nine o'clock, P.M., we assembled round the boats, ready for the start. Dark masses of clouds obscured the sun, and our route southwards led us into the gloomy monotonous region

¹ With three boats, two of which were whale-boats, each 26 feet long and 7 feet broad. His crew wore Eskimo clothing, and, strange to say, some of them had gutta-percha masks. Parry's towards the North Pole in 1827, Kane's in 1855, and our own, have much in common: but the greatest difficulties were on our side.



THE FIRST ABANDONMENT OF THE "TEGETTHOFF."



of ice-hummocks covered with snow—our world for the next three months. The first day's work for twenty-three men, harnessed to boat or sledge, was the advance of one mile; and even this rate of progress, small as it was, was not constant. Many days it did not amount to half a mile; the sledge-sail was of little avail, for the deep snow retarded our progress; the sledges sank deep into it, those on which the boats were placed actually sticking fast. We had to pass three times heavily laden, and twice empty, over every bit of the road, and half our number were scarcely able to move a sledge or a boat. Such labours and exertions in deep snow were truly distracting. Almost at every step we sank knee-deep. Sometimes some unhappy fellows went in deeper still; of Scarpa, it was asserted that scarcely anything but his head was visible while he dragged. Constantly we had either to unload the sledge, or, harnessing ourselves all together for a moment, drag it out of the deep snow-drift. For one-half of the march we might get on without special impediment, the other half was spent in vain efforts to push the load on, amid "Aussingen,"¹ to time the strong pull and the pull all together. The perspiration often streamed down our faces, for the sky was overcast, and the air exceedingly sultry. After the exertion of some days, raw wounds appeared on the shoulders of several. After a bit of our track had been passed over three times in the way described, it was like a path in the snow hollowed out by the shovel, so that we had spent our strength in levelling it, but hardly in satisfactory progress. To add to our trials, we suffered intensely from thirst, and those among us who were unaccustomed to the fatigues of sledge-travelling, sank down in the snow at every halt and greedily ate of it. If such were to be the course of our journey, would escape be possible? Not a man among us imagined that we could be saved, except by some extraordinary and happy turn of fortune, small signs of which were at present to be seen. To escape from this depressing fear, we deliberately avoided every allusion to the future.

3. The dogs, under the superintendence of Carlsen, took their part in the transport of the baggage, but showed them-

¹ "Aussingen" is a sailor's word for a particular rhythm to which they pull in time.

selves very lazy and intractable under his management, and seemed to take a pleasure in plunging their loaded sledge deep into the snow, out of which it was beyond the old man's power to free them without help. Nor was their own strength equal to going over the track twice at least, even with only one cwt. each time. If, therefore, their services were to be turned to account, they must be led by some one whom they obeyed, who could help them by shoving or dragging, who could set up the sledge when it overturned, and was strong enough to keep constantly lifting the heavy bags, and who could pass over the same piece of road four or five times, if necessary. This duty was taken in turn by Haller and myself, and we succeeded in transporting in this way daily all the bread and the spirits, weighing together from 8 to 10 cwt., and, in some cases, at a later period, even the entire load of a great sledge divided into parts. I mention this in order to show the great services which our dogs, though their number was small, rendered during the march.

4. In the first week after the *Tegetthoff* was abandoned, whenever Weyprecht encamped at the end of the day's march, Haller, Zaninovich and I returned in the dog-sledge to the ship in order to replenish the stores we had consumed. The distance, which we had taken a week to pass with all our baggage, was done by the help of the dogs in an hour or two. In these different visits we did our utmost to fulfil the commissions of our companions. We rummaged the hold, though in many of the cases we opened nothing was to be seen but a dressed bear-skin. In one of these trips we filled a small cask with a concentrated decoction of all the tea which was left behind, and the rum we found was used to give it the proper strength. When we returned to the boat-parties before the morning start, this still lukewarm decoction of tea and rum met with great approbation, but the greatest was reserved for the remains of the condensed milk we brought with us, not merely because it was milk, but because to us it was the only milk in the world. Round the remains of the bears we had killed we always found flocks of sea-gulls screaming and quarrelling. Sometimes too we saw bears prowling round the ship at a distance, waiting till their time for plunder came. They seemed to wait for the moment when they should be

able to take permanent possession of a fortress which had been so long hostile to their race.

5. But we had the benefit of their company through the earlier part of our journey. May 23, a bear was shot by Weyprecht, and forthwith the gulls, who always turned up whenever there was anything eatable to be got, consumed the remains with astonishing rapidity, even to the bones. On the 26th, when I was about two miles from the advanced parties, fetching something which had been left behind, I suddenly sighted a bear at about 100 paces distant, lying in the snow and apparently asleep. The dogs too got sight of him, and I had much trouble in keeping them in, till I overturned the sledge to act as a breast-work. As the bear rose and stood on his hind legs I fired, but though severely wounded, he managed to crawl away. The dogs, rushing off with the sledge behind them, assailed the wounded animal with a fury which would have been fatal to them, if the sledge had been checked by any obstacle. Torossy specially showed a complete ignorance of how matters stood, and was saved by Jubinal from the paws of his assailant. Whenever the bear came up to the sledge, Jubinal swung round with it, till I came up so close as to make sure of killing it with my last cartridge. On the 31st, Klotz shot a bear which came within ten paces of the boats; but notwithstanding this addition of fresh meat, the stores we brought in the dog-sledge from the ship maintained their charm.

6. A few days after the abandonment of the ship, dark masses of clouds, indicating open water, were seen in the south-west, which doubtless proceeded from the fissures we had observed three weeks before from Cape Brünn. There was good ground, therefore, to hope that we should get beyond the land-ice in a few days, and reach the network of ever-changing "leads." If we succeeded in this, we might then launch the boats in one of these water-ways, and following the windings of its course between the fields of ice, escape to the south with greater rapidity. Our most sanguine expectations were exceeded when, on the 28th, we reached unexpectedly a small flat island, the very existence of which was unknown to us—Lamont Island. Ascending the highest point of it, we saw an "ice-hole" stretching to the south-east,

in which was floating an enormous table-shaped iceberg. This "ice-hole" was not more than a mile from the southern extremity of the island, which was itself still surrounded by forced-up blocks of ice. A driving snow-storm detained us on the 29th on the island, and we contented ourselves with gathering pieces of drift-wood lying on the shore. On the 30th we delayed no longer in our attempt to advance to the edge of the floes and launch our boats. But our calculations were doomed to disappointment; after a toilsome search of several days to find a suitable spot from which to launch our boats, we were convinced that this was for the present impossible, because the edges of the "ice-hole" were surrounded with broad barriers of broken ice, rendering the passage of



IN THE HARBOUR OF AULIS.

the boats and sledges impossible. Weyprecht and Klotz had meanwhile started to reconnoitre, and their report on their return showed that sledging, for the present at least, was at an end. The ice-hole before us extended far eastward, and the attempt to outflank it would have led us through walls of ice piled up to the height of fifty feet. We went back, therefore, to the more level surface of ice we had left, and pitched our camp, which we called the "Harbour of Aulis;" for, like the Greeks of old, we had here to wait for more favourable winds. Winds only could open the ice before us and widen the "leads" into a navigable condition. We had never kept at any great distance from our boats while engaged in transporting their heavy loads, but henceforward we were careful

to keep close to them, as we had every reason to look for the speedy breaking up and separation of the ice. We were now in $79^{\circ} 46'$ N. L., and therefore only five miles from the ship. Cape Tegetthoff was still distinctly visible on our northern horizon.

7. The space in the boats being insufficient for the crew and all the baggage we had to take, Weyprecht determined to send back Orel and nine men to bring away the jolly-boat, which had been left behind, and I went on in the dog-sledge to help in the work of removing more stores from the ship. It took me just three hours to do the distance, which it had cost the advanced parties eight days to accomplish. The activity of the dogs received a fresh stimulus from their coming on the track of a bear running in the direction of the ship, and when we came within 1,000 yards of it, there we saw our enemy, who, however, thought it more prudent not to await our attack. On the 7th of June the equipment of the jolly-boat was completed, and we returned to our companions with a load of 3 cwt. of boiled beef, shot, and other necessaries. The old track, now well trodden down, proved a great advantage to us. If we had deviated a single step, we should at once have stuck fast, for the character of the snow had altered, and where it lay in masses it had become mere sludge. The temperature, which at the end of May had varied between 25° and 19° F., rose, on June 1, to freezing-point, and remained steady at that point for some time. Even during the weeks of midsummer the temperature rose only a few degrees above freezing-point. On the 3rd of June it rained for the first time, and gradually the weather assumed the character of fogs and driving mists so common to the Arctic Ocean. Clear days were of rare occurrence, and, occasionally only, the sun shone for a few hours. On our return to the boats we found their crews were sitting up and looking out, like young birds in a nest, to see what we had brought from the ship. Tobacco was regarded as a right royal gift, and Dr. Kepes, to whom I gave a shirt-sleeve well stuffed out with the precious weed, regarded himself as a Croesus.

