

DISCOVERY & EXPLORATION

Exploring the Polar Regions

REVISED EDITION



Harry S. Anderson

General Editors: John S. Bowman and Maurice Isserman



Exploring the Polar Regions

Revised Edition



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1

An Expedition Vanishes

IN FEBRUARY 1845, THE BRITISH ADMIRALTY APPOINTED SIR JOHN Franklin leader of a mission to discover and navigate the final unknown parts of the long-sought Northwest Passage. For many years, explorers had searched for a waterway through North America leading to the Pacific Ocean and the riches of China and the Orient.

Franklin was 59 years old, an advanced age for such a job. It would not be easy, but Franklin was eager to go. Solving the puzzle of the Northwest Passage would be the highlight of his career. Franklin had certainly shown, by his three earlier Arctic expeditions and his years of public service, that he was a man of great strength.

In 1819–1822, after a number of false starts, Franklin made his way from Fort Enterprise on Canada’s Great Slave Lake to the Coppermine River. From there he canoed to the mouth of that river, on the Coronation Gulf. Traveling east along Canada’s northernmost shore, he carefully explored and mapped 300 miles (482 kilometers) of coastline. He named the farthest point he reached Point Turnagain.

The return to Fort Enterprise, in the dead of winter, was one of the most horrific ordeals ever endured by Arctic explorers. Nine of the 21 expedition members died. Although the expedition had mapped several hundred miles of new territory, it had failed in its primary mission. Even so, Franklin became known in London as the man who had survived by living on stew “made from moss and leather boots.”

In 1825–1827, Franklin led his second expedition to North America. This time his mission was to continue mapping the western part

of the Northwest Passage. He managed to chart another 600 miles (965 km) of coastline, and his partner, Dr. John Richardson, mapped an additional 1,000 miles (1,609 km). After his return to England in 1827, Franklin was generally regarded as the greatest living English explorer.

THE PERFECTLY PLANNED EXPEDITION

So it was that the expedition of 1845 under the great John Franklin was expected to be completed with relative ease. Never before had an expedition been so carefully prepared. Franklin had two ships, the *Erebus* and the *Terror*. Both were true veterans of polar exploration. James Fitzjames, the young star of the Royal Navy, was captain of the *Erebus*. Francis Crozier was captain of the *Terror*. In preparation for this voyage, both ships had been modified to make sure they could survive the terrible Arctic winter. The sides were strengthened with oak planking up to eight feet thick in the bow portion. The bow was then covered with thick plates of sheet iron. These would crush any ice in the ships' way. Mas-



At the age of 59, Sir John Franklin headed an unsuccessful search for the Northwest Passage. He had led three earlier Arctic expeditions.

sive timbers inside the hull crossed from beam to beam. These would strengthen the sides and prevent huge ice sheets from crushing the ships. More powerful steam engines and propellers were installed. These allowed the ships to keep moving even when there was no wind. Even the rigging was changed to make it more manageable by fewer crewmen.

Inside, new cabins and bunk spaces were built for officers and men. Space was made for extra fuel and enough supplies to last three years. London's most famous grocers, Fortnum

and Mason, had supplied more than 65,000 pounds (29,483 kilograms) of meat pickled in salt in barrels. Another 40,000 pounds (18,143 kg) of canned meat and vegetables were packed aboard. The ships carried 10,000 pounds (4,535 kg) of lemon juice. This juice would prevent scurvy, a disease caused by a lack of vitamin C. Sugar, spirits, raisins, tea, concentrated soup, dried peas, and 100 pounds (45 kg) of mustard were only some of the other foodstuffs loaded aboard. Of course the seaman's staple, hard tack, was in great abundance. Hard tack was a hard baked biscuit of flour and water. The ships carried 68 tons (61 metric tons) of flour to make these biscuits.

The two ships were lavishly equipped in other ways. There were libraries with almost 3,000 books on every subject. There were musical instruments and costumes for the dramatic performances that would entertain the men during the long Arctic nights. A variety of scientific instruments were available to officers and men to carry out observations and conduct experiments. Many of the crew, particularly officers, took along personal items. Some had fine silver settings for formal dinners. Others had formal clothes and shiny leather dress boots. Some officers brought writing desks, walking sticks, and favorite foods.

THE FRANKLIN EXPEDITION SETS OUT

On May 19, 1845, the *Erebus* and the *Terror* weighed anchor and sailed down the Thames from London. The expedition reached Greenland. There the men loaded final supplies and met the supply ship *Baretto, Junior*. Sheep, pigs, and cattle from the *Baretto, Junior* were slaughtered and loaded aboard the *Erebus* and the *Terror*. The men would have fresh meat for the first part of the voyage. Final letters to friends and family were entrusted to the master of the *Baretto, Junior* to take back to England.

The Admiralty's orders to Franklin were to sail north in Baffin Bay, and then turn west into Lancaster Sound. This body of water was the eastern starting point of the Northwest Passage. He was then to sail west to Cape Walker. Not far beyond this cape, the passage was blocked by ice. Franklin was told to follow any likely waterway to the south, to the mainland of Canada. Failing this route, he was to try to the north. Most of all, he must always bear west until he reached the Bering Strait. The strait was the end of the Northwest Passage.

STEPHAN GOLDNER'S CANNED FOOD



Stephan Goldner was one of the many contractors who supplied food for voyages made by the British Royal Navy. Usually the navy's voyages were short, three to six months. When the Admiralty requested bids from contractors for Sir John Franklin's Arctic voyage that would last for three years, Goldner wasted no time in presenting a bid. His bid was less than half that of his lowest competitor, and he was awarded the contract.

Goldner fulfilled the contract by cheating the navy on almost every request. Instead of a variety of 16 different soups, every can was a mush of half-cooked, rotten vegetables. He put different labels on the cans: carrot, ox tail, veal, even real turtle. His 15 varieties of beef all turned out to be six-month-old salt beef—if it was in fact beef. It might have been horse or even mule. Goldner threw bones, gristle, intestines, feet, and whatever else came to hand, into the cooking pots. He added water to everything and thickened it with alum, a chemical. He added sand to the sugar and gravel to the soup. Everything was undercooked, and it is believed that the deadly botulinum contamination was present in almost every can.

Goldner delivered the bulk of the huge order just two days before Franklin left London. The Admiralty was so relieved to finally receive it that they made no inspection of any of the cans. It was years before Goldner was found out. By 1852, as punishment for what he had done seemed inevitable, he apparently left London and was never heard of again.

On July 28, 1845, the *Erebus* and the *Terror* were in Baffin Bay anchored to an iceberg, waiting for good weather to enter Lancaster Sound. Some of the officers were that evening entertained by a Captain Dannett on his whaler, the *Prince of Wales*. Dannett wrote in his log that they were all well, "in remarkable spirits, expecting to finish the operation in good time." The next day the *Erebus* and *Terror* moved off into the mist. They must have very soon met conditions that began to affect the "remarkable spirits" of the voyagers.

The party reached Cape Walker, which they found to be the headland of a very small dot of land, Russell Island. Although it was still summer, there was ice everywhere. The ice barred passage to the west and to the south. Franklin followed one of the options of the orders, heading north via the Wellington Channel, fighting through icy waters the entire way. In the end, Franklin found himself back where he had started, in Lancaster Sound. Passage was still blocked to the south and west. Franklin retreated to tiny Beechey Island, just off the southwest corner of massive Devon Island.

For the first time, on this windswept barren island, the explorers must have had a hint of what lay ahead. Food was still plentiful. The fresh meat was long gone, but there were thousands of pounds of salted beef and pork. There were canned vegetables and pickles, hot soups, raisins, sugar, and even chocolate. In the evenings the men performed in musicals and plays. Some read books. Although the cold outside was terrible, the ships were warm. They were islands of light and heat in the frozen desert.

THINGS BEGIN TO GO BAD

In the middle of the first winter on Beechey Island, a terrible sickness spread through the entire crew. The first man to die was John Torrington, on January 1, 1846. Two days later, a second crewman died. Others were ill but recovered. In early April, a third man died. The men suspected that the cause was the canned food. Can after can (12 pounds [5 kg] each) was opened. Some appeared to be good, while others contained a soupy, putrid mush. What they did not know, though, is that at least some of the contents were apparently poisoned. The cans were contaminated with the bacteria *Clostridium botulinum*. These bacteria can cause fatal botulism in the eater unless the food is thoroughly boiled before consumption. Another poison was contained in the cans. The lead that sealed the seams and tops of the tin had leached into the food.

The potential loss of so much food was a serious setback. Forty percent of their food was canned. There was no way of telling how much of what remained was good. However, there was not any thought of turning back.

The spring of 1846 came early. Summer promised to be unusually warm. By July, the ships managed to sail due south with moderate

resistance from the scattered, receding ice. As they approached what his maps indicated was King William Land—but in fact was King William *Island*—Franklin knew that he had already passed through half of the unmapped waters of the Northwest Passage. Ahead, a mere 200 miles (321 km), lay the northern Canadian coast and open water to the Bering Strait.

The *Erebus* and the *Terror* sailed to the west of King William Island rather than entering the narrow passage to the east, and the men found themselves in one of the most dangerous areas of the Arctic. They met water filled with larger and larger ice floes. Yet, retreat was not an option for a man like Franklin. With the steam engine fired to the maximum, he drove on. He was certain that the ice would soon thin out as he kept going south. But the floes became solid ice five, then six, then seven inches thick. The two ships slowed, then stopped. They were powerless and held fast by the ice.

The *Erebus* and the *Terror* were held 15 miles (24 km) off the northwest shore of King William Island. They were in the path of the “ice stream,” the gale-force wind that sweeps down from the North Pole. In the distance, the men could see King William Island. The island had little or no wildlife and no vegetation larger than the frozen moss that clung to the black rock already buried under snow. Furthermore, as the explorers soon found out, the journey of 15 miles over the ice to the island was a nightmarish three-day trip. The return was even worse in the teeth of the 40-mile (64-km)-per-hour wind. Walking, let alone pulling a sledge with tent, fuel, and supplies was extremely difficult. Exploratory parties were sent out to see if the water was open to the south. It was not. The pack ice in which the ships were held grew thicker. In some places it was 14 feet (4 meters) thick. By September, the party realized that they must spend this second winter trapped in the ice.

The future seemed far less bright than it had a year earlier. Food supplies were running low. Freshwater was a problem since there was not enough fuel left to melt ice and keep the sleeping quarters warm. The mysterious disease had returned. Men died and more rotten canned meat had to be thrown away. There was still some lemon juice left, but the crew hated to drink it. Here and there a case of scurvy broke out. All the while the invisible lead poison from the lead-sealed cans was slowly breaking down red blood cells. It made the men tired and clouded their judgment.



John Franklin's ships, the *Erebus* and the *Terror*, found themselves in one of the most treacherous areas of the Arctic when they entered Victoria Strait to the west of King William Island. The ships became trapped in ice several inches thick. Here, the men pull a sledge loaded down with provisions.

The Franklin party hoped that the summer of 1847 would bring release from the ice. As the new year began, exploratory parties prepared to search for open water. Sledges were built and supplies were packed for the short expeditions that hopefully would find some evidence that

a breakup of ice was on the way. By April, the ice master was in his crow's nest daily. He scanned with telescope the miles and miles of surrounding solid ice. There were no breaks, no signs of the blue water that would mark a thaw. If anything, there was more ice packing, creating even rougher ice fields. By June 1847, it was clear that there would be no early spring. There would be no warm summer. There would be no release from imprisonment.

On June 11, the 61-year-old Franklin died, probably from scurvy. The loss of the commander who was respected and beloved by the men deepened the dark mood that pervaded both ships. The men wondered how they could survive until next summer. Already, the food supply was dangerously low.

Captain Crozier, now in command, had ordered 6/4 rations. This meant that six men now shared the amount of food previously given to four men. Water was rationed to only a few swallows a day. There was no water for washing and shaving. The crew's quarters were filthy. Rats, as hungry as the crew, prowled the hold, eating into everything that was not sealed in metal.

Outside, the ice stream took its toll on the immobile, vulnerable ships. The *Terror*, caught in broken ice floes constantly moving with the gale winds above and currents below, began to drift away. On the *Erebus*, the sailors listened nightly to the creaking and cracking of the ship's timbers. The *Erebus* was breaking up. The ship would not be seaworthy even if the ice left.

Some time during the winter of 1847–1848, Captain Crozier decided to abandon the ships as early in the spring as the weather permitted. His plan was to walk to the Canadian mainland, to the nearest point due south, the Adelaide Peninsula. He had heard that game and fish were abundant there. After the party had regained their strength over the summer of 1848, Crozier planned to find the Great Fish River and follow it upstream to the Great Slave Lake (in the Canadian Northwest Territories) where there were trading posts. Crozier knew there was a lot to do to prepare for the dramatic step of leaving the shelter of the ships. By this time he had discovered that King William Land was actually an island, so they would need to take small boats on the march to get off the island. Crozier selected seven boats to transport. The boats would be loaded with provisions, clothing, and tools. To haul the boats, the

men built sledges out of oak from the ships. When loaded, they weighed at least 1,500 pounds (680.3 kg).