8. Meantime our longings to launch grew apace; anxiously we looked for the widening of a fissure to enable us to advance southward. We attempted again and again to approach the

“ice-hole,” but always found insuperable difficulties to bar the way. The effort to get one of our boats into a dock we had hewn in the ice nearly ended in its loss, and nothing was left to us but to repeat the flank march along the fatal “ice-hole” to the “harbour of Aulis,” there to watch for the breaking-up of the ice. Throughout the day we sat penned up in the boats, worn-out with a feeling of indescribable weariness, each morning longing for the end of the day, and at every meal thinking when the next would be ready. It seemed as if the time for launching the boats would never come. When the hoarse melancholy scream of the burgomaster-gull sounded through the stillness of the night, it seemed like a demon voice from another world, proclaiming that all our efforts would avail nothing to deliver us from the icy power which held us in its grasp. A visit from a bear was a welcome change in the monotony of our life.

9. We were now in the middle of June. Winds from the south still prevailed, and we were close to the ship at the expiration of some weeks; the third part of our provisions was consumed, and of the 250 German miles between the ship and coast of Lapland we had accomplished but one mile and a quarter. If this should continue to be the rate of our progress, we had the prospect of reaching home in twenty years! Yet gloomy as things appeared, there were moments when we were tempted to think that the end of our trials had come at last. Thus, on the 17th of June, an “ice-hole” opened close to us; instantly we prepared to take advantage of it. The day was perfectly clear, and though the temperature in the shade stood at freezing-point (F.), it was to us an African heat. We threw down the walls of ice, levelled a track for the sledges, and that night we stood, with all our baggage, at the edge of the open water, and, on the morning of the 18th of June, we at last succeeded in launching our boats and putting all our baggage on board. The sledges, fastened to the boats, were towed in their wake. The dogs were put in the different boats, Jubinal alone taking kindly to his new abode, seeing doubtless that he would have to sleep no longer on snow. After drinking some tea with the last remains of our rum, we pushed off, steering towards the south, and it was a sure sign of the elevation of our spirits, that three-and-twenty tobacco-

pipes were immediately put into active operation. Our progress, however, was but small, scarcely more than one mile an hour, which was fully accounted for by the deep lading of the boats and the towing of the sledges. We might have sailed about three miles, steering in a southerly direction, when a heavy floe stopped us, and, progress for the time being impossible, we drew the boats up on the ice and went to rest. Soon after, snow began to fall, and a west wind set in, which gradually veered to the south, and the floes were again forced together, and we found all the "leads" closed up when we attempted to move on in the morning. Again we had to



WE LAUNCH AT LAST.

wait, but with this difference, that we were now at the mercy of the wind, which might drive us with the floe, on which we happened to be, wherever it pleased.

10. On the 19th of June we had to lie still in our boats, but next day we were able to push them to the edge of a fissure, into which we let them down, unlading them and lading them afresh on the opposite side; our progress during the day thus amounted to a mere change of encampment from one floe to another floe. The absence of navigable "leads" prevented our advancing further. Our position remained unaltered for the next two days, the only event

that occurred being the shooting of a seal (*Phoca Grænlandica*), which sufficed to make the soup we had for supper somewhat more palatable. He had fallen to the gun of Weyprecht, who proved to be the luckiest of us all in seal-hunting, in which only the persevering succeed. Every seal that was shot was of course a saving of the stock of our provisions, and hence the killing of these animals was a matter of extreme importance to us, and the preservation of our lives depended in a very great measure on our success.

11. Nothing can give a better idea of our life at this period than a few quotations from my journal :—

“ June 23.—Things have improved a little towards the south; in the forenoon of this day we passed over two water-holes and two floes, thus advancing about a quarter of a mile. The intervention of a third floe hindered us from penetrating into another ‘ice-hole.’ After midnight the ice again opened, and we sailed several hundred paces further.

“ June 24.—Early in the morning Orel shot a seal of unusual size. We dragged on for half a mile over a large field of ice to its southern edge, but found, on our arrival there, that an accumulation of smaller floes barred our advance.

“ June 25.—We could not sail a bit further; winds from the north-east prevailed; our latitude was $79^{\circ} 16'$. After leaving the ice under the land, the depth of the snow considerably diminished, so that the sledges on which the boats were placed could be dragged on much more easily than before. There were, however, no pools of thaw-water on the ice, though we had observed such much earlier in the preceding year.

“ June 26.—Several hours occupied in passing over ice-fields and small ‘ice-holes.’ During the halt at noon a bear came within twenty paces of us, but seeing so many men in motion, ran off. The ice appeared to be last year’s ice, and was much crushed. Orel at noon took the latitude by sextant and artificial horizon, and found it $79^{\circ} 41'$ —bitter disappointment.

“ June 27.—With a fresh north-east wind we sailed to-day over a larger ‘ice-hole,’ our latitude at noon being $79^{\circ} 39'$. In the afternoon we dragged our sledges for a quarter of a mile over an ice-field, and our baggage had so diminished

that I had to drag with the dog-sledge not more than 7 cwt. In the lee of large ice-fields, which act like islands, we find sometimes somewhat more open water-ways.

"*June 28.*—Two ice-fields and two 'ice-holes' were crossed to-day. Progress, though small with the boats, would have been simply impossible with a ship, which could not, like boats, be dragged over floes. Falls of snow and gleams of sunshine alternate with each other. While the rest slept a watch was always posted outside the boat to observe the behaviour of the ice, and to give us timely notice of the approach of a bear.



MARCHING THROUGH ICE-HUMMOCKS

"*June 29.*—Two or three small 'ice-holes' and some ice-fields were crossed to-day. The last ice-field we dragged over was of considerable extent. To-day, for the first time, we made the attempt, with great success, to force the boats through narrow 'leads' by means of poles. Another seal was got. Every one of us had now learnt, by force of habit, to eat half a pound of seal blubber with our tea at noon, and to eat it with pleasure. It was some comfort to the more delicate and sensitive to be assured that it tasted like butter, and many experiments had been made on the edibility of the fins during the last few days. Kane came to consider seal-fin as a kind of salad. We cooked it in our soup, and the dogs at last went beyond us in the high estimate they placed on

this article of diet. It is worth remarking, albeit it seems to be a contradiction, that though we had all an abhorrence of fatty substances during the sledge-journeys in the coldest period of the year, we now took to them with great relish when the weather was warm. In fact we never felt better than after a noon-day meal at which we had consumed a considerable quantity of blubber. Our digestion was particularly good, and those who suffered from stomach complaints, produced by the continuous use of pease-sausage, ceased to be so affected. The real ground of this abnormal preference



HALT AT NOON.

of fatty substances was doubtless the fact that we had now abundance of drinking water, and did not suffer therefore from thirst.

“*June 30.*—A small ‘ice-hole,’ and then a large ice-field were crossed, and as we were in the act of passing over a ‘lead’ filled with broken ice, it suddenly closed, and we had to draw our boats up again, and to wait till the ice should part asunder. The snow has become quite soft, and we find water at the bottom of a hole, and employ it for the first time for cooking. Cape Tegetthoff and Salm Island are still visible

The dogs to-day drew 12 cwt., and are quite exhausted. I had my hair cut by Klotz, and, with many apologies for my poverty, offered him some water in compensation—an offer he declined. In the Arctic Seas, even to the doctor, a glass of water is a handsome fee.”

So it runs on for weeks together in my journal; and if it be tiresome for readers to follow such repetitions, how much more wearisome must it have been to live through and experience them! Yet if it were possible for our situation to become worse, it did so during the first half of the following month.

12. On the 1st of July the whole of our day's labour consisted in passing over a fissure. The observations taken at



CROSSING A FISSURE.

noon gave $79^{\circ} 38'$ as our latitude, so that during the last four days we had gained one single minute only. Next day we lay amid fragments of floes closely packed together, and there were neither “ice-holes” nor fields of ice over which we could pass. On the 3rd of July we crossed some fissures with great difficulty and traversed two small ice-fields, but a wind from the S.E. set in, and our observations showed $79^{\circ} 38'$ N. latitude; while we discovered from our longitude that we were only four miles to the east of the ship. The small amount of drift discernible in the ice, with such strong winds, was a sad sign of its closely packed condition.

13. With imperturbable patience we continued to drag our heavy loads over the ice, and on the 4th imagined that we

had penetrated a mile in a southerly direction ; but the wind from the S.E. blew so persistently that when we took our observations on the following day we found our latitude $79^{\circ} 40\frac{1}{2}'$, and that we had thus been actually driven back towards the north-west, and that the toils of the last three weeks had been fruitless. On the 5th and 6th the ice lay before us in piled-up masses rendering progress impossible, and we were compelled to rest, consuming our provisions without getting one step further. Our seal-hunting also on those days was seldom successful. For hours the hunters lurked round the edges of ice-holes, sometimes without seeing a single seal come to the surface ; and when at last the animal did make its appearance, it very often sunk after it was hit, before a boat could be launched. Those we saw on the edges of ice-holes showed a dexterity in diving out of the way of mischief which failed, as things were, to excite our admiration. The bears, even more than the seals, showed a prudence and caution which their previous behaviour had not led us to expect. On the first of those days a bear came pretty near us, but the dogs, alas ! rushed at him and drove him away. Henceforward when the dogs were not dragging they were secured with ropes, but our prudence came too late.

14. On the 7th there was no change. The day passed away in moving from one floe with rotten edges to another somewhat more firm. We only shoved our boats a few hundred yards through the lakes of thaw water which had formed themselves on the ice. Our latitude was $79^{\circ} 43'$.

15. On the 8th we got away in a narrow "lead" a few hundred paces southward, but after getting so far we were stopped by thickly-packed ice, and again we had to draw our boats out of the water and recommence our life of painful expectancy—watching for the ice to open. No one of the party suffered so much from this depressing state of things as Carlsen. For more than twenty years the old and tried "ice-master" had lived amid floes and ice-blinks, manfully and successfully fighting against the hardships of the Arctic Seas, and now that frailties had increased on him, he saw himself compelled to such toils and privations as would have taxed his strength even in his prime. The old polar navigator bore his burthens without murmur or complaint,

though it was painful to others to see the signs of exhaustion in his appearance. He no longer spoke of the polar bears and walruses, which he had entranced by a glance of his eye or bewitched with one of his words of magic. Even the puritanical zeal with which he once rebuked and lectured the Slavonians for playing cards on "God's holy day" had grown somewhat cold, and his fears lest the conversations of the lively Southerners should end in blows became even more intense.

16. It was a strange life this abode for weeks of summer in



CARLSEN.

boats covered over with a low tent roof. Oars by way of furniture, and three pairs of stockings for each man's mattress and pillow. My journal describes these days: "Four boats are lying on the ice, crammed with sleeping men: and so great is the heat in them, that no one needs his fur coat, and snow placed in any vessel becomes water in a few hours. If Torossy has not ushered in the day by barking, the cooks do it when they bring the bowls of soup to the boats with the cry 'Quanta!' Then ensues a short scene of confusion:

spoons and tin-pots have to be searched for and found, till at length quiet is again restored, after a little ransacking, and each man has his pot full of hot soup in his hand, consisting of meal, pemmican, pease-sausage, bread-dust, boiled beef, seal, and bears' flesh ; when the soup is flavoured with seal-blubber it is called 'Gulyas.' The soup is consumed amid perfect silence—not a word is spoken ; what indeed was there to be said, which was not already known, or which had not been said a hundred times before ? Each one knows the other's history from his cradle downwards. A stillness like death reigns over all the surrounding forms of ice, and the frozen ocean stretches out beneath a vast shroud. A sunless leaden sky spreads over all, not a breath of air stirs, it is neither warm nor cold, slowly melts the snow, and this pale realm of ice forms a world of danger and difficulty, against which are matched the strength and sagacity of three-and-twenty men !

“ Again all have taken their places in the boats to bale out the thaw water, the great enemy of their health—and of their solitary pair of boots. He whose turn it is to hunt the seal squats at the edge of a floe before a fissure, which admits a few square feet of water, in which no seal will show himself, because he has scarcely room to turn in it.

“ To the others, their abode in the boats is a time of manifest weariness and ennu. Happy the man who has any tobacco, happy he who, after smoking his pipe, does not fall into a faint ; happy too the man who finds a fragment of a newspaper in some corner or other, even if there should be nothing contained in it but the money-market intelligence, or perhaps directions to be followed in the preparation of pease-sausage. Enviably is he who discovers a hole in his fur coat which he can mend ; but happiest of all are those who can sleep day and night. Of these latter some have stowed themselves away under the rowing seats, and above them reposes a second layer of sleepers, but nothing is visible of either party but the soles of their feet. No paradise of bliss ! Noon comes : a little tea is made over the train-oil fire, each gets one cup of it and a handful of hard bread-crumbs—a kind of dog's food which the impartial 'committee of provisions' measures out with Argus-eyes. The fourth part of the skin of a seal is thrown into each of the four boats, and

the blubber on it is eagerly devoured. Some, for the sake of the fins, the ribs, or the head, become guests of the dogs. Flocks of gulls settle impudently near us, screaming and fighting for every morsel they can reach. Some of us try to catch them with nets, but no sooner are the nets up than the gulls disappear.

“The formality of dinner is over, and we have come to such a pass that even the tea excites the nerves of the community, and some Troubadour will then raise his voice with a *bravura* such as might have been heard on San Marco. The end of the Franklin expedition, and the history of the two skeletons which were found in the boat, is told again for the twentieth time—a story which never fails to produce a harrowing effect, and to rouse the firm and resolute to yet greater efforts and self-command.

“The most animated conversation, however, or rather a constant chattering, is going on meantime in the soot-begrimed tent of the cook. A difference of opinion arises about the precise time when the kettle was to be scraped out, or about the curtailing of the allowance in the last distribution of salt, or as to the delinquent who made a wood-fire on a cask of spirit, or who, instead of untying, cut the string of the sledge packing; many flourishes of speech are bandied to and fro, which at any rate speak well for the oratorical gifts of the disputants.

“There is still, however, one solace left us, the solace of smoking. Some indeed have already exhausted their whole stock of tobacco. He who has half a pouch of it at his disposal is the object of general respect, and the man who can invite his neighbour to a pipe of tobacco and a pot of water is considered to do an act of profuse liberality. Tobacco becomes a medium of exchange among us, and provisions are bought and paid for with it, its value rising every day. There is no difference between day and night, and Sundays are only distinguished by dressing the boats with flags.”

17. In this enforced idleness passed away the days between the 9th and 15th inst., save that on the 14th we changed our place by three hundred yards, in order to select a more convenient spot for seal-hunting and to keep up the appearance of travelling—but in truth only the appearance, for in reality

our situation had become truly dreadful. There were no events of sudden occurrence either to excite or alarm us, but time flowed on, and our constantly diminishing stock of provisions, like the steady movement of the hands of a clock, spoke with a plainness of speech, that could not be resisted, of the doom impending over us. Hitherto we had patiently endured the severe labours of dragging our heavily-laden boats and sledges from floe to floe, of launching the boats in the small fissures, and again drawing them on to the floes, when the ice became closely packed, often too carrying all the provisions and baggage as we slowly crept along. The least progress was sufficient to fill us with joy and thankfulness. Meanwhile the ice on all sides lay closely packed, and many times we had to wait for a week in our boats on a floe, till the "leads" were pleased to open, while every empty tin case proclaimed, with fearful distinctness, the diminishing of our provisions and the gloominess of our prospects; and now a steady wind from the south destroyed the little progress we had made. *After the lapse of two months of indescribable efforts, the distance between us and the ship was not more than nine English miles!* The heights of Wilczek Island were still distinctly visible, and its lines of rocks shone with mocking brilliance in the ever-growing day-light. All things seemed to say that after a long struggle with the supremacy of the ice there remained for us but a despairing return to the ship and a third winter there, stript of every hope, and the Frozen Ocean for our grave!

18. Such reflections and prospects were not calculated to raise our spirits or promote calm and deliberate thought, and it was happy for us that the earth was round, and that we were thus prevented from seeing how much ice lay between us and the open sea. No measures were left untried which promised to facilitate our progress or prolong our lives. We ceased to cook with oil, and used spirit instead, in order to lighten the boats. The rations of bread were diminished; even our faithful companion little Pekel fell a victim to necessity. Seals played a greater part still in our *cuisine*, and everything seemed to depend on the successful use of the four hundred ball-cartridges which still remained in store. On the 15th of July a walrus

showed himself close to the boats, but when we made a rush upon him to finish him he disappeared under the waters, and heavy rain drove us back again into the boats. Up to this time all signs of a happy termination of our venture seemed to have disappeared; but the hour of our liberation and escape was nearer than we thought.

19. On the evening of the 15th of July, after finishing our supper, a line of small "leads" running to the south-west opened itself, and we forced our way for about a mile against wind and current coming from the same direction. Next day, July 16, the wind blew from the north-west, and after our boats had been nearly crushed by the ice closing in some smaller "ice-holes," we ran into a broader and longer "lead." At noon of this day our latitude was $79^{\circ} 39'$, and we had gone so far that the highest points of Cape Tegetthoff and Wilczek Island were barely discernible—blue shadows surrounded by an edge of yellow vapour, and over the whole a heavy water sky.

20. Up to this date we had been compelled to cross every fissure, a procedure as exhausting for us as it was detrimental to the boats. The least impediment, such as the stoppage of a "lead" by some pieces of ice, had sufficed to cause us hours of laborious efforts. The ice lay thick and close, and its floes were firmly frozen together. But now it was not only somewhat opened, but seldom cemented by frost, and the efforts of fifteen or twenty men generally sufficed to shove apart any two floes with long poles, or remove any barrier which closed a "lead." If the "leads" closed in so that there was danger lest the boats should be crushed, the crew jumped out and hauled them up on the ice.

The accompanying sketch exhibits one of the scenes that occurred almost daily—the pushing the floes asunder with long poles, in order that the boat might pass between them, while the rotatory motion of the floe closes the fissure in the foreground, so that another boat has to be drawn on the ice as quickly as possible. The baggage of the boat is represented partly as packed on a sledge, or partly lying on the snow, and the men and dogs stand ready to drag it over the floe to the next place of launching. Two other boats, which have found the "lead" open, are on before, and one of them



SCENE ON THE ICE.

is lying at an ice-field which has to be crossed, waiting for the others to come up.