In March 1848, they brought boats, sledges, food, clothing, tools, stoves, and all necessities from the ships to King William Island. This was backbreaking work. By this time the men were undernourished and sick with scurvy and lead sickness. Back and forth from the ships they toiled in the constant wind and temperatures were rarely above -40° Fahrenheit (-40° Celsius). Finally, a mountain of cargo sat on the shore of the island.

It took 10 men to budge one of the sledges an inch. They were fighting piled-up ice and deep snow. A healthy, strong man with no load would be lucky to move at a rate of three miles (4.8 km) a day. They had to move this mass 1,000 miles (1,609 km). One man, Harry Peglar, wrote in his journal: "We have some very hard ground to heave." Everyone knew that this march was the only chance of survival.

THE FINAL MONTHS

On April 25, 1848, Lieutenant Graham Gore placed a report of the mission in a cairn, or pile of rocks, at Victoria Point. A note from Captains Fitzjames and Crozier was included in the report. It read as follows:

28th April 1848. H.M.S ships Terror and Erebus were deserted on the 22nd April . . . having been beset since 12th September 1846 The officers and crew consisting of 105 souls under the command of Captain F.R.M. Crozier . . . and start on tomorrow 26th for Back's Fish River.

On April 26, the expedition that had originally numbered 135 was now down to 105. The men headed south. Much of the mountain of supplies was abandoned. One week later, they had moved only six miles (9.6 km). Another pile of goods was left behind. This time many of the items were personal and nonessential: curtain rods, sets of silver tableware, fancy dress clothes, a portable lightning rod, and a mahogany writing desk. At least one man died each day from exposure, gangrene from frostbite, scurvy, food poisoning, and starvation. As the group moved south, it tried to deal with mountains of ice, slushy shore ice, and deep snow. Two hundred yards (182 m) in five hours was unusually good progress.

In desperation, Crozier divided the expedition into those who were unfit and those who could still pull the heavy sledges. Those who were fit went on, promising to return with help, while the sick were told to struggle back to the ships or the abandoned supplies. They were given one sledge with few supplies. Some of these unfortunates fell down as they walked. At first, the dead were attended to, buried under piles of rock. At the end they were left where they fell. The last men died with their sledge. Two died inside as if asleep. One lay facedown beside the forever-stalled burden.

By mid-August 1848, the main party had finally reached the southern tip of King William Island. There must have been no more than 35 men left in this group. Captain Fitzjames had died. The survivors were still almost 100 miles (160 km) from the mouth of Back's River. There was no food, for they had neither seen nor killed game. Here, at Booth Point, the retreat would end for all if food could not be obtained. Crozier was forced to make a decision: life or death. He decided to cannibalize the dead. Human corpses became food for the living. Every part was used, down to the marrow in the bones.

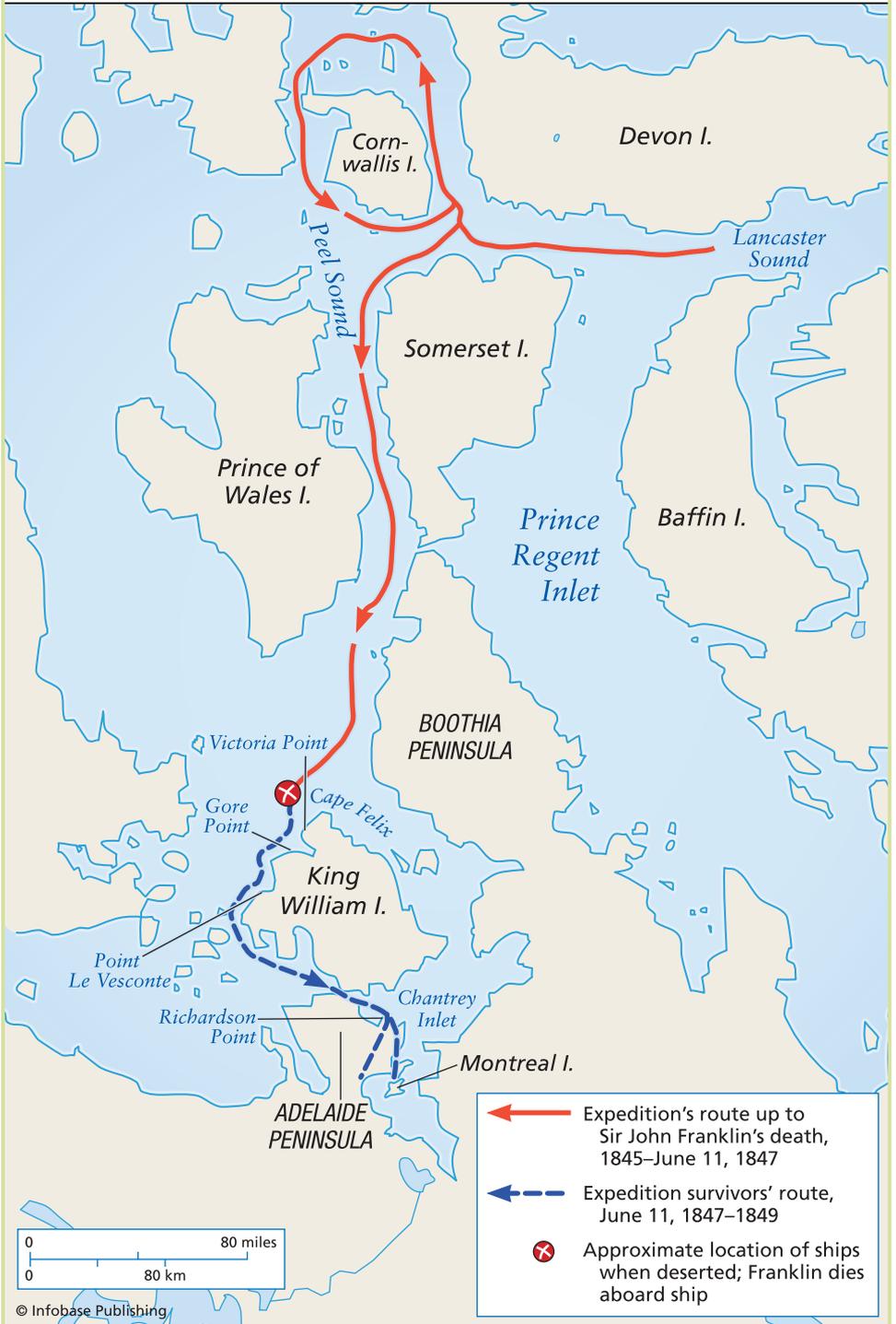
Crozier's party crossed the 23-mile (37-km) ice of Simpson Strait to the Adelaide Peninsula. They settled for the winter at Starvation Cove. The Inuit helped them in the winter of 1848, but the native people soon moved on. They could not possibly feed 30 starving men—especially hungry, armed men who were carrying strips of dried human flesh.

In 1849, some of the survivors reached Montreal Island, located very near the mouth of Back's River. For some reason some of the men from Crozier's party returned to the *Erebus* and the *Terror*. They were visited by Inuit aboard the *Erebus* during the winter of 1849–1850. Sometime in 1850 the broken *Terror* began to drift further south in the ice of Victoria Strait. The *Erebus* lay wrecked on its side in the ice just offshore at King William Island.

There was no shelter for the men still with Crozier. They wandered mindlessly. They were scurvy-ridden skeletons. The Inuit watched as man after man walked to his death. One explorer, perhaps the last, died

(*opposite page*) This map shows the probable routes taken by the Franklin expedition. Because they carried enough supplies to last three years, the Admiralty waited until 1848 before sending out several search parties.

End of Sir John Franklin's Last Expedition, 1845–1849



of scurvy and starvation as he walked. In his pack were 12 pounds (5 kg) of chocolate. It was later found with his frozen remains.

When Crozier crossed Simpson Strait, he may or may not have realized that he was completing the last undiscovered part of the Northwest Passage. If Crozier was aware, he must have felt that the cost of his success was high. But whatever the thoughts of the last survivors of the Franklin expedition, the men were cut off from the world outside. Sir John Franklin and all the members of his expedition had vanished, and the search for the Northwest Passage had once again come to a dead end. Yet as Franklin himself wrote in his account of his earlier voyages:

It is, moreover, pleasing to reflect that the loss of life which has occurred in the prosecution of these discoveries does not exceed the average number of deaths in the same population at home under circumstances most favourable. And it is sincerely to be hoped that Great Britain will not relax her efforts until the question of a north-west passage has been satisfactorily set at rest.



2

The Polar Regions

TO GEOGRAPHERS, THE NORTH POLAR REGION, OR THE ARCTIC, IS the area from the North Pole to the Arctic Circle. The South Polar Region, or the Antarctic, is the area from the South Pole to the Antarctic Circle. The circles mark the farthest point from either pole where there is a full 24 hours of sunlight on a midsummer day. In Antarctica, this occurs in December. In the Arctic, it happens in June.

Explorers who hoped to master the polar regions had to also spend a fair amount of time in the bordering seas and lands. The conditions that they confronted there were often every bit as challenging as those within the circles. Water, which was permanently frozen at the poles, could become open water overnight. Unwary travelers could easily be trapped.

THE ARCTIC DISCOVERED

People have been living within the Arctic Circle for thousands of years. For much of that time, they did not communicate with the world outside their region. In the ancient civilizations centered around the Mediterranean, peoples' ideas about the North Pole region were often based on myths. Rumors of a cold region far to the north must have reached some of these people. Mariners and merchants would have met men who had had some experience with the polar region.

Probably the oldest known account of contact with either polar region was that of the voyage by Pytheas in about 325 B.C. Pytheas was a Greek from Massalia (now Marseilles, in France). He wrote of an island

north of Britain—"Thule"—and a frozen sea. The ancient Greeks were quite curious about the unknown north. They named it Arktos, "the bear," the same name for the constellation that appears in the northern sky and that today is still known as the Great Bear. Some Greeks believed that people called the Hyperboreans (those beyond the north wind) were living in a paradise so far north that they escaped the harsh climate associated with the Arctic.

In the centuries that followed, little true knowledge of the Arctic region was gained. Maps of the later Greeks and Romans, for instance, continued to be based on fantasy rather than exploration. The Roman historian Tacitus (ca. A.D. 55–120) described people of the north who were probably those known today as Lapps. However, few people would have known of his writings.

In the tenth and eleventh centuries, however, this changed. Norwegian Vikings moved westward, first to Iceland and then to Greenland. About the year 1000, a few even briefly settled a land to the west. They named it Vinland, now believed to have been the tip of Newfoundland. The Vikings brought tales of wild, hostile people back to Iceland and Norway. They told also of a climate that was warm to the south and impossibly cold to the north. All of this was set down in long accounts known as sagas, which record the explorations of the Norwegian Vikings in the tenth, eleventh, and twelfth centuries. Few people outside the Viking lands, however, knew of these sagas.

In 1555, Olaus Magnus, the Catholic archbishop of Sweden, published *A History of the Northern Peoples*, which drew in part on Viking accounts of travels in the New World—that is, Greenland and Vinland. Magnus's work was the basis of European knowledge about the Arctic for the next century. Meanwhile, an interest in geography and map-making had improved Europeans' sense of what Earth looked like. In 1595, a Belgian mapmaker, Gerardus Mercator, made an atlas of the world. It contained a chart of the Arctic. Mercator wrote that under the North Pole "lies a bare rock in the midst of the sea. Its circumference is almost 33 French miles, and it is all of magnetic stone." Mercator also described a giant whirlpool at the North Pole. He claimed that all the polar waters poured into the whirlpool.

Why did Mercator refer to "magnetic stone"? By this time sailors knew that the magnetic needles of their compasses pointed north when

in the Northern Hemisphere and south when in the Southern Hemisphere. A mixture of fact, near fact, and pure fiction found in Mercator's atlas exhibits the state of knowledge about the North Polar Region in 1600. Exploration of the area by ship or overland was needed. By the mid-1800s, the Arctic Circle around the North Pole had been explored and mapped. What was inside was still largely a mystery.

WITHIN THE ARCTIC CIRCLE

What is inside the Arctic Circle? The answer is one simple word: ice. Here and there within the Arctic Circle are frozen areas that sometimes melt in the two months of summer. Sometimes, but rarely, there are sections that are open water the year-round. But mostly there is ice.

The Arctic is composed mainly of the Arctic Ocean. The ice pack on the Arctic Ocean is not one smooth sheet of ice; rather, it is an uneven mass of ice sheets, called floes, and pressure ridges. At these ridges, the ice is pushed up at angles, creating a surface that can be crossed only with great difficulty. In the summer, channels of water, called leads, may open up. They create streams that may be a yard wide or a mile across. For an Arctic traveler pulling a sledge, a lead presents great difficulty and deadly danger. The Arctic pack ice, always on the move, flows east, over the Pole. It then moves southward down the east coast of Greenland. The pack, at times up to 12 feet (3 m) thick, begins to break up into smaller and smaller pieces as it floats into warmer water.

The geographic North Pole is under moving pack ice. This means that an explorer camped on top of the North Pole one day might on the next day be two or three miles (three or four kilometers) away from the Pole. The ice he camped on floated along in the polar wind and the current of the frozen sea.

Surrounding the frozen Arctic Ocean are landmasses. They include the two-thirds of Greenland that lies within the Arctic Circle; the northern tip of Sweden, Norway, and Finland; the northern coast of Russia; northeastern Alaska; the northern rim of Canada; the entire Canadian Archipelago; and most of Baffin Island.