21. It sometimes happened that we could not push the floes asunder, and we were then compelled to cross them; and in those cases where the floes were a mile or more in diameter, our progress took the form of sledging. The provision was sent on for some distance to the nearest water, and the boats, which remained behind under the care of the less able-bodied of our party, were lifted on to the sledge when it returned by the rest of the crew, and firmly secured. The smallest of our boats was shoved through the snow while the dogs with their sledge transported the bags of bread and the spirit.

22. An advance of four miles a day now sufficed to satisfy us, and we had acquired such precision in our arrangements before starting that three hours sufficed to accomplish them. If the sledges came on obstacles from the ice, the pioneers hurried on with picks and shovels to remove them. Lakes on the ice were made little of; we waded through them with much equanimity, and any one who fell into a "lead" while the day's labour was going on seemed to take the accident very coolly. On the 17th of July we had passed, in the way I have described, three ice-fields and three small "ice-holes;" but on the following day we made very little progress, because a wind, setting in from the west, packed the ice closely. We were therefore overjoyed to find our latitude to-day $79^{\circ} 22'$, a result which could only be ascribed to the late north winds; but we could not quiet our fears, lest a wind from the south should deprive us of our dearly-bought advance.

23. We now penetrated into a region full of icebergs, many of which were covered with earth and moraine dirt, which made them look at a distance, amid the dazzling uniformity of the ice, like rocky cliffs. In the evening a she-bear was seen close to us, which came full tilt at our dogs; at thirty paces off she was hit, but not mortally, and fell; but getting up again, ran off to an ice-hole, and remained long enough on its surface to be secured by the harpooners. She afforded us as much food as four small seals, and some of our party, with the voracity of beasts of prey, scraping the flesh off the bones for their private use, carried it about with them wrapped in their pocket-handkerchiefs, and ate about a pound of it raw

every day at noon, as long as it lasted, after merely washing the carrion in sea-water.

24. On the 19th of July we again passed over several small ice-fields, and on the 20th and 21st one several miles in diameter. We were favoured with a north-west wind, and on the 20th of July our latitude was $79^{\circ} 11'$, our longitude $61^{\circ} 3'$, and our progress was so brilliant on the 22nd ($79^{\circ} 1' L.$), that we were compelled to draw the boats twice only out of the water, and warping through narrow "leads," came again to larger "ice-holes," over which we were able to sail. Our spirits were greatly raised, and we went on full of hope that we should soon come into longer water-ways, which would exempt us from the toils of crossing floes with the sledges. On the 23rd sudden squalls from the E.N.E., accompanied with heavy showers of rain, detained us in our covered boats, and our whole business on this day was collecting the rain-water in an empty spirit-cask and drinking it as grog. On the 24th we again made good progress. The rain fell in torrents, and we were wet through and through, and at night we lay down to rest reeking. The rain continued, but good progress was made almost without interruption during the next three days. We bore all the discomforts with joy, because the rain powerfully and rapidly dissolved the ice.¹ Our clothes were constantly wet, but we eagerly snatched every gleam of sunshine to dry our stockings or our saturated boots.

25. The cooks, when they called us in the morning, now constantly drew such pictures of the day's prospects, that we might have been tempted to believe that during the night all the ice had disappeared; but this pleasing illusion was rudely dispelled whenever we stepped out of the boats into the open air. These good men, having no compass to consult, always flattered themselves with the notion that where water was to be seen, there also lay the south. But, alas! there lay the ice-hummocks, and there, too, lay the boats and sledges to be dragged as before. Klotz went a little further; it was his opinion that we ought always to take to the water without fear, even if it stretched to the north, in order, as he said, to get home round the North Pole.

26. On the 27th we had reached $78^{\circ} 48' N. L.$, but a wind

¹ It was Parry's experience also that nothing melts the ice like rain.

from the south-west set in, and after two days of constant toil, alternately launching and drawing up the boats, we found, on the 29th, that we had been driven back to $78^{\circ} 50'$ N. L. But in many cases the movement of ice is unaccountable, and on the 30th this was verified; for, notwithstanding the prevalence of the south-west wind, we had drifted to $78^{\circ} 32'$ N. L., $61^{\circ} 3'$ E. L. The weather at this time was thicker and duller than usual, and the horizon from our boats extended but a few hundred paces, so that we had considerable difficulty in choosing the most navigable "leads." The view did not extend above two miles, even when we climbed to the top of one of the hummocks, and mists generally lay on its outskirts. In clear weather we had always steered in the direction of a water-sky which promised open sea, even though we had to make *détours* to the south-west or south-east. But now such a foggy obscurity lay over every "ice-hole," however small, that the outline of its edges was hardly discernible at a few paces off, and, under these circumstances, we could only pull the boats round, till we came to the first opening in the enclosing ice.

27. Winds from the south continued during the following week, and heavy rains again fell, and we had much laborious dragging through the fog on the 31st of July and the 1st of August. Our stock of bread, which had been reduced to powder by the constant lading and unlading, was meanwhile so thoroughly soaked that on the 2nd of August we stopped for half a day on a floe ($78^{\circ} 28'$ N. L., $61^{\circ} 40'$ E. L.) to dry it in the sun, which, after a long absence, gladdened us by showing himself. We took the opportunity also to dry our clothes and our stockings. On such a day as this the scene around us entirely lost its gloomy sepulchral character; the heavens were brilliantly blue, the ice lay around us in dazzling light, and the deep ultramarine of the sea-water peeped forth from the "leads." Henceforward we had less occasion to cross large floes. Our route gradually changed its character; "leads" and "ice-holes" occurred far more frequently, and the channels between them, winding through drifting islands of ice, were sometimes three or four miles in extent. Along these we glided under sail and oars, and when we came to a temporary halt, Weyprecht, with his compass, mounted one

of the ice-hummocks to examine the water-ways and determine which we should follow. Our rate of progress was much increased, an acceleration due to the change in the ice, effected slowly but surely by sunshine and rain. The enormous masses of snow were wasting away; the thaw-water, gathering in countless streams, spread as lakes on the hollows of the floes, and oozed through fissures in the ice into the sea. The edges of the floes, undermined by the action of the waves, fell in, or were worn away by the pressure, and a single warm day or shower of rain sufficed to dissolve what remained of them. Hence, if the difficulty of drawing boats on to the ice was lessened, the danger of breaking through it in the process was greater, and we ran the risk of seeing all the cases containing our provisions sink in the sea before our eyes. As the ice-fields diminished in size and thickness, the number and breadth of the "leads" increased. The alternation of heavy south-east winds and calms helped on the destruction of the ice, and our progress was great in proportion. From the 3rd to the 7th of August each day we accomplished greater distances. The ice gradually changed from pack-ice to drift-ice, impenetrable only where it lay in thicker masses. When fogs came on, we generally decided, after wandering about for a little, to wait on or near a floe for finer weather. We no longer restricted our labours to certain times of the day. In the highest spirits, we toiled incessantly at rowing or dragging the boats, or shoving the floes asunder with our long poles.

28. On the 7th our progress might be estimated at twelve miles. It was the first day we had got on without dragging the sledges and crossing floes, and when we halted at noon amid some loose ice, we saw, to the south, a fluctuation in the sea level, and the ice alternately rising and falling. "The swell of the ocean!" exclaimed all with joy: "we are close to the open sea"—the open sea being to us at that moment deliverance. Our amazement at finding it at such a latitude, 78° N. L., was so great that, notwithstanding that indisputable sign, we could scarcely believe our eyes, and we were filled with indescribable excitement. For a moment only that excitement was diverted to other and very different objects—two bears suddenly appeared on the scene, swimming about

100 paces from us. Two boats were at once manned, and the chase began. But the bears swam faster than the boats could be pulled by the four men in each boat; sometimes they raised themselves high out of the water as they turned to look at their pursuers. Suddenly one of them disappeared, while the other made for a floe and climbed on to it. As he stood and impudently stared at us, a shot was fired at him, and he immediately decamped, swimming with great rapidity to another distant floe. But as no trace of blood was to be seen on the ice, and our companions drinking their mid-day tea were scarcely to be distinguished, we considered it unsafe



BEARS IN THE WATER.

to pursue him further. In the evening we stopped again before a dense group of small floes, which like the rest of the ice had become rotten; the one whereon we were preparing to encamp for the night broke into several pieces just as we were raising our boat on to it. We were, however, fortunate enough to save our provisions.

29. Though we had been accustomed so long to oscillate between extremes, we now felt that the hour had come, when we might count with certainty on being liberated from the fetters of the ice, and all our hopes gained new life. Yet once more they seemed doomed to be disappointed. On the

7th, before we turned into sleep, the prevailing north wind had gathered so much ice around us that we were fairly shut in. Next day (August 8), after the efforts of many hours to force through the multitude of small floes by which we were jammed in, we discovered that we should be unable to move, unless the wind changed to the south-west. Our exertions on the 9th were equally unsuccessful. It was not dense masses of ice, under whose walls we had so often felt ourselves imprisoned, that now held us captive, but miserable flat floes. Their diameter was from fifty to sixty paces, and though they hardly appeared above water, they were not the less impenetrable hindrances. The movement in the sea, that had so elevated us, was scarcely perceptible, and our faith in the nearness of the ocean was consequently much shaken.