All of these lands border on seas that are extensions of the Arctic Ocean. Not all of these waters are frozen the year-round. In fact, if explorers moved around the southernmost part of the Arctic region, they would find plenty of open water, especially in the summer, except



The North Pole, the northernmost point on Earth, is located in the middle of the Arctic Ocean. The waters are permanently covered with constantly shifting ice floes. Scientists have predicted that the Arctic ice cap could melt away by 2014.

in the Canadian Archipelago. This multitude of islands actually serves to hold and protect the winter ice. This situation is mainly why the Northeast Passage through the ocean at the top of Eurasia is crossable while the Northwest Passage through the ocean across the top of North America is not.

The lowest temperature recorded in the Arctic is -90°F (-67°C) in Siberia. Temperatures have dropped a few degrees lower in Alaska and northern Greenland. But along the Arctic Circle the temperature can be surprisingly warm. In the summer months of July and August, it reaches 50°F (10°C) or higher.

The animals of the Arctic depend on the water. Water is the environment of the polar region, and the water is warmer than the air. Polar land animals mainly are the musk ox, the caribou, the Arctic fox, the Arctic wolf, the hare, and the lemming. The polar bear is as much at home in the water as on land, although it gets almost all its food from the water. There is a variety of birds: geese, ducks, auks, and gulls. Most of these migrate south in the winter. The snowy owl, the Arctic raven, and the ptarmigan stay in the Arctic year-round.

The Arctic Ocean is filled with life, from tiny plankton to the calanus (a shrimplike creature) and fish. In the warmer regions of the Arctic there are cod, halibut, salmon, and the Arctic shark. At least five kinds of whales live in the Arctic waters, as do walruses and seals. Experts believe that the seal has been the mainstay of Inuit existence since the original migration to the far northern regions.

PEOPLE OF THE ARCTIC

More than one million people live in and just below the Arctic Circle. Most of these hardy folk live in Siberia or in Inuit settlements in Alaska and Canada. Most indigenous people who live in the Arctic fall mainly into the following groups: the Sami, the Chukchi, the Inuit, and the Athapascans.

The Sami live in Norway, Sweden, the Russian Kola Peninsula, and Lapland. The ancestors of the Sami occupied these coastal areas 10,000 years ago. They were hunters and fishers, and over the years they also became known as reindeer herders. The Chukchi live in the most remote part of Siberia on the Chukot Peninsula. The land there is mountainous and the weather there is perhaps the coldest in all of the Arctic. The Chukchi hunt and fish and raise herds of reindeer.

Inuit, which means “the people,” has generally replaced the term *Eskimo*. The Inuit live in lands from the east coast of Greenland to the Alaskan side of the Bering Strait. The first Inuit migrated there from Siberia and central Asia about 5,000 years ago. They were hunters and fishers, as are their descendants today. Being seminomadic, they moved to where game and seals were more plentiful.

Archaeologists believe that the first Athapascans crossed the Bering Strait into Alaska about 10,000 years ago. They moved inland and stayed there, becoming hunters and settling in villages. Eventually the



The Chukchi live in far east Siberia, one of the coldest places in the Arctic. At a population of about 15,000, they are the largest native nation on the Asia side of the North Pacific. The reindeer Chukchi live inland of the easternmost portion of the Chukchi Peninsula, and the maritime Chukchi live on the Arctic and Bering coasts. Above, the Chukchi community of Uelen is battered by heavy seas during an autumn storm.

Athapascans migrated above and below the Arctic Circle in Alaska, to the Yukon and the Northwest Territories and south into western Canada. These Athapascans today prefer to call themselves Dene, which means “the people.” Other Athapascans moved into the American Southwest. These are the people known as the Navajo and Apache.

The peoples who live throughout the Arctic region speak many different languages, which linguists have grouped into several families, but are quite distinct from one another. Although it is assumed that the languages spoken across the North American Arctic must have originally come from those spoken in Asia, linguists are unable to agree on any direct relationships. The main languages spoken by the non-Athapaskan peoples who live across North America are grouped as Inuit and Yupik, and within each group there are many variations. Because there is a

common root, two strangers might be able to communicate, if only in a simple and basic way. In all cases, the languages spoken by Arctic peoples are expressive and capable of complex ideas when the subject is a matter that concerns these peoples' basic interests.

ANTARCTICA DISCOVERED

Long before Antarctica was ever seen by the human eye, it existed as a hypothesis of certain ancient Greeks. They decided that a great landmass must lie far south to counterbalance the landmass of Eurasia to the north. The great Greek philosophers Plato and Aristotle were among those who believed that Earth was a round sphere and therefore that certain laws of symmetry or balance had to apply. Theopompos, a Greek historian, was the first to set down in writing the idea of a vast "dry land" that bordered the southern ocean. Plato called its people "antipodes" (opposite feet). In some Greek writings, the land itself is referred to as the Antipodes. Other Greeks began to refer to the land as Antarktos, "opposite the Arctic." The Romans adopted this notion of a southern land. They named it Terra Australis Incognita (unknown southern land). That is what it was called for many centuries.

About the year A.D. 150, Claudius Ptolemy, a Greek living in the Roman-controlled city of Alexandria, Egypt, was the most important astronomer and geographer of his time. He made a map of the world that included Terra Australis Incognita. The original map of Ptolemy did not survive. However, copies of it were made and it was the most important map of the world until about 1400.

It was not until the fifteenth century that nautical exploration and actual observation and experience became the basis for mapmaking about the southern continent. After Ferdinand Magellan returned from his voyage around the world in 1519–1522, the possibility of Terra Australis Incognita became very real to Europeans. Furthermore, the Maori who lived in New Zealand by this time had tales about a large "white land" to the south. These stories suggested that some among them had at least caught a glimpse of Antarctica.

During the two centuries following 1550, explorers began to search for the southern continent. There was no convenient jumping-off point. The nearest lands to the so-called hidden continent were the tips of South America and Africa, but these places had no settled populations

and no ports where supplies could be restocked. They were 10,000 miles (16,093 km) from Europe. Just getting into position for a search involved a long expedition. In 1578, Sir Francis Drake sailed around the globe. He discovered Cape Horn and the islands off the tip of South America. However, looking south from Tierra del Fuego into the empty expanse of ocean, he declared that no land existed in that direction.

In 1673, Antonio de La Roché, a London merchant, sailed to Peru. On his return voyage in 1675, he rounded the tip of South America. He was blown off course by a terrible storm. By accident, he discovered South Georgia Island and Clerk Rocks, far out in the South Atlantic, well north of Antarctica. Clerk Rocks was clouded by mist and fog and surrounded by icebergs. The island rose 1,000 feet (304 m) from the sea with snowcapped peaks. La Roché believed that he had sighted the coast of the southern land. He had not, but his reports gave an idea of conditions in that part of the world. He described windswept, desolate emptiness surrounded by wind-torn hostile seas.

In 1738, French naval officer Jean Bouvet de Lozier left France on a mission to discover the “Southern Lands.” He believed they could be found off the tip of Africa. From there, some 1,000 miles (1,609 km) south, he did discover land that he named Bouvet Island. It is called the most isolated island on Earth. Bouvet was unable to land there because of stormy seas. He eventually reached 54°40' S (54 degrees latitude, 40 minutes south from the equator) and met thickening ice. He followed the edge of the pack ice for 1,500 miles (2,414 km) but saw no land. He returned to France in 1739, convinced that the icebergs he saw proved the existence of a glacier-filled landmass further south within the pack ice.

Explorers were beginning to zero in on Terra Australis. On his second voyage (1772–1774) English explorer James Cook circumnavigated the globe. He reached 71°10' S, the farthest south recorded at that time. Cook crossed the Antarctic Circle three times. He proved that the southern continent must lie within the ice pack. He wrote in his journal that “the world will derive no benefit from it.” When Cook finished his expedition, he had sailed through 20,000 miles (32,186 km) of unknown oceans. He faced some of the worst weather to be found on the planet. His voyage of circumnavigation has been called the greatest exploration by sea ever undertaken. However, his failure to find the hidden continent discouraged similar attempts for a while.

It also had another effect. It encouraged sealer and whaling expeditions to move into the region in ever-increasing numbers. It is estimated that by 1820 there were 50 British and U.S. ships near the Antarctic Circle in search of the seals and whales. It was probably an unknown British or U.S. sealing ship that first caught sight of Antarctica. The Americans claim that the first to see the Antarctic Peninsula was Nathaniel B. Palmer. He sailed along its west coast in 1820. The British claim that their Edward Bransfield saw the peninsula earlier in 1820. Whichever is the case, it is certain that in 1820 both of these skippers were more concerned with seals than with discovering Terra Australis.

A number of sightings and landings occurred in the nineteenth century. Explorers and hunters penetrated deeper into the pack ice barrier around Antarctica. In 1821, Thaddeus von Bellingshausen, a German in the Russian navy, sighted two islands that he thought were the mainland. The islands were eventually named for two Russian czars, Peter I and Alexander I. Also in 1821, John Davis, an American seal hunter, entered Hughes Bay on the tip of the Antarctic Peninsula. He sent men ashore on February 7. Between 1821 and 1824, James Weddell, a British seal hunter, steamed to 74°15' S. He discovered and named the Weddell Sea.

Between 1838 and 1842, U.S. Navy Lieutenant Charles Wilkes sailed into the Indian Ocean and throughout much of the Pacific Ocean. In 1839, he headed south to the still-unnamed land and then sailed along 1,500 miles (2,412 km) of the coast. Wilkes proved once and for all that this was a vast landmass, not just a number of islands. He named the land Antarctica and proved that it is a continent. In 1840, Jules-Sébastien-César Dumont d'Urville, a French explorer, sighted land and named it and the penguins he found there for his wife, Adélie. This phase of Antarctic exploration peaked with the expedition of the English explorer James Clark Ross. Between 1841 and 1843, he discovered and named a great number of natural features along the coast of Antarctica. When members of his expedition set foot on an offshore island, the exploration of Antarctica entered a new chapter.

THE GEOGRAPHY OF ANTARCTICA

The continent of Antarctica is a roughly circular mass of ice. It is found between the Atlantic, the Pacific, and the Indian oceans. Its area is

some 5.5 million square miles (8.8 million square km, compared to Australia's area of some 2.96 million square miles or 4.76 million square km). Surrounding it is the Southern Ocean. Over this ocean a wind-storm blows almost constantly. On a bad day the wind can reach 115 miles (185 km) per hour. On a calm day there are 15-foot (4.5-m) swells. When the weather is bad, there are waves that are 50 feet (15 m) from trough to summit. Most of the time there is fog and mist present. Ice coats ships from deck to mast top.

Spreading out hundreds of miles from the continent on all sides is thick pack ice. The pack ice shifts and drifts, making further approach by ship impossible. For two months of the year this ring of ice is penetrable, with good navigation and luck. A ship caught in the pack will be crushed and pounded to destruction. The nineteenth-century English explorer James Clark Ross wrote about his trip through the pack ice and concluded: "The awful grandeur of such a scene can be neither imagined or described."

Inside the gauntlet of stormy seas and ship-smashing ice lies the continent itself, a dome of ice covering 98 percent of its entire area and reaching as high as 14,000 feet (4,267 m) at some points. Seen from a satellite, it appears to be a great white light as it reflects the sun (and its heat) back into the stratosphere. Antarctica has more than 90 percent of the world's ice and snow—more freshwater than in all the rest of the world combined. If the ice cap melted, the rising world's oceans would cover New York City, London, Paris, and Rome. Half of the world's population would perish.

Under the ice is a landmass—or some scientists believe, a number of landmasses. The land has been pushed down below sea level by the weight of ice: 27,000 million billion tons. It has been measured that at one point, there are 15,580 feet (4,748 m) of ice below sea level forming the base for the mile of ice that rises above the sea. Stretching across the continent are the Transantarctic Mountains. The highest peaks rise to some 16,000 feet (4,876 m). Many of the mountains are buried deep under the ice cap, as are some lakes that remain frozen.

The ice of Antarctica is always on the move. It inches toward the edge of the ice mass in glaciers, narrow rivers of ice called tongues, and fast-moving ice streams. Sometimes the moving ice breaks off as it reaches the coast. More often it spreads out, still anchored to the land,



Antarctica is 1.4 times bigger than the United States, and has 70 percent of the world's freshwater frozen as ice. There are no permanent residents, but scientific bases do house 1,000 researchers during the long winter and 4,000 during the short summer. In winter, Antarctica doubles in size due to the ice that forms around the coasts.

forming ice shelves that eventually “calve,” or break off into icebergs. The Ross Ice Shelf, for instance, grows out into the Southern Ocean at the rate of one-third of a mile per year. It has given birth to icebergs as large as 100 miles (160 km) long, 10 miles (16 km) wide, and hundreds of feet in depth. In the midst of the mountains of ice in the central regions lie the mysterious dry valleys. These are always free of ice and are much warmer than the surrounding mountains. Such valleys can be 40 miles (64 km) long, 5 miles (8 km) wide, and run 5,000 feet (1,524 m) deep between the mountains.

The central plateau of Antarctica, although generally free of glaciers’ movement, is the most hostile part of the continent. It is the driest part as well, receiving only about two inches of snow per year. But here is found the deepest cold and the most severe wind. A temperature of

“BLASTED FUNNY WEE BEGGARS”



Penguins have amused and amazed explorers in the southern regions for centuries. Sailors with Ferdinand Magellan in 1520 called them “strange black geese.” They were surprised that they could not fly. One Scottish sailor called them “blasted funny wee beggars.” The penguin is graceful in the water, but much less so on land or ice. The penguin is, or seems to be, always off balance. Its waddle is intensified by the fact that the penguin is rather short-legged, causing it to rock back and forth when walking. Indeed, they are easily thrown off kilter by the slightest bump in the ice or rock. After stumbling, they appear to glare at the tiny offending obstacle. They then adjust the egg they might be carrying on their foot and swagger off.

Penguins are dubbed “flightless birds,” but there was a time when they flew. Scientists believe that 60 million years ago penguins had broad wings that evolved into the flippers that they now use for swimming. They have adapted well to the extreme conditions of the Antarctic. As the wings formed into flippers, the bones of the wings, once hollow, became solid. Muscles developed to better propel the sleek body through the water at high speed. Their white fronts and dark backs hide them from predators. An air-breathing

-135° F (-92° C) has been recorded at the South Pole, the lowest temperature recorded on Earth. Average temperatures on the plateau can vary from -30° to -60° F (-34° to -51° C) in the cold months, but the wind can make such cold more deadly. Australian Antarctic explorer Douglas Mawson described his winter in Adélie Land: "The wind blew non-stop for eight hours at an average speed of 107mph [172 km/h]; gusts were recorded of over 150mph [241 km/h]. . . . In these conditions it was possible to stand for no more than a few seconds."

LIFE ON ANTARCTICA

Indeed, the conditions at the South Polar Region make life there all but impossible. Some grasses and herbs grow on the Antarctic Peninsula. Lichens and mosses appear on exposed hillsides in the summer.



mechanism developed that allowed the bird to stay underwater for up to 20 minutes while searching for its favorite food, the krill, tiny shrimplike marine creatures.

The body of the penguin is well protected against the Antarctic cold. Two layers of feathers provide a barrier against the cold and the wind. The top layer overlaps to form a tight wind-breaking overcoat. The second layer of feathers has tufts of down at its base, creating a warm pocket of air next to the skin. Penguins have a gland that secretes oil with which they groom themselves, thus making their feathers waterproof. Inside the skin there is an inch or two of fat, protecting the inner organs from any cold that might have gotten through the outer defenses.

The curiosity and fearlessness of most penguins made them easy prey for explorers. Explorers killed them for food and for the oil extracted from their blubber. Running out of whales, whalers even hunted the king penguin for oil. The fashion of penguin feathers did not really catch on in Europe, so the penguin was eventually left in peace to deal with its own natural enemy, the leopard seal.

Plants that have deep roots—trees and shrubs—simply cannot grow there. There are numerous species of insects, spiders, and microscopic creatures that live on the mosses and lichens. A wingless fly less than one-tenth of an inch long is the largest land animal on Antarctica except for the birds that put down there. The best known of these are the penguins, most of which nest on the islands on the edges of the continent. Among the birds that live at least part of the year on Antarctica are skuas, cape pigeons, fulmars, and petrels. Arctic terns arrive each summer, having flown 11,000 miles (17,702 km) from their breeding grounds in the Arctic.

The ocean beneath and between the pack ice remains slightly above 32° F (0° C) and is rich in phytoplankton. Shrimplike krill eat the plankton and are the real base of the food chain. They are food for penguins, birds, seals, and whales (including the blue whale, the largest animal that has ever lived). There are also hundreds of species of fish in the Southern Ocean.

Antarctica then, like the Arctic, is a land of ice, cold, wind, and desolation. Both polar regions are as hostile to human presence as any place on the globe. The opening up of the two areas eventually occurred. Most of the myths and misconceptions about the polar regions were exposed. However, the price of discovery was high in terms of human suffering and life. The terrible climate and conditions of the Arctic and the Antarctic did not, however, discourage generations of explorers from their quests.



3

A Northwest Passage

AFTER CHRISTOPHER COLUMBUS'S VOYAGE TO NORTH AMERICA in 1492, people began looking for a passage through or north of this newly found landmass. They hoped to reach Asia from the west. In 1497, England's John Cabot explored the northeastern coast of Canada, from the tip of Newfoundland south to possibly the northern parts of Nova Scotia. He did not find any evidence of a passageway that might lead to the west. His son, Sebastian, claimed to have followed the route of his father in 1508 and went as far north as Hudson Strait in 1508. He, too, did not find the passage.

Spain controlled the sea routes around South America. The Portuguese jealously tried to guard the sea route to Asia around Africa. For the British and others, an alternative passage needed to be found, if it existed, in the northern regions. Exploration first focused on the entire eastern coast of North America, but North America seemed like a solid mass with no way through. Fishermen, however, told tales of vast waterways that lay north of Newfoundland. There were bays, straits, inlets, channels, and sounds. Any one of these might lead westward. All hopes for a passage to Asia soon lay in the unexplored regions north and west of Newfoundland.

THE DUTCH AND ENGLISH TRY TO FIND A WAY THROUGH

Martin Frobisher set out to find the Northwest Passage in 1575. He was a highly experienced seaman and adventurer. He left Blackwall,

England, on June 15, 1576, with three ships. One ship was broken up in a gale and the crew lost. A second ship, damaged by storms and ice, returned to England. Only the *Gabriel* pressed on, past the southern tip



Martin Frobisher attempted to find a northwest passage to Asia. He was one of the first people to explore the northeast coast of North America. The “gold” that he found on his first voyage allowed him to find financing for a second and third voyage to bring back more of the mineral. The gold turned out to be worthless.

of Greenland and reached the southern tip of Baffin Island. Frobisher then entered a bay (later named after him) that he thought was a strait. Observing the mountains on both sides of his “strait,” Frobisher concluded that he had found the first part of the passage. He thought that the land on the left was America, and that on the right was Asia. Frobisher’s conclusion that he had already reached Asia indicates how very little was known about the size of the new continent.

After some incidents with the Inuit of Baffin Island—five of the Englishmen were captured, never to be seen again—Frobisher returned to England. He brought with him some furs, an Inuit prisoner (to be put on display), and a quantity of iron pyrite. The explorers falsely believed the mineral was actually gold ore. Frobisher’s backers were thrilled with his discovery. They sent him on a second and third voyage to bring back more of the worthless mineral. On Frobisher’s third voyage in 1578, when his ship was blown off course, he discovered the entrance to Hudson Strait.

There were several other attempts at the passage in the late sixteenth and early seventeenth centuries. In 1609, Henry Hudson set sail for the Dutch East India Company. He was looking for a northeast passage to China along Russia’s coast. When he ran into difficulties, he turned his ship, the *Half Moon*, westward and sailed for North America. There he explored the east coast from Maine to North Carolina. At one point he sailed up a river, later named after him, but the grounding of his ship proved it was not the Northwest Passage. Hudson returned to England in 1609. He was ordered by King James I to cease his association with the Dutch. One year later, Hudson was hired by a group of English merchants to return to explore regions of North America.

In 1610, Hudson left England in the *Discovery* with a crew of 20 men. From the beginning, Hudson failed to establish any discipline. Even before the *Discovery* reached Iceland the crew was constantly quarreling. In June, they entered Hudson Strait and for three weeks the ship was imprisoned by the ice in Ungava Bay. Finally, the voyagers pressed westward to the end of Hudson Strait and entered the massive inland sea since known as Hudson Bay. Hudson was sure that the western end of this bay was China and that he was sailing over the top of North America. He followed the eastern coast of the bay to the south until it began to curve away to the west, after 500 miles (804 km) of clear easy sailing. This change was a good sign that the passage was heading to Asia.

THE LURE OF ASIA



For centuries—at least since the times of the ancient Romans—Europeans considered Asia a source of exotic products and potential wealth. Spices, exotic foods, and colorfully dyed silk and wool cloth were sought after. European merchants sold them to royal and wealthy customers at high prices. Other valuable goods included gold, ivory and jade carvings and jewelry, tapestries and paintings, and books filled with unknown symbols and words. Europeans wanted more and more of these treasures.

For some 2,000 years, the main route from Europe to Asia had been overland along the so-called Silk Road. This route was in fact several roads and involved many products in addition to silk. As the 1400s grew to a close, Muslim peoples became a powerful force in the Middle East. They stopped many Europeans from using the Silk Road. This situation forced European countries to seek another route to Asia. The path they chose was to the west.

Hudson followed the shoreline for 200 miles (321 km) only to find that it abruptly turned north and the explorers realized that they were in a dead end. They had in fact sailed out of Hudson Bay into James Bay, a smaller part of the larger bay. Ice started to form and rations were running out. Hudson then did something odd: He sailed from north to south, east to west, back and forth, seemingly unable to get out of James Bay. As the ice closed in, the *Discovery* anchored deep in the southwest part of James Bay for the winter. Somehow, despite scurvy (the disease caused by lack of vitamin C) and near starvation, the explorers survived the winter of 1610–1611.

The *Discovery* was finally released from the ice in June 1611. Hudson's decision to continue westward touched off a mutiny. Hudson, his young son, and six loyal sailors were put in a small boat. They were given a single sack of meal and cast off. They were never seen again. The *Discovery* struggled back to England. For some reason, the mutineers were never held to account for their deeds.

The voyage of Hudson was tragic and inept, but the discovery of Hudson Strait and Hudson Bay was an optimistic promise (however false) of the existence of a northwest passage. Robert Bylot, an officer of the *Discovery*, described a great flood tide, coming from the west, in Hudson Bay. This, he and others were certain, was a sure sign that the Pacific Ocean lay on the other side of the bay.

Financial backers, such as the Muscovy Company and the newly formed Company of Merchants of London, hoped to find the passage in the region of Hudson Bay. A few more expeditions took place. Thomas Button sailed for England in 1612. He proved that there were no passages from the central or northern portions of Hudson Bay. The explorer William Baffin joined two expeditions in 1615 and 1616. His discoveries showed that, even if a passage existed, it might be too far north. The ice might prevent ships from getting through it. Jens Monk, a Dane, led a disastrous voyage to Hudson Bay in 1619. English navigators Luke Fox and Thomas James both went on explorations in 1631. They examined areas already mapped. By 1632, the search for the Northwest Passage had virtually come to a halt.

THE INFLUENCE OF JOHN BARROW

By the late eighteenth and early nineteenth centuries, explorers knew there was no easy solution. A Northwest Passage might exist. But, it would only be found after carefully checking the whole northern boundary of North America. In 1803, a young Englishman named John Barrow was made second secretary to the British Admiralty. Barrow believed passionately in the continued search for the Northwest Passage. During the 40 years as secretary, he was in constant support and sponsorship of effort to discover it. Commercial reward was no longer the main goal. The search, according to Barrow, “had for its primary object that of the advancement of science, for its own sake.”

Barrow backed the expedition of William Edward Parry. Parry’s expedition met with perfect weather and favorable winds. In August 1819, his ships passed Lancaster Sound. Ahead lay open water and the explorers sailed easily with a constant easterly wind. In September, after passing and naming numerous islands and islets, they reached longitude 110° W. At longitude 112° W, Parry reached the permanent

ice cover that extends from the Beaufort Sea. He was forced to turn back. Parry was given a hero's welcome in London in November 1820. He had certainly found the starting point for the Northwest Passage. He had also found that the way was blocked by permanent ice. However, he believed the passage must dip south into warmer waters.

Barrow also supported John Franklin's first voyage to the north coast of North America. Franklin explored from 1819–1822. He carefully mapped hundreds of miles of Canada's northern coast. By 1823, the British were hopeful. Only a few parts of the Northwest Passage were unknown. The missing parts would be put in place by the next few expeditions. Barrow approved four missions in 1824. The first, under Franklin, was to travel to the mouth of the Mackenzie River and explore to the east and to the west along the shore of the Arctic Ocean. The second, under George Francis Lyn, was to proceed overland from northern Hudson Bay to Franklin's Point Turnagain (on the Coronation Gulf, east of the Coppermine River). The third expedition, under Frederick Beechey, was to pass through Bering Strait and explore eastward along what would be the coast of Alaska's border on the Beaufort Sea. Finally, Parry was to enter Lancaster Sound, sail west to the Prince Regent Inlet, and follow it south, in order to find a passage from it to the west.

All four expeditions were partially successful. Their biggest achievement was mapping 1,500 miles (2,414 km) of the north coast of Canada. By 1840, only the central section, perhaps 600 miles (965 km), was still in question. Thus was the setting when in 1845 Franklin set off on his third North American expedition. It was on this trip that Franklin and his ships vanished in the Arctic wilderness.

FRANKLIN DISAPPEARS

There was no word from Franklin in the summer of 1846. He had been gone just a year. Franklin expected to be out of touch for at least two years. His ships, the *Erebus* and the *Terror*, carried enough food to last three years. With some hunting and fishing, the supplies could probably last another year. Yet as the end of 1846 grew near, the Admiralty began to feel uneasy.