30. Again rain fell in abundance, and we remained in the boats waiting for the breaking-up of the ice. It was scarcely possible to go any distance from them, for the ice of the surrounding floes was so thin, that we could not venture to walk on them lest we should break through. Fissures abounded, but no seals were to be seen in them. This forced abode in our boats was almost unendurable. We could not always sleep, and only a frugal few had any tobacco left to smoke. Some of our party had for a long time smoked dry tea-leaves in the form of cigarettes, or had filled their pipes with match paper. All the tinder had been long used up in this way, and a dreadful trial it had been to the olfactory nerves of those who would not so indulge. Haller went further still, and smoked paper in the close covered boat! besides many leaves of his note-books, he still had a quantity of packing-paper, but, in the interest of the community, I was compelled to interfere against its use in this fashion. He found some compensation in another occupation, which had the merit at least of being inoffensive to others—mixing together his rations of tea, salt, and bread-dust, he converted the mixture into a soup. These days seemed as though they would never end; there was a continual taking off and pulling on of boots; some sat in the boats gaping about vacantly in all directions; some standing on the ice gaped as vacantly; all mental activity was concentrated in two wishes, that the ice would break up, and that the time for the next meal would

come round. No one had any private reserve of provision. The days were gone when a stocking filled with bread might be seen hanging from the belt of one, or the ribs of a bear in the hand of another. And yet amidst all the hunger, which we felt the more acutely from our abundant leisure, some among us had actually become as plump as quails, and if we had been found dead on the floes, it would have been thought, that we had died in consequence of over-eating, so stout had most of us become. But dreadful was the solemn lapse of time. August was well advanced; the knowledge that we had provisions for only one month more, and the shortness of the season for action that still remained, failed not to impress upon us all that the crisis of our fate was at hand. For three weeks past the formation of young ice had begun, both on the ice and on the sweet-water lakes on the floes. Even during these summer months, the temperature in the night had frequently fallen two or three degrees below freezing-point, and the cold now began to join the fragments of old floes into formidable obstacles. The caprice of a wind might again carry us off towards the north, as it had done two years ago, but carry us too, to certain inevitable destruction. On the 9th of August we found our latitude $78^{\circ} 9'$ —a higher degree than we had expected. But what would a lower degree have availed us, had not the open sea been near us—the open sea, on which hung all our hopes, ever since the word had been uttered? The joy of that day's discovery was fed and sustained by the low murmur of a distant surf, which either imagination or our senses, rendered acute by the presence of danger, continued to hear in the south.

31. Thus passed the days from the 10th to the 13th of August, the calking of our boats forming our only distraction. Eagerly and earnestly we gazed on the water-sky in the south and on every change in the ice.¹ On the 10th our latitude was $78^{\circ} 6'$ and our longitude $60^{\circ} 45'$, E.; on the 13th our latitude was $77^{\circ} 58'$, and our longitude $61^{\circ} 10'$ E. On the 12th the ice had become somewhat looser. We advanced a mile to the south, but were then again beset. It rained during the whole day, and in the night, the temperature fell several degrees below freez-

¹ The wind maintained its westerly character, and we drifted, as we had so often before, to the *right* of its direction.

ing-point. Ice an inch thick was formed on the 13th over the surface of the fresh-water lakes, and when we went, either to drink from them or to perform our toilet, we had to break through a coating of ice. All these were so many signs that Summer had bid us adieu and that the short Autumn of the north had begun. This day, too, we had the first impression of the returning cold.

32. At last during the night of the 14th, the ice somewhat opened and we could go on our way. Just before we started, in the early morning, a seal was shot which the dogs had



CALKING THE BOATS.

discovered and attacked: it was the eighteenth and last we shot since we abandoned the ship. With much labour in shoving we forced a passage through a long succession of "leads" and halted for a short rest at midnight in front of a larger "ice-hole," to refresh our strength with some pieces of blubber, seasoned with alcohol and thaw-water. Drift ice lay all round us, and we had the presentiment, that the hour at last had come which was to set us free from the ice. All things rise in our estimation, when we are about to bid them farewell, and it was with some pain that we felt all at once, that in a few minutes we should bid adieu to the realm of ice, which lay behind us in all its magical grandeur. We now

moved on under sail: the "ice-holes" increased in size, the ice diminished, and the swell of the ocean was perceptibly greater. Our latitude at noon next day was $77^{\circ} 49'$. A large "ice-hole" opened before us, and with a sea running high, the boats, making a good deal of water, we sailed into it—it was the last ice-hole. The last line of ice lay ahead of us, and beyond it the boundless open sea!

33. About six o'clock in the evening we had reached the extreme edge of the ice-barrier, and once more, but for the



FAREWELL TO THE FROZEN OCEAN.

last time, drew our boats on a floe. Again our ears heard the noise of the waves—the voice of life to us. Again we saw the white foam of the surge, and felt, as if we had awoken from a death-like slumber of years to a new existence. But if our joy at deliverance was great, not less great was our astonishment to have reached the ice-barrier in the high latitude of $77^{\circ} 40'$, and with it the hope of final escape. We went to rest for some hours, but were roused by the watch about two o'clock in the morning. The east wind had gathered some heavy masses of ice around us, which rose and fell with

the swell of the ocean, and we were already several hundred yards from the water's edge. Any delay in escaping as quickly as possible would require the labours of many days to set us free again. After much shoving with the poles, and lading and unlading, we again got beyond the line of ice. The frozen ocean lay behind us, and on our last floe we made preparations for our voyage on the open sea.

CHAPTER III.

ON THE OPEN SEA.

1. THERE lay the open Ocean before us; never were its sparkling waves beheld with more sincere joy, than by the small band of men, who, escaping from the prison house of the ice after fearful struggles, now raised their arms on high to greet its glad waters. The 15th of August was the day of our liberation—the festival of the Assumption of the Virgin—and our boats were dressed with flags in its commemoration. But it was no time for the rest and recreation of a Holy Day: graver duties pressed upon us. The boats had to be ballasted, and were with difficulty made to take on board the baggage, the water-casks, and the crews. Our four sledges, to which we owed so much of our success so far, were of course left behind. The dogs too were put on board, not, however, without much hesitation, when the contingencies of the voyage were considered.

2. With three hurrahs, we pushed off from the ice, and our voyage commenced. Its happy issue depended on the weather and on incessant rowing. If a storm should arise, the boats, laden as they were, must sink. We were soon convinced that the dogs, which suffered greatly from sea-sickness, would dangerously incommode us in the boats by destroying their trim. There was, in fact, no room for them in our overcrowded boats, nor water, nor provisions. We could not bring ourselves to abandon them, and our only form of gratitude for their services was, alas! the painful one of putting them to death. A floe, by which we passed, became the grave of these our true friends, our companions in all situations, and our helpers in all dangers! It was indeed a painful

moment, when Jubinal was taken out of the boat to meet his death. It was the loss of a true comrade, who had never departed from my side, and who had patiently borne all the labours and toils imposed on him. Poor Torossy too, born in the Arctic regions, amid the ice-pressures, was not a little lamented.

3. With boundless satisfaction, we saw the white edge of the ice gradually become a line, and at last disappear. Every one felt, that finding the ice-barrier in so high a latitude, was the crowning blessing to which we must ascribe our liberation. At the distance of a mile from the edge of the ice, the temperature of the water had risen to 30° F., and that of the air to 39° F. The sunbeams were reflected with such intensity from the smooth surface of the sea, that we felt the long unknown sensation of heat, and were obliged to cast off some of our garments.

4. We shaped our course south-by-west, towards the Barentz Islands, intending to take in supplies of provisions from the depôt formed by Count Wilczek, and then to coast along Novaya Zemlya in search of a ship engaged in the fisheries, which we hoped to find either at Admiralty Peninsula, or Matoschkin Straits, or in Dunen Bay. Norwegian vessels, engaged in the capture of the walrus, might be looked for as far south as Matoschkin Straits, and the Russian salmon-fishers still further to the south. The nearest land was fifty miles off, and everything depended on our reaching its friendly shores before the weather changed for the worse. In the event of stormy weather there would be no other alternative than to throw our provisions overboard in order to lighten the boats.

5. Putting forth all our strength, we rowed steadily for some days. Weyprecht took the lead in his boat, and the others followed him as quickly as possible. The crew of each boat was divided into two watches, who were relieved every four hours. It frequently happened that one boat fell behind the others, and was lost sight of in a fog or mist. Trumpets and horns were then sounded, till the laggard boat, by renewed efforts of her crew, came up with the others. On the 16th, a breeze from the north sprang up, and we used our sails with good effect for some hours. At last Novaya Zemlya was sighted—some silvery points above the level of the sea, which

our people took at first for the reappearance of the ice in the south ; they proved to be the snowy summits near Cape Nassau. At this headland the mountains running along the coast suddenly cease, and the land trending to the north-east, assumes the monotonous character of glaciation almost without mountains, as far as the lonely shores where three centuries ago Barentz slept his last sleep.