Sir John Ross had made a promise to Franklin to lead a relief expedition in search of him if no word had been received by January 1847. Ross reminded officials at the Admiralty of this promise in September

1846. Ross had grounds for his concern. He had been held by the ice for four years in the area Franklin intended to explore. Ross asked to be given command of a search mission. His request was denied.

As 1847 drew to a close, anxiety grew that the Franklin expedition might be in grave danger. The Admiralty assembled a group of senior Arctic explorers, called the Arctic Council, to assist in planning the best and most efficient way to proceed. The difficulty was that no one had the slightest idea where Franklin had gone. Because no contingency plans had been made for the possibility of trouble, there was no prearranged place for Franklin to leave a message.

THE SEARCH FOR FRANKLIN BEGINS

In 1848, the Admiralty finally sprung into action. Three search parties were organized. The first was under the command of James Clark Ross, nephew of Sir John Ross. Ross was to try to retrace Franklin's route. The second search party headed to the western end of the Northwest Passage. It would look for Franklin near the Bering Sea in case he had made it through the passage and was stranded. The third search mission was overland. Sir John Richardson and John Rae led this group. They were to leave Great Slave Lake and travel down the Mackenzie River to the Beaufort Sea. They were then to move east along the coast, in small boats, to the mouth of the Coppermine River.

None of the three search expeditions found any trace of John Franklin. Franklin had never come close to reaching the Bering Strait where one party searched. Richardson and Ross, on their expedition up the Mackenzie, were hundreds of miles away from Franklin's location.

Ross's search was at least in the general region visited by Franklin in the early part of his exploration. He led one group by sledge 150 miles (241 km) south down Peel Sound. He did not know it, but this was the route actually taken by Franklin. Ross saw unbroken, thick ice that stretched as far as the eye could see. This convinced him that no ship could ever have sailed this way. He could not know that in the summer of 1846 the ice had lifted. It allowed Franklin to sail into the trap from which he could never escape. Ross began to fear for his own safe return. In November 1849, Ross sailed back to England.

Ross's return to England in November 1849 was a great disappointment. The Admiralty resolved to find Franklin or solve the mystery of

his disappearance in the coming year. Private parties joined in the frantic search. Their efforts added more to the knowledge of the Canadian Arctic than had been added during the previous 200 years.

FIRST EVIDENCE OF FRANKLIN

By summer 1850, there were 12 ships searching for Franklin, most of them centered in the east. There was still no evidence of Franklin's route. All they knew was that he had entered Lancaster Sound. In late summer, Lieutenant Edwin J. DeHaven, skipper of the *Advance*, had joined up with Horatio Austin's party of the *Assistance* to search together. They found a campsite at Cape Riley on Devon Island. Then, on nearby Beechey Island, the searchers found the wintering spot of Franklin's first year in the Arctic. Cairns and relics marked the site. They found the gravestones of the first three men who died. There was a metal pike in the ground at the beach. On it was painted a hand, pointing to the open water. This was the only clue to where Franklin might have gone.

Winter was closing in. The searchers found the water to the west had closed. Passage to Melville Island was no longer possible. The *Advance* and the *Rescue*, American ships, were poorly equipped for winter. They turned for home—too late. They became frozen in the ice and were not freed until June 1851. Horatio Austin and his four ships were frozen in near Cornwallis Island. Captain Forsyth of the *Prince Albert* made it back to England. The ships led by John Ross and William Penny found safe harbor. They settled in for the winter.

During the winter they were trapped in the ice, the explorers took to their sledges. They mapped islands and waterways. The most impressive exploration done in the winter of 1850–1851 was carried out by Leopold McClintock of the *Assistance*. He had studied the techniques used by previous explorations and was aware of the problems caused by heavy sledge. He spent the early winter of 1850 designing, then building, new extra-light, strong sledges. Then he devised a method of travel whereby depots of food were left in advance for the traveling party. In April 1851, a group of men left Cornwallis Island using McClintock's methods heading south and west. They moved up to 10 miles (16 km) a day, moving in the night and stopping by day when the slightly warmer temperatures occurred. When there was a favorable wind and smooth ice, sails were installed on the sledges. They then sped forward over the frozen water. Whole new



After several years of no word from John Franklin, the Admiralty sent several parties to the Arctic to search for the missing explorer. Leopold McClintock (*above*) discovered many belongings that were linked to the Franklin party. Their remains were found by later explorers.

regions were surveyed and charted, such as Wellington Channel, Prince of Wales Island, and Peel Sound. The explorers of Peel Sound reported that the ice there appeared to be solid from surface to the bottom. No one believed that Franklin could have gone that way.

McClintock himself went all the way to Melville Island. He had traveled 770 miles (1,239 km). Altogether, the sledging parties traveled and mapped a total of 7,000 miles (11,265 km). The entire north-central portion of the Northwest Passage was now known. There was, however, no trace of Franklin. The search parties all sailed for home. They reached England in fall 1851.

THE FATE OF THE FRANKLIN EXPEDITION

The lords of the Admiralty were shaken when the report of John Rae reached England in 1854. Rae was a Hudson's Bay Company doctor and solo explorer. He had begun walking through the Arctic in 1850. In 1853, he began to explore the coastline of Boothia Peninsula. He also planned to look for signs of Franklin's expedition. In March 1854, he headed across the snowy wilderness of Boothia Peninsula with four other men.

Heading for the western side of the peninsula, he met an Inuit wearing the gilded officer cap of the Royal Navy. Rae told the man that he would trade for any other such items upon his return. He headed west to English Bay, then turned north to continue his mapping. To his amazement, he discovered water between Boothia Peninsula and the coast of King William Island. He named it Rae Strait. People had long believed that King William Land was connected to the mainland. Rae had found that it was an island. He realized that the passage to the east of King William Island was the key to the Northwest Passage. The east side was protected from the ice stream. It was almost always free of ice.

Rae decided to get this news back to England quickly. He hurried back to his base. On the way, he met more Inuit. They carried items for trade. Included in the items were Franklin's Order of Merit and a silver plate engraved with the name Franklin. They told Rae stories of the death marches of the party. They also told of the deaths of the few stragglers who finally reached the mainland.

John Rae sent a full report of what he had found to the Admiralty. He included evidence of cannibalism resorted to by the men in their final desperation for survival. Rae could not have put it more bluntly:

“The survivors of the long lost party under Sir John Franklin had met with a fate as melancholy and dreadful as it is possible to imagine.”

The mystery was solved. A horrified public read the details of the failed Franklin mission. The Admiralty, aware of its own misjudgments and failure, awarded Rae £10,000 (British) pounds. They again closed the book on the affair. Lady Jane Franklin, however, did not. She raised the money for one final trip. Perhaps there were still, somehow, survivors. Perhaps there were reports telling what had really happened. And perhaps, most of all, Lady Franklin thought, there might be evidence that her husband’s party had completed the final link in the Northwest Passage. Lady Franklin was horrified at the suggestion that Rae lead this search. She could not forgive his report of cannibalism. She chose instead McClintock, veteran of the previous searches and the clear master of sledge travel.

The *Fox*, captained by McClintock, left England on July 1, 1857. It was late summer in 1858 before the *Fox* entered Lancaster Sound. The weather was impossibly bad. The party spent another winter frozen in the ice, and then took to the sledges. By April 1859, the party began to search King William Island. McClintock took the east side of the island, and Lieutenant William Hobson took the west. From the beginning, the searchers found many relics: skulls and bones, Royal Navy clothing and buttons, silverware, medals, odd bits of metal and meat tins. All of the items belonged to the Franklin party.

Finally, in the summer, Hobson found a cairn at Point Victoria. Inside was the report of Lieutenant Graham Gore. Gore told the story of the two years spent by *Erebus* and *Terror* frozen in the ice. He also found the notice of abandonment of the ship by Crozier and Fitzjames. It described the planned journey to the mainland. The Inuit supplied the rest of the story. The skeletons verified the details of the tragedy.

The *Fox* returned to England in 1859. McClintock’s evidence ended the Franklin saga and British involvement in Arctic exploration. In 1866, a statue of Franklin was erected in London, engraved with the words:

*To the great Arctic navigator and his brave companions
who sacrificed their lives in completing the discovery of
the Northwest Passage.*

A.D. 1847–1848

AMUNDSEN NAVIGATES THE NORTHWEST PASSAGE

Roald Amundsen had been a student of the Arctic since his boyhood. He slept with his window open to the Norwegian winter to get used to the cold. As a young man, he read about the Franklin tragedy. He also read about other great Arctic explorers. Amundsen later wrote, “I, too, would suffer in a cause.”

After studying medicine for a while, Amundsen quit medical school to join the navy. After an Antarctic expedition, he returned to Oslo, where he bought a ship. On the 72-foot, 47-ton (21-meter, 42,637-kg) *Gjøa*, he installed a 13-horsepower diesel engine. With borrowed money, he stocked it with five years’ worth of food and supplies. He hired six crewmen: Godfred Hansen, Anton Lund, Peder Restvedt, Helmer Hansel, Gustav Wük, and Adolf Lindstrom. Amundsen’s goal was to sail the entire Northwest Passage.



Shown here is the deck of Roald Amundsen’s *Gjøa* in 1906. Amundsen had become the first person to lead an expedition all the way through the Northwest Passage.

Amundsen left Norway on June 16, 1903. He made his way to Gjøa Haven on the southeastern coast of King William Island. There he remained locked in the ice for two years. During this time, he carried out scientific observations. He was a skilled winter traveler and had brought dogs on the *Gjøa* for his sledging. He made many long sledge journeys and spent a great deal of time with the Inuit. He learned all he could from them about the Arctic.

On August 13, 1905, the ice suddenly opened. The *Gjøa* sailed around King William Island and into Queen Maud Gulf. Then the *Gjøa* navigated the shallow waters of Dease Strait and into Coronation Gulf. They had reached charted territory at last! Finally, on August 27, 1905, just as Amundsen was falling asleep after a watch, he was awakened by a shout: “Vessel in sight, sir.” An American whaler was approaching—from the west! “Victory was ours!” wrote Amundsen in his journal. Ahead lay the Beaufort Sea, Bering Strait, and Asia.

There are things that human beings do that cannot be explained. The 350-year quest for a northwest passage is one of these things. Why would generations of seamen—thousands of officers and crew—willingly submit themselves to the agony of Arctic exploration? The passion that these early explorers brought to their quest was unstoppable.

And so, after all the years, the Northwest Passage was conquered. It did not matter that there was no commercial value to this victory. What was important was that the perseverance, heroism, and suffering of the countless explorers before seemed now to be justified. New challenges lay ahead and they would be faced with equal determination and passion.



4

A Northeast Passage

THE BRITISH HAD STARTED THE SEARCH FOR A NORTHWEST PASSAGE as a way to reaching the treasures of Asia. The hoped-for route lay atop North America and would avoid the long voyage around the tip of South America. The Spanish controlled these southern waters. Spanish ships fiercely fought the efforts of any other nation to pass through them. In time, the Northwest Passage was found, but it proved to be of little use as a trade route. Most of it was too frozen to be traveled by ordinary ships. But long before the dream of a northwest passage faded, there were those who believed that a better, faster pathway to the East existed: the Northeast Passage.

The Northeast Passage would begin at the northern tip of Scandinavia and proceed eastward along the coast of Europe and Asia to the Bering Strait. This strait led to the northern Pacific Ocean. From there would be a short run south to Japan and China. Geographers had no idea how far it was from Norway to the Bering Strait, or from there to Japan. In fact, the existence of a strait between the Arctic Ocean and the Pacific was not even certain. It was merchants in London and Amsterdam who came up with the idea of the Northeast Passage. They knew little about the northeastern part of Russia. They did not know how far north it extended, what kind of seas bordered it, what kind of people, if any, lived there. Even the Russians did not know what lay to the farthest east and north.

EARLY ENGLISH EFFORTS

A group of merchants in London, eager for profits, formed a private company in 1553. They called it “Company of the Merchant Adventurers of England for the discovery of lands, territories, isles, dominions and reynoires unknown.” It became known as the Muscovy Company. The men were interested in any route that led to the riches of Asia. One of the governors of the Muscovy Company was Sebastian Cabot. With his father, John, he had sailed in search of the Northwest Passage. A contemporary of Cabot, a merchant named Gregory Istoma, described a voyage he had taken from the White Sea to Trondheim (northern Norway) in the company of a number of ships on a trading mission. Cabot also noted that there were rumors of established trade between Russian cities and ports on the Scandinavian Peninsula. Cabot reasoned that, if voyages to the White Sea area were possible, then it could not be that much farther to the Pacific.

The Muscovy Company had three ships built for a voyage along the Arctic coast of Russia. The ships’ goal was to reach China. The ships were solidly constructed of seasoned oak and coated with lead for protection against the worms that would inhabit the warm waters of the Pacific. Sir Hugh Willoughby was appointed to command. Richard Chancellor was pilot major and second in rank. The party left London in May 1553. It included 11 members of the Muscovy Company. Sebastian Cabot, being in his seventies at the time, remained in London.

The explorers sailed north around the tip of Norway, and bad weather scattered the three ships. Willoughby, who was very inexperienced in all aspects of seamanship, drifted off course to the north with two ships. They reached about 72° north longitude. Turning east at this point, he ran into an unknown island, Novaya Zemlya. He thought it was the mainland of Russia. He headed off to the north, where he soon met heavy storms and dangerous ice. Willoughby eventually retreated to the Kola Peninsula in western Russia, where he looked for a wintering place. The ships reached land in an uninhabited area. All of the men died over the winter. The cold, exposure, inexperience, and despair of the crew brought an end to the ill-advised adventure.