6. Our progress had no longer the paralysing insignificance of former days. This day at noon our latitude was $76^{\circ} 46'$, and on the 17th, the picturesque range of mountains south of Cape Nassau, rose through the morning mists close before us steeped in violet and crimson hues. A fog arising, we rowed along by compass in the midst of it, the boats seemed to float in the air amid the fog. During its continuance a current caused us to deviate so much to the south-west, that when at noon the land was again visible, we discovered that we had gone beyond the place where the depôt had been formed, and found by the chart, that we were in $75^{\circ} 40'$ lat. and 58° long. But as the loss of time, in going back a distance of a hundred miles, was out of all proportion to the amount of provisions we could have taken in our overladen boats, we determined at all risks to hold on our course.

7. Before us, in the far distance, now rose above the horizon the higher parts of Admiralty Peninsula ; to these we now steered. As we passed along we made a vain attempt to land on the north of Gwosdarew Bay. We found the shores full of cliffs, between which a heavy surf was breaking, and could thus form some notion of the perils we should have encountered, had we attempted to land on the Barentz Islands. Two years ago the edge of this coast had been covered with firm ice, and the depôt had been formed by the aid of sledges. But now not a fragment of ice was to be seen on the west coast of Novaya Zemlya, and the rocky shore could only be approached by boats.

8. The differences between the climate in the years 1872 and 1874, were also in other respects very remarkable. In 1872 the mountains of the country were mostly covered with snow, but in 1874, it lay only on the higher parts of its glaciers, and in latitude 76° N., where we had found thick ice, the temperature of the sea was 39° F., and of the air 43° F. The pheno-

mena of the climate of 1871, as we observed them in the voyage of the *Isbjörn*, were similar to those of 1874; and this peculiar mildness was experienced on the eastern coasts of Novaya Zemlya by Captain Wiggins, who when navigating the sea of Cara as far as the mouth of the Ob, was shut in there by the ice for a few weeks only.

9. The inaccessibility of most of the places on the coast had hitherto obliged us to continue our course without going on shore to rest, although our arms were stiff and swollen with our exertions in rowing. No vessels as yet had been



LANDING ON THE COAST OF NOVAYA ZEMLYA.

seen, and what we thought to be a ship turned out, when we rowed closer to it, to be only a small iceberg. There was therefore no other alternative than to coast along in a southerly direction, cutting across the bays, and keeping as near the shore as possible. On the night of the 17th we pulled over the broad Gwosdarew Bay, which was filled with countless fragments of glaciers. Some of the smallest of these we took on board our boats to replenish our fast decreasing supplies of water. Ever since our coming under the coast of Novaya Zemlya, we had entered a region where auks abounded which whizzed over our heads with small crayfish in their bills in their flight to the land, or sat so indolently on the water,

that they seemed determined not to get out of the way of the boats. Many were bagged, but we made no halt to shoot them. Twice only in the day we rested for about ten minutes to take our food. Onwards we pressed, each boat striving to get before the others. On August 17 the sun set for the first time about midnight, and in the afternoon of the 18th we landed at a spot to the south of black Cape, remarkable for the luxuriance of its vegetation. To our eyes, accustomed to the monotonous white of snow and ice, it appeared like a garden. There was nothing to remind us of a polar region either in the land, or in the temperature, or in the weather. Its broad bay, if it had been without its circle of glaciers, would have appeared like an Italian gulf. It was now ebb-tide, and wading in the water we shoved our boats, using the oars as rollers, over the muddy shore. It was the birthday of our gracious monarch, which we celebrated in the best manner we could—we dressed the boats with flags, washed ourselves in a little fresh-water lake, and flavoured our weak tea with a small quantity of alcohol.

10. This was the first land on which we had set foot for months. Completely exhausted we lay down on its damp turf and listened to the pleasant sound of the surf. Flames soon rose from the pile of drift wood we collected, while some of us ascended the neighbouring ravines, and even gathered flowers.¹ There were quantities of forget-me-nots, and of coltsfoot (*Tusselago farfara*), which was dried and smoked, and pronounced to be excellent tobacco. But our paradisiacal happiness could not be of long duration. The necessity of finding a ship as quickly as possible was urgent, and soon roused us from our deep sleep, while the thunders of the glaciers of Novaya Zemlya proclaimed to us that bad weather was not far off.

11. On the 19th, we coasted along Admiralty Peninsula; the thermometer giving 50° F. in the air, and 43° F. in the sea. Its shores rising in a succession of terraces were indisputable evidence of its gradual elevation above the sea-

¹ Baer brought home from Novaya Zemlya ninety species of Phanerogams. According to an observation of Mojssejew, June 18, 1839, the thermometer in the sun stood at 93° F., and 59° F. in the shade.

level,¹ and the flatness of the shores and the shallowness of the sea, interspersed with rocks, easily explain why they have so often been dangerous to ships approaching them in a fog. As we came further south the charts proved more trustworthy. At noon of the 20th at Cape Tischernitzky we reached latitude $74^{\circ} 21'$. We passed a number of picturesque bights on the coast, with mountains, whose tops were covered with clouds, and whose green banks extended along the shores. These are the favourite wintering spots of Russian expeditions, and in some places we saw ruined huts. On the 21st a fresh wind sprung up from the east. The sea rose, and as we sailed fast before the wind the boats took in a good deal of water, and we were thoroughly wet; the boats too got separated. We accordingly ran into the bay under "Suchoi Nos" ($73^{\circ} 47' L.$) to wait till the wind fell and the other boats should join us. The boat commanded by Lieutenant Brosch, was exposed to much danger from the lowness of its gunwale, when the sea was at all high; an addition made to it by a strip of canvas stretched round the boat proved ineffectual. We quickly dried our clothes at a fire made of drift-wood and erratics of brown coal which we found, but were much disappointed that no reindeer were to be seen, though we were surrounded by excellent feeding-grounds for these animals. The stew, which we made from the spoonwort we gathered, and some pemmican, was but a poor substitute for the venison we had hoped to enjoy. Neither were there any auks to be seen, and the divers shot under the water like stones whenever we came within distance. The other boats having joined us we again put to sea, though the weather was threatening and a high sea running. In latitude $73^{\circ} 20'$ we ran into Matoschkin Bay, hoping and expecting to find a vessel engaged in the fisheries. But no vessel was to be seen, nothing but the outlines of an Arctic mountain-land. Carlsen also, whom Weyprecht had despatched to explore the straits so full of turnings and windings, returned without the

¹ On older charts it is still separated by a sound from the mainland. The layers of drift-wood, which we found everywhere at a considerable height above the level of the sea, show beyond a doubt that the coast of Novaya Zemlya has gradually risen; but as in those latitudes this wood rots only after centuries, we have no measure to estimate the rate of this movement.

intelligence we hoped for. Before Carlsen rejoined us we ran into a cove—Altgläubigen Bucht—and erected, on a conspicuous headland, a cairn, on which we placed a signal post made of drift-wood. In this cairn we deposited a document, briefly describing the course of our expedition up to that date, in order to leave some trace of it in a region which is visited annually by ships. The discovery of this statement in the course of the next summer would prevent our countrymen at home from sending out vessels to rescue us in higher latitudes, if we meanwhile should perish.

12. The prospects of our being saved had, in fact, considerably diminished, for all our hopes had been centred in finding a vessel in Matoschkin Straits, and these, as I have just said, were doomed to be disappointed. Carlsen now returned with the information, that, in the narrow seas he had visited, he had met with nothing but a whale-boat, lying keel upwards, round which were footmarks of not very recent date. There was no doubt, therefore, that the fishing vessels had withdrawn from our high latitudes. At night a storm from the north-east roared over the cliffs surrounding the cove, and the surf breaking on the rocks reached our boats.

13. It was noon on the 23rd before we could continue our voyage. Our provisions would last for only ten days more, so that our fate must shortly be decided. Further delay was out of the question; there was but one hope for us—to press on and find a ship in Dunen-Bai (the Bay of Dunes). Should this too prove deceptive, we must then make the desperate venture of crossing the White Sea, direct to Lapland—a distance of 520 miles. To follow the vast circuit of the coast-line would have been impossible to us with our stock of provisions, and at that season of the year. The next days too plainly taught us what would have become of our small boats had we been forced to attempt that passage.

14. We now rowed and sailed alternately down the flat coasts towards “Gänseland,” amid stormy weather, during which the boats were often separated, and we almost exhausted our strength in baling out the water. We lost sight completely of Weyprecht’s boat on the open sea, and of the others under the coast. That in which Orel and I were,

appeared to have out-sailed them, and we, therefore, on the morning of the 24th drew to shore in a dark rocky cove to await the approach of our missing friends. Wet through and through we sprang into the shallow water, and by a great effort drew the boat to land. We then kindled a fire with the drift-wood we gathered, and after making and eating a kind of dumpling we sank down to sleep on the wet stones, amid the smoke from our fire, thoroughly exhausted. So passed away four hours. When we awoke we ascended a height, and as there was not a single vestige of a boat to be seen, we determined to put to sea again. Near Cape Britwin (Lat. $72^{\circ} 40'$), the wind and sea fell, and the boats again joined company. It was now deemed necessary to make an equitable division among the crews of the provisions that remained, and this being done, we took to our oars once more, and pulled into the boundless waste of waters—into the mystery that hung over our destiny.