Pictured is a seal of the Muscovy Company from the mid-sixteenth century. The first English joint-stock trading company, it was an important link between Muscovy (Russia) and England.

Meanwhile, Chancellor sailed east. He reached the Divina River, which empties into the White Sea. There he met friendly and curious inhabitants. Eventually, Chancellor abandoned his search for a sea passage and traveled by sledge to Moscow. He was treated well at the court of Ivan the Terrible. When he returned to England, he set up an Anglo-Russian trading relationship that was carried on for many years.

The Muscovy Company was convinced that China must be very close to the White Sea. It was probably just past the massive island (Novaya Zemlya) that was blocking the way to the east. They were wrong by about 4,000 miles (6,437 km). A mission was organized under

the command of Stephen Burrough in 1556. Burrough was told to get past Novaya Zemlya into what was known as the Kara Sea. Despite the help of some Russian seamen Burrough encountered near Murmansk, he was unable to get past Novaya Zemlya because of its rough seas and what his journal referred to as “monstrous whales.” Another English seaman, James Bassedine, got no further in 1568.

At this point, the Muscovy Company turned its attention to a north-west passage, putting its support behind Martin Frobisher. However, Charles Jackman persuaded the company to pay for one more trip east. Jackman was given command of the *William*, while his friend Arthur Pet was given the *George*. The ships left England on May 30, 1580, and sailed around North Cape. They headed for Novaya Zemlya and mainland Russia. With good seamanship and some luck, they passed into the Kara Sea. They were probably the first non-Russians to visit these waters. Winter was approaching and the ice was already thick and impassable. Between July 23 and August 15, they were trapped in ice. The ships turned back on August 16. On August 22, Pet wrote, “With a great fogge we lost sight of [the *William*] and since we have not seene her.” Pet’s ship made it back to England by December 25. Jackman’s ship wintered at a port along the northern coast of Norway. He set out again in February 1581. The ship with all aboard was lost. Pet told of his discovery to interested merchants in London, and his ship’s journal was published. For the most part, it was a routine mariner’s log. It recorded the depth soundings, directions sailed, weather conditions, fog, and ice, with only the occasional expression of feelings. Translated into Dutch, it was read eagerly by businessmen and explorers in Holland.

THE DUTCH EFFORTS

A Dutchman, Oliver Brunel, had lived in Russia for years, in the White Sea area. He worked as a trading agent for Dutch merchants. He spoke Russian and heard of the journeys of many Russian travelers. Brunel learned that Russian ships regularly made trips from the White Sea to the Ob River and then on further east to the Yenisei River where there was good wintering. This river runs into the Kara Sea near the western edge of Siberia. Russian travelers told Brunel that there was open water beyond the Yenisei River. Brunel was certain that the Pacific was not far from that open water. The truth was far different. East of the Yenisei

lay 3,000 miles (4,828 km) of brutal Arctic coastline before the Bering Strait gave access to the Pacific Ocean.

It was in 1584, with misguided confidence, that Brunel loaded a ship with trading goods and headed east. He turned back before reaching the Kara Sea and smashed his boat to pieces halfway back to the White Sea. Nonetheless, the Dutch were determined to find a northeast passage. In 1594, an expedition was organized under the command of William Barents on the *Mercurius*. His officers were Brandt Tetgales and Cornelius Nay. Tetgales and Nay were to go to the south of Vaygach Island and east into the Kara Sea. Barents was to sail around the northern part of Novaya Zemlya and into the northern Kara Sea. They were then to go as far east as possible, but Barents could not get around the northern tip of Novaya Zemlya. There was too much ice. He returned to the mainland of Russia and learned that Tetgales and Nay had sailed into the Kara Sea. But they had been blocked by ice almost immediately.

Barents still believed that the passage would lie north of Novaya Zemlya, which seemed to block all ships' passage from west to east. When he was made head of an expedition sponsored by Dutch merchants, he and Jan Cornelius Rijp sailed from Holland in 1597. Barents insisted on attempting again to go north of the island, so they parted. Once again the ice stopped him. Suddenly, his retreat was cut off, and the ship was crushed in the ice just offshore of Novaya Zemlya. The crew needed to survive 10 months of winter. They carried stores and tools from the ship and built a huge house onshore.

Early in November, the sun sank out of sight. It was dark for the next three months as the bitter Arctic cold set in. It was unlike any experienced by these explorers. Barents's journal records a typical day: "December 12: extreme cold, so that the walls inside our house and our bunks were frozen a finger thick with ice; yea, and the very clothes upon our backs were white all over with frost and icicles." Incredibly, the entire party survived the winter. By spring, they were weak and suffering from scurvy. In June, as the ice began to break up, the 14 men loaded up the small ships' boats. They began the 1,000-mile (1,609-km) journey to the mainland. Barents wrote in his journal: "Every minute of every hour we saw death before our eyes." Three men died before they reached the Kola Peninsula and by luck encountered Jan Rijp, who

was looking for them. Barents did not survive the journey, and his body was lowered into the sea that now bears his name. For the next 282 years only snow, wind, and polar bears visited the house he had built. In 1879, a Norwegian fishing boat crew found the collapsed house. Its pots, pans, books, and guns were still in place.

After 1600, many people stopped believing in the Northeast Passage. The Muscovy Company, however, wanted to make one last attempt. In 1607 and again in 1608, Henry Hudson sailed around North Cape and then northeast. He showed that it was pointless to go north, toward the North Pole, as a way of getting to the East. But he did not make any progress along the Russian Arctic coast. Then in 1609, Hudson was hired by the Dutch to sail east by first going *north* of the troublesome Novaya Zemlya island, then back south to the mainland and east to the end of Russia. He was not to be paid if he did not follow the explicit orders. This stipulation must have been added because Hudson had made it clear he did not really believe in an eastern passage. Hudson sailed from Amsterdam in his ship, the *Half Moon*. After rounding North Cape and heading north to Novaya Zemlya, the *Half Moon* encountered impossible weather and heavy ice, and his crew refused to go further. Hudson retreated, eventually to pursue his significant exploration in search of the Northwest Passage and his discovery of Hudson Bay. As threatened, the Dutch did not pay Hudson.

THE RUSSIANS LOOK EASTWARD

By the late 1500s, Russian soldiers, called Cossacks, were moving eastward. They wanted to control the vast, unknown land of Siberia. They set up trading posts and settlements along the Arctic coast, but it would be the end of the seventeenth century before the Cossacks had reached and settled the Pacific coast of Siberia. Native groups in northern Siberia, who were as determined as the Cossacks, tried to stop them. The Koryaks and the Chukchi fought the Cossacks in what they considered to be their land. In the meantime, trading went on among the native inhabitants of the 5,000 miles (8,046 km) of Arctic coastline as it always had. Bundles of beautiful furs from the Arctic coast continued to arrive in St. Petersburg: sable, otter, Arctic fox, and seal. It was inevitable that a Russian ruler would decide to explore the potential of the vast unknown region.



Peter the Great, emperor of Russia, sponsored a series of voyages to map the northern sea route to the east. A large section of the Arctic coast of Siberia was charted by Vitus Bering and Aleksei Chirikov. These voyages stimulated fur trading in the region.

Czar Peter the Great (1672–1725) began Russia's exploration of Siberia. Peter was concerned with empire and expansion. He was also interested in geography and knowledge in general. In 1719, he sponsored an expedition to Kamchatka Peninsula on the northeastern coast of Siberia. He wanted to know if Asia and America were joined by a land bridge. The expedition was not successful, but Peter soon organized another mission. It was carefully planned and headed by the best naval officer available. Vitus Bering, a Danish officer who had spent 20 years in the Russian Naval Service, was chosen to command. Bering was experienced in Arctic service and was a master of navigation. Bering's orders were clear but demanding. He was to proceed to Kamchatka and build a boat. Then he was to sail north along the coast of Siberia and see if it joined the coast of America. He was to contact settlements along the way (as well as any ships encountered) and get information wherever he could. Then he was to make charts of everything encountered and return them to St. Petersburg. He needed to bring all of his supplies with him. This included everything he needed for shipbuilding, except wood. Never mind that Kamchatka was 5,000 miles (8,046 km) away, over mountains and bogs and rivers and across Arctic tundra.

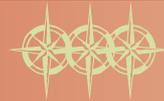
Bering left St. Petersburg in 1724. Part of the journey was made by water along the northern coast, but soon the frozen Arctic waters forced Bering inland. In June 1726, Bering reached the village of Yakutsk, deep inside Siberia. The land had high mountains and endless swamps. Due to the extreme cold and starvation, the final overland push to Okhotsk, on the east coast of Siberia, took a toll of baggage horses and men. Bering built a boat at Okhotsk and sailed it to Kamchatka Peninsula. Bering was afraid to sail around the peninsula, so they crossed it on foot and built another ship, the *St. Gabriel*. Four years after leaving St. Petersburg, Bering was ready to set sail.

Bering visited and named St. Lawrence Island, which is now part of the United States. He then sailed north through a strait, proving that Asia and North America were separate landmasses. Actually, Bering did not see the strait because of heavy fog. Had it been clear at the right time, he might have seen Asia on his left and North America on his right. Based on Bering's voyage, the St. Petersburg Academy of Sciences

published a map that showed Alaska to be an island, with a passable strait running to the east of the landmass and extending all the way to the Polar Sea.

In 1732, Bering joined the Great Northern Expedition. Its goal was mapping the entire Arctic coastline of Siberia. This major project continued for 10 years and was largely successful. Bering himself did not participate in this mapping but instead set out in 1733 with another expedition to the Kamchatka Peninsula, from which base he proposed to sail to North America. It was June 1741 before he left in the *St. Peter*, accompanied by the *St. Paul* under the command of Aleksey Chirikov. The two ships became separated and Bering sailed all the way to the southern coast of Alaska. In July, some of his party briefly landed on an offshore island and also sighted Mount St. Elias, the fourth-highest peak in North America. On his way back to Kamchatka, Bering's ship

THE RUSSIANS AND NORTH AMERICA



Russia's ventures into North America did not end with Vitus Bering's expedition. Even though not all of Russia's claims of discovery are accepted by other nations, there is no denying that for an entire century Russians were active along the coast and interior of Alaska. The Russians claim, for example, that Michael Gvosdev and Ivan Federov were the first to sight the easternmost headland of Alaska that came to be known as the Seward Peninsula. During the next 37 years, the Russians also take credit for exploring the coast of Alaska and discovering almost all of the Aleutian Islands. None of these Russians, however, appears to have ventured very far into mainland Alaska.

By 1784, however, a Russian fur trader, Gregory Shelikof, was establishing the first nonnative settlement on Kodiak Island, just off the Alaska Peninsula. In the decades that followed, countless Russians came to Alaska to advance the Russian fur trade and to explore the coast and points inland. In the early 1790s, Aleksandr Baranov sailed on several expeditions that explored the coast of Alaska. His activities led to his appointment (1799–1818) as the

ran into bad weather. One by one his crew became ill and died. By November, the survivors had reached an island off the Kamchatka Peninsula where Bering died (it now bears his name). Bering would forever be honored as the first European to prove that Asia and North America were not linked by land. He also proved that North America could be reached quickly by sea.

THE NORTHEAST PASSAGE ACHIEVED

It was many years before exploration of the Northeast Passage began again. It was not until 1872 that a serious attempt was made by an Austrian party to find a northeast transit.

Karl Weyprecht and Julius von Payer set off on the sail-assisted steamship *Tegetthof* in July 1872. Their goal was to find a passage to the Far East using a more northerly route than that of earlier attempts. They



first manager of the newly founded Russian-American Company. It became a leader in Russia's fur trade, settlements, Christian missions, and exploration in North America.

Otto von Kotzebue, a Russian of German descent, served on the first Russian ship to make a round-the-world voyage (1803–1806). Between 1815 and 1818, he discovered the sound along the west coast of Alaska that he named after himself. Between 1825 and 1839, Mikhail Teben'kov commanded surveys of the waters along Alaska's coast. In 1829 and 1830, Ivan Vasil'ev, traveling on foot or in small boats, went into the interior of Alaska and explored the drainage region of the Kuskokwim and Yukon rivers. And in 1838, Alexander Kashevarov, also son of an Aleut mother and Russian father, led an expedition that explored the coast of Alaska from Kotzebue Sound to Point Barrow.

As pioneering and worthy as these Russian explorers, expeditions, and findings were, most went completely unrecognized by people outside Russia and Alaska. They have received little notice in most histories of exploration in North America.

had heard that there was open water close to the North Pole. So they headed north, past Novaya Zemlya, where they were soon trapped in ice. For more than a year they drifted back and forth, unable to escape. In 1873, they sighted and landed on uncharted terrain that they named Franz Josef Land. Eventually, they abandoned their ship and managed to safely reach the coast of Norway. They proved that ice conditions were better nearer the North Pole.