15. But the hour of our deliverance was nearer than we thought. It was evening as we glided past the black weather-worn rocks of Cape Britwin, the ledges of which were covered with flocks of birds, revelling in the spray of the surf. Then about seven o'clock a cry of joy as from one voice arose from the boats. A fifth small boat with two men in it lay before us, apparently engaged in bird catching. They pulled towards us, not less amazed than we ourselves were, and before either party could explain itself, we turned a corner of the rock—there lay two ships.

16. It is with a certain kind of awe and reverence that a shipwrecked man approaches a ship, whose slender build is to deliver him from the capricious power of the elements. To him it is no lifeless machine, but a friend in need, yea, a higher creation than himself. Such were our feelings as we neared the two schooners which lay a few hundred yards off in a rock-encircled bay. To us at that moment these vessels were the sum total of the whole world! Dressing our boats with flags, we followed the strangers in their boat, and made fast to the schooner *Nikolai*, whose deck was in a moment crowded with bearded Russians, who stared at us with mingled feelings of wonder and sympathy, and whose captain, Feodor Voronin, stood like a patriarch among them to welcome



THE BAY OF DUNES. THE RUSSIAN SCHOONERS.

us. Ten days sooner and our poor dogs might have gambolled on the deck with us!

17. No *grandees* could have been received with more dignity than we were. At the sight of the two *Ukases*, which we had received from St. Petersburg, and which required all inhabitants of the Russian Empire to furnish us with all the help we needed, these humble seamen bared their heads and bowed themselves to the earth. We had an example before us to show how orders are obeyed by the subjects of that Empire a thousand miles from the place where they were issued. But we were received not only in this reverential manner, but were welcomed with the greatest heartiness, and the best of everything on board was spread before us—salmon, reindeer flesh, Eider-geese eggs, tea, bread, butter, brandy. The second skipper then came on board, and invited us to visit him: the first of a series of invitations. Dr. Kepes was very pressingly invited, for he had a sick man on board his vessel, and our doctor returned with an *honorarium* of tobacco in his hand. These simple Russian seamen of the Arctic seas freely produced their little stock of good things to give us pleasure, and one of them after observing me for a long time, and thinking that I did not express myself sufficiently strongly for a happy man, persuaded himself that something was the matter with me, and that I wanted something. Forthwith he went to his chest, and brought me all the white bread he had and the whole remaining stock of his tobacco. Though I did not understand a word he said, his address was full of unmistakable heartiness, and so far needed no interpreter.

18. Since we abandoned the *Tegetthoff*, we had passed ninety-six days in the open air, and, including the sledge journeys which preceded the abandonment of the ship, about five months. The impressions of a return to life were felt by us with silent yet deep thankfulness of heart, for as the poet says:—

“Das Schweigen ist ihr bester Herold.”

It gave us infinite satisfaction to gaze on things the most insignificant, and as we thought of our adventures, our discoveries, and our deliverance, many of us asked his heart

in a whisper: What will be said of this in Austria? Lusina, as the only one among us who spoke Russian, was constituted our interpreter, and through him we learnt that great events had happened during our absence: that there was general peace in Europe; that Napoleon was dead; and we learnt too that the greatest interest in our destiny had been excited in Austria; that the Russian government had issued orders to all their vessels employed in the Arctic fisheries to do their utmost to find us, and contribute to our rescue; that Count Wilczek had returned in safety—the skipper of our schooner having met him at the mouth of the Petschora, just as he was setting out for Obdorsk, and lastly, that a Norwegian fishing vessel had been beset in the ice in the autumn of 1872 at the Barentz islands—very near to where we were, and had been crushed; that four of the crew had escaped in a boat, and after the most dreadful sufferings, had travelled over land to the country of the Samoyedes in the extreme north of the Ural Mountains.

Harcroft Lib.

19. The ships we found in “Dunen Bai,”—the Bay of Dunes—came from Archangel, and were engaged in the salmon fishery, at the mouth of the Puhova River. They had taken very little, and their purpose was to remain where we found them for fourteen days’ longer, and to spend about the same number in fishing and hunting at the southern extremity of Novaya Zemlya. This programme was not exactly to our taste. To spend a month in a fishing-vessel, just as we awoke to the remembrance of all the comforts and pleasures there are in the world, to sleep in the hold where cholera lurked among bear and reindeer hides, amid heaps of salmon and reindeer flesh, among nets and oil casks—such a prospect was not to be thought of. Accordingly, we agreed with Captain Voronin, that he should leave off his fishing and take us without delay to Vardö, in Norway, that we should give him in return for his services three of our boats, two Lefaucheur rifles, and guarantee him the further compensation of 1,200 silver roubles.

20. At last we could go to sleep, the much-needed, much-desired sleep, undisturbed by the fear lest we should be starved to death at last. On that evening, when I opened my journal, I found these words: “Shall we be saved this day? shall we

be alive? Fifteenth May on board the *Tegetthoff*." I had written these words by the merest chance on the blank leaf reserved for the 24th of August, and it was singular that we should be rescued on that very day. For a long time I could not sleep amid the murmur of Russian words, which I mechanically endeavoured to imitate and to interpret as I lay amid the dead salmon, till at last I fell asleep, my last connected thought being, that I had not to row any more. Next day Voronin and his trusty harpooner, Maximin Iwanoff, insisted on Weyprecht and myself occupying their own cabin, and as we could utter no other Russian word than 'khorosho' (good), we were obliged to do as they wished. The ship was now watered, and the nets which had been stretched out were hauled on board, the crew, as they worked, singing their wild "Volklied" excellently well.

21. On the 26th we left the small quiet bay, the scene of our happy rescue, and with a favourable wind from the north, the vessel ploughed her way through the waves of the White Sea. Now began the time of letter writing; many of us, indeed, had commenced this employment even before we left the boats. On the 27th and 28th, we had stormy weather from the north-west, and the high seas we saw told us what our fate would have been had we tried to cross this sea in our small boats. On the 29th, we sighted Black Cape on the "Murmansk coast," and for two hundred miles we ran under the low, rocky coast of Lapland. We often fell in with ships sailing from or to Archangel, and in our own eyes we seemed the only barbarians amid the commerce and civilization of the world. We sent deputations to every ship that came within hailing distance to beg tobacco or sheets of writing paper, without, however, betraying our incognito. We desired to be the first to give news of ourselves by the telegraph. Contrary winds compelled our captain to tack often, and the delay seemed to our impatience purgatory itself.

22. At length on the 3rd of September—the 812th day from the day we sailed from Bremerhaven—we sighted the little seaport of Vardö. Forthwith the Austrian flag was displayed at the foretop of the *Nikolai*, while each of us, clad in his fur-coat, stood with beating hearts on deck ready to land. Soon she ran into the little harbour, and about three

o'clock in the afternoon of that same day we put our feet on Norwegian soil with the glad thought that our dangers and our toils were over at last. While Weyprecht attended to our money affairs, I hastened, amid the wondering looks of the inhabitants, to the telegraph station to despatch the news of our happy rescue and safe arrival, and as each message sped on its way, our hearts glowed with joy as we thought that in a few minutes friends and countrymen would learn the good tidings and share in our joy.

23. On the 5th the mail steamer from Vardö to Hamburg took us on board, and stopping at Tromsö, we put ashore, with many adieus, our friend and companion Captain Carlsen. He had been one of those who believed that we should return home by Behring Straits; but here he landed, a touching instance of the vanity of human hopes. Apart from his linguistic acquirements—for he had learnt to speak several languages on board the *Tegetthoff*—the hardy old Arctic voyager went ashore with three things only; his carefully preserved reindeer coat, his wig, and trusty walrus spear. But all our hearts burned to reach home—home for its own sake; for no presentiment had any of us of the honours that awaited our arrival there. The favours shown to us by our monarch, the enthusiasm which greeted the news of the discoveries we had so marvellously made, the sympathy so abundantly expressed for our sufferings, made us feel that we were rewarded far beyond our deserts, and that we had gained the highest men can gain—the recognition of their services by their fellow-countrymen.







APPENDIX.

I.

METEOROLOGICAL OBSERVATIONS.

THE meteorological observations were always taken by the officers of the watch, by Lieutenant Brosch, Midshipman Orel, the boatswain Lusina, and Captain Carlsen. Krisch, our engineer, who shared in this labour during the first winter was exempted from it in the second year, owing to his failing health. Readings of the thermometers were taken every two hours; observations to ascertain the moisture of the air were made by the psychrometer during the summer months; the direction and force of the winds, the amount of precipitation, the form and character of the clouds were carefully noted down. As their labours were zealously and conscientiously carried out for one year and a half, and chiefly in regions never before visited, the results are of peculiar importance.¹ The direction and force of the winds seemed in the first year to be nearly in equilibrium, save that in the south air-currents from the south-west generally prevailed, while in the north the prevailing air-currents were from the north-east.

Thunder-storms never occurred; even on the northern shores of Siberia they are seldom experienced. The forms of the clouds in Arctic regions have never the sharply-defined contours of those in more southerly latitudes. In summer they increase in fulness, and in winter they consist chiefly of vapours and frosty mists which throw dark inky hues over the brightness of the nights. The proverbial clearness of the heavens, of which Koldewey, Kane, Middendorf, and Wrangel speak, is found in the high north, as also in the tropics only over the greater masses of land. "The clouds," says Weyprecht, "have either the uniform dull grey aspect of elevated fog, or they assume the cirrus form, and the latter is not as with us the fleecy mass rising high above the horizon, but consists of masses of mist rising little above it, which very seldom assume the sharply-defined forms which are seen in more southern regions. Instead of clouds gloomy fogs prevail, sometimes rising high, sometimes also close to the ground as if they were nailed to it. Four-and-twenty hours of

¹ These have not as yet been published.

clear weather rarely occur in summer ; generally after shining for a few hours the sun disappears behind dense fogs. Dull and gloomy as these fogs are, they maintain the conditions which we find in the regions of ice,—they prevent the escape of the sun's heat and they act more potently on the ice than its direct rays." With respect to the winds he adds: "Until the autumn of the second year, the winds were of a very variable nature. In the neighbourhood of Novaya Zemlya we had many south-east and south-west winds ; in the spring the winds were more from the north-east. A prevailing direction of the wind was only discernible when we lay in our second winter under Franz-Josef Land. Here all snow-storms and about 50 per cent. of the winds come from east-north-east. These winds were mostly accompanied by clouds, which were dispersed only when the wind veered more to the north. The force of the wind is mitigated by the ice. Very frequently fog masses are seen driving rapidly at no very great height above the ice, while below them there is almost a calm. In the January of the two years we passed in the north, it was very interesting to observe the struggle between the cold winds from the north and the warmer winds of the south. The approach of warm winds from the south and south-west brought masses of snow, and in a short time produced a rise of temperature amounting to 67° to 79° F."

Falls of snow take place at all seasons of the year ; but as they generally occur accompanied with strong winds, it is not very easy to determine the depth of the layers. Apart from extreme cases of snow-drifts the mean depth of the snow on the ice during winter was about three feet, and it is more considerable under the land than at a distance from it. Rain falls almost exclusively only during the few months of summer, and generally in fine showers, never in the sudden torrents of southern latitudes. More rain fell with us in our second than in our first summer.

I was impossible, owing to our continual change of place, to give the barometrical means for any particular locality ; in the following table, therefore, the monthly mean only is noted. The thermometers we used were placed at the distance of five-and-twenty paces from the ship, so that they were pretty well isolated from any influence due to it, and they were raised four feet above the surface of the snow.¹

Readings of the minimum thermometer were taken at noon every day in the year, and of the black-bulb thermometer at different times of the day during the summer. The time of the day when the temperature reached its maximum was irregular during the winter ; it

¹ Thermometers should always hang freely ; when they are enclosed in cases they give false values, especially if the cases should be filled with snow. In our first winter we were obliged on account of the ice-pressures to suspend our thermometers on the ship in such cases, and there can be no doubt that their readings were too high. Sometimes, however, they were too low, when the thermometers came in contact with the snow on the ship. Scoresby, Parry, and we ourselves observed that the temperature of the snow-covering sometimes sunk in clear winter nights some degrees below the temperature of the air.

occurred about two o'clock in the afternoon when the spring was well advanced. As I have already inserted in the course of the narrative the temperatures of each day in the month, it will be enough for the purposes of a general survey to give here a summary of the mean monthly temperatures and of the maximum and minimum extremes:—

	Mean of the Barometrical Measurements.	Mean of the Monthly Temperature.	Maximum. R.	Minimum. R.
1872.				
July	—	—	—	— 2'4
August	750'99	+ 0'41	+ 6'5	— 5'6
September	748'92	— 7'34	+ 0'4	— 18'6
October	751'8	— 13'5	+ 2'0	— 26'5
November	757'27	— 19'52	— 2'3	— 28'7
December	757'11	— 23'95	— 14'9	— 28'7
1873.				
January	753'69	— 18'1	— 2'1	— 35'1
February	741'62	— 27'95	— 1'8	— 36'9
March	748'21	— 25'52	— 14'4	— 33'9
April	753'04	— 17'49	— 6'8	— 30'9
May	756'58	— 7'12	— 1'9	— 18'4
June	751'3	— 0'41	+ 8'1	— 8'6
July	750'23	+ 1'26	+ 6'4	— 1'8
August	749'33	+ 0'32	+ 4'4	— 4'6
September	747'79	— 3'32	+ 1'3	— 12'4
October	745'64	— 13'93	— 2'9	— 23'1
November	748'2	— 21'21	— 6'2	— 31'8
December	744'98	— 23'08	— 10'1	— 34
1874.				
January	732'97	— 19'6	— 1'7	— 36'7
February	744'92	— 22'83	— 1'7	— 35'5
March	742'25	— 18'46	— 1'0	— 36'9
April	751'15	— 12'32	— 2'8	— 22'8

Note.—The temperatures are given in Réaumur degrees. By adding one-fourth, the numbers given in the three last columns will be reduced to Centigrade degrees.

II.

DIRECTION AND FORCE OF THE WIND,
FROM OBSERVATIONS ON BOARD THE "TEGETTHOFF."

	Mean Direction and Force.			Mean Direction and Force.	
	Direction.	Force.		Direction.	Force.
1872.			May 31 . . .	N5°W	0·53
July 15 . . .	N53°E	1·36	June 30 . . .	S79°E	0·97
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			December 31 . .	N66°E	1·21
1873.			1874.		
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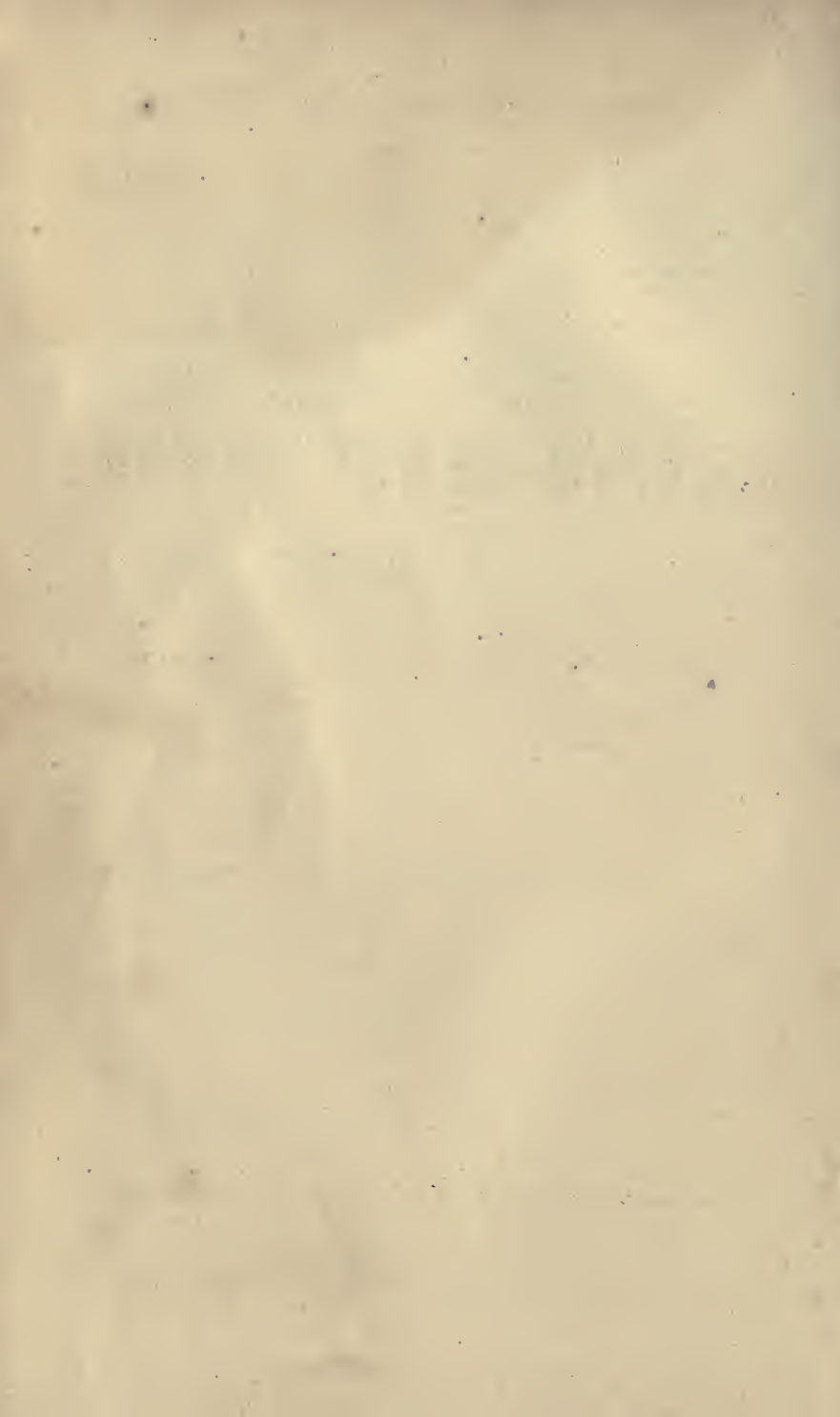
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