Their voyage was studied carefully by a Swedish geologist and explorer, Nils Adolf Erik Nordenskjöld. He, too, wanted to sail the Northeast Passage. He felt confident that he could round the infamous Cape Chelyuskin. No explorer had done this successfully. On the other side was the Laptev Sea. From there, he thought, it would be a month's easy passage to the Bering Strait.

With support from private merchants and from King Oscar of Sweden, Nordenskjöld purchased the steamship *Vega*. He assembled a competent crew and left Sweden on July 4, 1878. After difficult but steady progress, it passed by Cape Chelyuskin (the most northerly part of Asia, closest to the North Pole at about 77° north latitude). The Laptev Sea was at first kind to the travelers. However, by September, snow was falling and ice was building. Less than one day's steaming from the Bering Strait, the *Vega* stopped. It was unable to move an inch in any direction.

The *Vega* was stuck a mile from the mainland. Nordenskjöld piled supplies onshore in case the ship had to be given up. As had many Arctic explorers before him, he listened to the groaning and cracking of the ships timbers and wondered if it could withstand the force of the crushing ice. Meanwhile, he carried out scientific experiments and traded with Chukchi people. At Christmas, a tree was made from driftwood and decorated with flags and candles. Gifts were given to all the crewmen. Food was given to the Chukchis, who had had a poor hunting season.

Signs of spring eventually appeared: birds, cracks broke in the ice, and emerging bare spots from the blanket of snow. Then on July 19, 1879, there was a bump and the *Vega* was freed. By the next morning, it was in the middle of Bering Strait. After triumphant stops in Japan, China, Italy, Portugal, England, France, and Denmark, the *Vega* steamed into Stockholm. It was greeted with a celebration due the first ship to sail

through the Northeast Passage. It was also the first ship to pass around the entire Eurasian continent. After 325 years of attempts, the Northeast Passage had been conquered.

In the many years since Nordenskjöld's voyage, the Northeast Passage has undergone incredible changes. Icebreakers now help hundreds of ships through the passage year-round. A voyage of 10 days from Murmansk to the Bering Strait is not unusual. Thanks to the Arctic route, the development of the Siberian far north has been a spectacular success.

The Race to the North Pole

THE SEARCH FOR SIR JOHN FRANKLIN AWAKENED IN AMERICANS the excitement of Arctic exploration. Some participated in the search, and the public showed a keen interest in their exploits. Almost immediately, the American adventurers turned their attentions to more lofty goals: the North Pole.

AMERICANS TAKE UP THE CHALLENGE

Many of the Americans who tried to reach the North Pole in the second half of the nineteenth century believed the “myth of the open polar sea.” The idea that there was a ring of ice around the Arctic that, once penetrated, gave way to open water to the North Pole had been around for centuries. American Elisha Kent Kane believed in the open sea theory. Kane had sailed north in 1850 in a search for John Franklin. That mission, quickly stalled by icy waters and bad weather, had returned to New York within the year. Although the mission had failed, Kane felt the lure of the Arctic, and he vowed to return. He persuaded Henry Grinnell, a wealthy American businessman, to sponsor another search for Franklin.

In May 1853, Kane set forth on the *Advance*. Unfortunately, Kane had not chosen his crew well. He had picked up a few troublemakers at the last minute from the waterfront. They were later to cause serious trouble for the expedition. In addition, Kane was not a particularly good leader. His health was poor and he was a terrible seaman, given to bouts of seasickness in bad weather. Furthermore, the *Advance* had not been adequately provisioned. There was food for only one year.



After returning from an expedition to search for evidence of John Franklin's expedition, Elisha Kent Kane claimed to have seen the open Arctic Ocean and to have reached the farthest north. Although his claims were later proved false, his tales increased Americans' desire of reaching the North Pole.

The *Advance* had rough sailing in Baffin Bay. Kane wrote in his diary how the ship was torn free of an iceberg to which it had been anchored:

August 20, 1853 . . . the strands gave way with the sound of a gun: and we were dragged out by the wild sea, and were at its mercy . . . at seven in the morning we were close upon the piling masses of ice. . . . Down we went with the gale again, helplessly scraping along a lee of ice seldom less than thirty feet thick.

Along the northwest corner of Greenland, the *Advance* reached land at a harbor that Kane named Rensselaer Harbor, where it was frozen in. Kane describes the food of that terrible winter: “We divided impartial bites out of the raw hind leg of a fox, to give zest to our biscuits spread with frozen tallow.” Kane, despite his frail physical condition, as well as near starvation, scurvy, and the constant threat of mutiny, managed to get through that winter.

In spring 1854, the *Advance* was still frozen in. Kane sent William Morton on an exploratory trip to the Humboldt Glacier. At the time, it was the largest known glacier in North America. Morton was told to look for the “open sea” that Kane believed existed. Morton most likely did not complete the difficult journey to the top of the glacier. It would have been a challenge for an experienced Arctic traveler—which Morton was not. But Morton knew how to stay on the good side of his commander. He told Kane that he had looked north and seen only open water. He said that he saw “not a speck of ice.” This untruthful report stopped Kane from retreating.

The *Advance* did not free up in the thaw of summer 1854. The crew was fed up and openly revolted. Some left the party and headed south on foot. Kane spent the winter of 1854 trying to deal with further mutiny, starvation, and scurvy. At one point, the party began to eat the ship’s rats. By the summer 1855, they had burned most of the *Advance* for fuel. The men took to the ship’s lifeboats to southern Greenland. There they met an expedition sent out to search for them.

Kane returned to New York to a hero’s welcome. Although he had no news of Franklin, he claimed to have seen the open Arctic Ocean and to have reached farthest north. His claims fueled the American dream of reaching the North Pole by an easy sail beyond the ring of ice. When Kane died of a heart attack in 1857, hundreds of thousands of mourners watched his funeral journey from New Orleans to his hometown of Philadelphia.

The quest for the North Pole subsequently began to reach a fever pitch. Isaac Hayes had been one of Kane's officers. Hayes in fact had been the ringleader of the mutineers whom Kane referred to in his journal as a "rotten pack of ingrates." Kane had also written in his diary regarding Hayes, "but-but-but—if I ever live to get home-home! and should meet Dr. Hayes [and the others] let them look out for their skins."

Hayes also believed in the open polar sea. In 1860, Hayes began his exploration aboard the *United States*, heading north to Greenland. As usual, bad weather and the quickly forming ice took its toll. The party was forced to seek shelter at Etah, on the northwest coast of Greenland. Sledge parties were sent out from Etah (with the help of the Inuit because Hayes's dogs had died of sickness), and Hayes later claimed to have reached the Arctic Ocean. In 1867, he published *The Open Polar Sea*. Hayes wrote that he "stood upon the shores of the Polar Basin, and that the broad ocean lay at my feet." He also claimed to have reached as far north as 82°30' N. Both of the claims were later disproved.

The next attempt at the North Pole was by a newspaper editor from Ohio. Charles Francis Hall was fascinated with stories of Arctic life and the mystery of John Franklin's disappearance. This ordinary man had never been further north than New England. He left his wife and two children and went to New York seeking a way of getting to the far north. By July 1860, he had managed to get a lift on a whaling ship to Baffin Island. At his insistence, he was put ashore without money, resources, or any sensible plans. Hall spent two years on Baffin Island. He met an Inuit couple—Joe and Hannah—who were to be by his side until the end of his career. From them he learned how to live and travel in the Arctic. Hall was one of the few explorers who paid close attention to the Inuit.

Hall returned to the United States in 1862. He spent several years raising money for a return trip to the Arctic. He returned to the Arctic in 1864 and spent time at Depot Island, Repulse Bay, and King William Island, sites along Canada's northeastern Arctic territory. He lived with the Inuit, who told him details about the last days of the Franklin mission. With this information, he found many graves and relics missed by other searchers. Hall's discoveries not only resolved the final chapter in the Franklin saga, but also brought about a new attitude toward the reliability of Inuit testimony.

Hall returned to the United States in 1869 and was hailed as a hero. His new fame helped him to finance a major expedition to the Arctic with the North Pole as his destination. On July 3, 1871, Hall left New London, Connecticut, in command of the *Polaris*. On board were a crew of 14 and Joe and Hannah. Hall sailed north, past his familiar Baffin Island. He passed easily through Smith Sound, which had frustrated many whaling and exploration ships. He reached territory visited by Kane and Hayes before him.

Hall kept moving. His team now faced scurvy and serious cold. The *Polaris* neared the northeastern tip of Ellesmere Island. This was land only ever visited by Inuit. On August 30, 1871, the *Polaris* reached 82°11' N. This was the farthest north ever achieved by an Arctic explorer. But the ice finally closed in, and Hall was forced to retreat to the northwestern coast of Greenland. He sheltered for the winter at a place he named Thank-God Harbor. Shortly thereafter, Hall was given a cup of coffee laced with a massive dose of arsenic and he soon died. His murder was presumed, but not proven, to be by the ship's doctor, Emil Bes-sels. To return to civilization, the crew floated on an ice floe for 1,800 miles (2,896 km). Their journey lasted from October 15, 1871, to April 29, 1872. It is one of the most incredible stories of Arctic survival.

RENEWED EFFORTS

Oddly enough, the experiences of Kane, Hayes, and Hall did little to discourage belief in the idea of the open polar sea. The president of the American Geographical and Statistical Society, Charles P. Daly, in a public address, ridiculed the notion that there was open water around the North Pole. In 1870, he backed his arguments up with good scientific evidence, but few listened to him. In 1875, one last expedition went in search of this open water.

The British Royal Geographical Society and the Royal Navy sent George Strong Nares to the North Pole in 1875. Nares had searched for Franklin and had valuable experience in Arctic travel and survival. He had also done some exploring in Antarctica. Nares and the British Admiralty were influenced by Hayes's invalid claim to have seen the open polar sea. However, his voyage was doomed to failure. The Admiralty did not supply his ship with scurvy-preventive food. By early 1876, several men

were dead and 60 were ill from scurvy. Still, the *Alert* reached a latitude of 82°27' N before it was frozen in. Sledge parties were sent out, but the sledges were too small and poorly made. The men had no dogs or snowshoes. No one knew how to build a snowhouse. Besides the heavy, ill constructed sledges, one of the sledge parties struggled with a massive boat that they had no use for. Against all odds the men reached 83°20' N. This was the farthest north ever reached up to that time. When the search parties returned to the *Alert*, only half of the men could walk. Although the expedition had been expected to last two years, Nares wisely returned to England in November 1876 when the spring thaw arrived. His trip had one major result. There was not much belief anymore that the North Pole was surrounded by open water.

After several more disastrous journeys north by explorers such as Major Adolphus Greely and Fridtjof Nansen, the myth of the open polar sea had been cast out. The Pole could not be reached by ship. A whole new way of traveling in the Arctic would have to be found. It was an Italian mission in 1900 that showed that travel in the Arctic must be based on dogs and not ships. Umberto Cagni and three companions traveled with sled dogs from Franz Josef Land to 86°34' N. The party moved quickly, showing the dogs' ability to move over very rough sea ice.

Although it did not reach the Pole, this expedition proved the greater efficiency of dogs over men for hauling supplies over the ice. Furthermore, it used the tried-and-true, centuries-old methods of the Inuit. It ended 200 years of such ill-suited exploration techniques as traveling with horses, mules, and even reindeer. Cagni's party proved something else. Franz Josef Land and Spitsbergen were not good jumping-off sites for a polar attempt. They were too far from the Pole and too hard to get to. The Canadian, not the Eurasian side of the Arctic must be the starting area.

The explorer who would achieve the prize of the North Pole would be a person driven by a passion so intense that the desperate hardship of the quest would not—could not—weaken his resolve. Such an individual must be prepared to battle the Arctic on its own terms. It would be man against nature. It would be man against all that could compromise his will to conquer. Robert Edwin Peary was such a man.

ROBERT PEARY'S QUEST

At the age of 30, Robert Peary dedicated himself to a career in Arctic exploration. During the 1890s, Peary made six expeditions to Greenland. He was searching for the best route to the North Pole. He failed in his first attempt at the Pole in 1904. But he did not give up. He was a determined man. He would either reach the Pole or die trying.

In 1908, Peary was no longer a young man. He was 52, scarred, and crippled by the struggles and ordeals of exploration. He felt that he had given up everything for his quest: a naval career, a serene life with his family, and the pleasures and contentment that might come from a life of achieving more reasonable goals. Shrugging off the disappointment that might have broken a lesser man, Peary set about preparing for his final assault on the Pole. Peary had done his preparatory work well. He knew the route that must be taken. The starting point must be from the northernmost point of Ellesmere Island, Cape Columbia. He had figured out the narrow window that existed between the freezing of the ice and the dangerous spring thaw that opened up leads. And Peary knew that he must use the Inuit ways of travel, eating, shelter building, and clothing. Most of all, he knew to use sled dogs.

Peary had perfected a system of ferrying supplies by support teams: retreating for pickups, advancing with needed food and fuel, then falling back to be replaced by others. One by one, the supporting teams would drop off and return to the *Roosevelt*, anchored at Cape Sheridan. A small party only would make the dash to the North Pole. There were to be five support teams led by Robert Bartlett, Ross Marvin, Dr. John Goodsell, George Borup, and Dr. Donald MacMillan. Each support team was assigned several Inuit dog drivers and from 16 to 24 dogs. Matthew (Matt) Henson, Peary's African-American manservant, was an excellent driver and was also given a dog team. But because Henson's status was that of a servant, not an explorer or scientist, he was not designated a team leader. His services and his dogs were under the direct command of Peary.

Peary's organization worked out. The first units left Cape Columbia on February 28, 1909. By April 1, Peary had reached 87°47' N. He was only 133 miles (214 km) from the Pole. The last support team retreated to base camp. Only Peary, Henson, and four Inuit guides remained. On April 6,



Robert Peary stands on the deck of the *Roosevelt* in full fur clothing. On April 6, 1909, he and his team reached the North Pole. Peary later wrote, "The pole at last! The prize of three centuries, my dreams and ambitions for twenty-three years. Mine at last."

1909, this small band reached the North Pole. Peary made solar observations and Henson took 110 photographs. Peary expressed his feelings in his book, *The North Pole*: “The pole at last!!! The prize of three centuries, my dreams and ambitions for twenty-three years. Mine at last. I cannot bring myself to realize it. It all seems so simple and commonplace.”

MIY PALUK



Matt Henson was born in 1866 to a black sharecropping family in Maryland. Orphaned at 11, he spent a few years on the streets of Washington, D.C., completely on his own. At 13, he went to sea as a cabin boy and rose to the rank of able-bodied seaman in six years. He was working as a stock clerk in a hat shop when Robert Peary hired him. Peary was looking for a personal valet for his explorations, and it was to Henson’s advantage that, although young, he was an experienced sailor. Henson went on to accompany Peary on seven of his eight missions, including his final voyage and conquest of the North Pole. On April 6, 1909, Robert Peary and Matthew Henson stood together at the North Pole.

Through the 17 years of Peary’s and Henson’s shared endeavors, their relationship remained, in every sense, that of servant and master. Despite the many times their lives lay in each other’s hands, Henson was never permitted to think of himself as a companion or a fellow explorer. There is no question, however, that Henson was a valuable member of the various Arctic teams.

Donald MacMillan, an explorer in the final polar quest, wrote later in regard to Henson’s experience and skills: “He was of more real value than the combined services of all of us.” In the 1908 final attempt, Henson served as sledge builder, driver, hunter, carpenter, blacksmith, and cook. Then there were his other duties as valet: cooking breakfast every morning for his boss, taking care of his clothing and gear, ministering to his personal needs, and coming to his aid when his injured leg gave way. Peary never showed gratitude to Henson for his efforts and

After three days, the explorers began the return to the *Roosevelt*. It was a difficult retreat. Leads were opening in the ice. Still, the return was amazingly swift. While returning to New York, Peary heard disappointing news. His rival, Frederick Cook, claimed to have reached the Pole on April 21, 1908—almost a year earlier.



abilities. He took to referring to Henson in derogatory terms to ensure that Henson knew and accepted his place. Henson wrote in his diary that he consoled himself by reading the Bible.

To Peary, Henson was “my colored boy” and “my dark-skinned kinky haired child of the Equator.” To the Inuit, Henson was Miy Paluk, or “dear Matty.” Henson was truly loved by the Inuit because he was a great hunter and dog driver, because he had learned to speak their language, and because he treated them with affection and respect. When the Inuit parted from Maktok Kabloona (black white man), they told him he would be remembered forever for his kindness and strength.

After the expedition’s triumphant return from the North Pole, Henson received a brusque dismissal and the \$25-a-month expedition salary. Peary’s only subsequent public reference to his valet was some disapproving comments about his competence.

Henson returned to a job in a parking lot. Later, he became a messenger, earning \$17 a week. In 1912, Henson published his autobiography, *A Black Explorer at the North Pole*. When he was 71, he was given a membership in the famous Explorers Club. It is not known if he ever went there. It is said that he could not afford the price of lunch. In 1944, the U.S. Congress awarded him a joint medal for his work on the expedition. The Geographical Society of Chicago gave him their gold medal in 1948. Matthew Henson died in 1955. In 1988, he was reburied in Arlington National Cemetery with military honors, a late but fitting recognition of his achievements.

THE COOK CLAIM

Cook, a fellow American, had been on an Arctic mission under Peary in 1891–1892, but the two men did not get along. Cook spent several years as an Arctic guide, working mainly in Greenland. In 1897, he was appointed medical officer aboard the *Belgica*, bound for an expedition to Antarctica. One of the young officers on the *Belgica* was Roald Amundsen, who reported later that Cook won the respect of all hands due to his hard work. In 1907, Cook persuaded a wealthy American, John R. Bradley, to finance an attempt at the Pole. On February 19, 1908, Cook started on his expedition with two Inuit, two sledges, and 26 dogs. According to Cook, they met no particular setbacks and reached the North Pole on April 21, 1908. He then retreated south and spent the winter on Devon Island. Cook returned to his starting point, in Greenland, in May 1909.

Cook maintained that he left his instruments and navigation notes in the safekeeping of Harry Whitney, another wealthy American hunter. Later, some instruments were found, but no notes authenticating his route. Cook was never able to produce evidence to prove that he had traveled to the Pole. Although he was cheered by 100,000 people in a parade in his native city, Brooklyn, in late 1909, the relentless attack upon his claims was kept up by Robert Peary and his supporters. Claims presented by Cook were one by one proven false. In October 1909, Cook disappeared from New York and was not seen for 10 months. When he returned to the United States in 1910, Cook told a reporter, “I still believe I reached the Pole although I am not sure I did.” By the end of 1910, Cook’s claim to the Pole was essentially discredited.

In the decades since, historians have debated over which of these men—Peary or Cook—first reached the North Pole. Many believe that neither explorer reached it at all. Both explorers are faulted for poor navigation and outright lies. The attainment of the North Pole will be forever clouded in doubt and suspicion.

NEW EQUIPMENT

Soon after Peary and Cook’s expeditions, the world was at war. World War I created a short pause in Arctic exploration. Interest in the Arctic began again after the war’s end in 1918. Great technological developments aided northern exploration. The ships themselves were vastly different in

the 1920s and 1930s. The new ships were huge icebreakers with powerful diesel engines. They were less vulnerable to the ice packs. The new ships, giants compared to the old sailing vessels, had more space for storing machinery, fresh food, and supplies. They also had comfortable quarters for the crew. In every way the expeditions were less at the mercy of the weather. Some ships carried their own airplanes. Every ship had a radio, which connected the explorers to the outside world. With reliable charts and maps and improved navigation aids, such as radar, there was little chance of a ship going off course or missing its destination.

The war had brought about great improvements in the design and efficiency of the airplane. Engines were larger and more reliable, and there were many men now skilled in aircraft maintenance. In an emergency, airplanes could be sent to a ship in trouble. Long flights could be made without refueling, eliminating the danger of landings and takeoffs under dangerous conditions. Planes were outfitted with skis, allowing planes to take off and land on snow. By 1925, the “flying boat” was in use. It was able to land on water or even smooth ice.

New land vehicles had been developed that were reliable in cold weather. Some earlier motorized sledges froze after moving only 50 feet (15 m). One model could not handle three inches of snow. Now tank-like Sno-Cats and snowmobiles pulled trailers of fuel. They were able to reach the North Pole from Greenland with fuel to spare.

The aims of polar exploration also had changed. Since the Pole had been achieved by Peary, there were attempts to duplicate the feat in other ways: over the Pole in the air, and under the Pole, beneath the ice. Much of the post–World War I Arctic exploration was carried out by adventurers rather than scientists or explorers.

Also, the war alerted many countries, particularly the Soviet Union and the United States, to the potential strategic importance of the Arctic; therefore, some of the polar activity had a nationalistic motivation to it. The early exploration of the Greenland ice cap in 1912 by native Greenlanders Knud Rasmussen and Peter Freuchen, a Dane, was a scientific mission, as well as a demonstration of Danish sovereignty of Greenland. The British also were active in Greenland. Gino Watkins was the leader of an expedition that established a meteorological observatory in the ice cap. Notable in this expedition was the attempt of Augustine Courtauld to

winter in solitude in a hut on the ice cap. At the last moment, Courtauld was rescued from death by starvation, cold, and a blocked ventilator.

AIRCRAFT IN THE ARCTIC

Practically all exploration in the Arctic and the Antarctic after World War I was carried out or supported by aircraft. Flying over the North Pole today is the same as flying from Paris to London, but it was not always so simple. The first Arctic flights were made by the Russians in Siberia in 1914. They were dangerous in that any serious mechanical breakdown would probably result in death.

The pioneers in Arctic flight were mostly men who had the explorer spirit. Great credit must be given to U.S. naval officer Richard Byrd. He made flying an essential part of polar exploration. Byrd was able to turn his fanatical love of the airplane into a new status for aircraft as a permanent factor in the years to come. His claim to have flown over the North Pole on May 9, 1926, has been questioned over the years, but his feat has not really been discredited. Historians believe that his 1926 polar flight was one of the greatest moments in aviation history.

In 1937, the Russians built a scientific station on the ice near the North Pole. The station's commander was Ivan Papanin. Four airplanes carried many tons of equipment and supplies to it. The program to be carried out was ambitious. They were to carry out magnetic and meteorological observations and biological and physical studies of the sea. Water depth was to be measured all along the path of drift. The living quarters were designed using new materials and ideas. The floor was made from air-filled cushions. The walls were lined with reindeer fur. The floating station drifted from June 1937 to February 1938. The party was picked up by an icebreaker just off the eastern coast of Greenland. Papanin and his three companions were all in good shape. They had recorded an enormous amount of scientific data.

THE POLE FROM BENEATH

One of the most colorful explorers of the twentieth century was an Australian named Herbert Wilkins. He taught himself electrical engineering and cartography. He learned how to fly and became an expert photographer. Fascinated by the Arctic, by 1926, he made a number of



In 1937, drift-ice stations were first used by the Soviet Union for scientific exploration in the Arctic. Today, North Pole, or NP, stations conduct complex year-round research and have housing for polar explorers and special buildings for the scientific equipment.

scouting flights over the Beaufort Sea. In 1928, he became the first pilot to fly across the Arctic from Alaska to Spitsbergen, north of Norway.

Wilkins was the first explorer to try to reach the North Pole under the ice. He leased a submarine from the U.S. Navy for \$1. He fixed the submarine and renamed it the *Nautilus*. He attempted to cruise under the Pole in 1931, but failed. Power, underwater range, and a navigational system were needed for such an exploration. The *Nautilus* had none of these.

All of the necessities were dealt with 25 years later. In 1958, the U.S. Navy built a new submarine, the USS *Nautilus*. William Anderson was its commander. The *Nautilus* had nuclear power, indefinite range, and a new navigational system. It submerged in the Chukchi Sea on August 1

and surfaced in the Greenland Sea on August 3 after a two-day trip beneath the North Pole. The sister ship of the *Nautilus*, the *USS Skate*, repeated the trip in the same year. In 1959, the *Skate* became the first ship to surface at the Pole.

THE POLE CONTINUES TO ATTRACT

Three successful expeditions to the North Pole were carried out between 1968 and 1986. Ralph Plaisted, an insurance salesman from Minnesota, put together a group of people who had never been in the Arctic. On his second trip, he used snowmobiles and was supported all the way by airplane. Plaisted reached the Pole on April 20, 1968. Those who do not believe that Peary or Cook reached the Pole count instead Plaisted's expedition as the first ever to stand at the true North Pole. About one year after Plaisted's victory, Americans walked on the moon.

Other expeditions to the North Pole occurred in the late twentieth century. Others will occur in the future. There will always be a "first" available to those who can think of techniques that no one else has tried before. But the real exploration of the Arctic is done.

All parts of the Arctic Ocean have been mapped or photographed. Today, tourists may stand on the bridge of the *Yamal*, a Russian icebreaker, as the nuclear-powered engines drive the ship over the North Pole. As they do so, perhaps they think of the 400 years of exploration that allowed them to be there.



6

Exploring Antarctica

THE ANTARCTIC EXPEDITION OF JAMES CLARK ROSS (1839–1843) with the *Erebus* and the *Terror* can stand as a symbol of the excitement and exhilaration of the discovery of the hidden continent, Antarctica. A number of other explorers had seen the towering height of icy mountains and the barren rocky peaks that rose even higher. None had stood in the presence of the terrible and awesome beauty that presented itself to Ross as he landed on an island in 1841 (later to be named after him). Ross and his party were struck by the land's natural beauty. They were amazed by the power of nature. Cornelius Sullivan wrote in his journal, "There is a sort of awe that steals over us all considering our own insignificance and helplessness."

As the party sailed west along the shore, Dr. Robert McCormick, the expedition's surgeon, saw what appeared to be a snowdrift. He wrote in his diary, January 28, 1841: "As we made a nearer approach, however, this apparent snowdrift resolved itself into a dense column of smoke, intermingled with flakes of red flame, emerging from a magnificent volcanic vent, in the very center of a mountain range encased in eternal ice and snow." They named it Mount Erebus, after the expedition ship, and a nearby peak was named Mount Terror. Soon after, the explorers came upon a perpendicular cliff of ice. The cliff was 120 to 250 feet (36 to 76 m) high, flat on top and made of solid ice.

The ice was smooth as glass. It rose straight up from the sea and had not one crack or opening in it. It would become known as the Ross Ice Shelf. Nearby, out to sea, the raging ocean tossed gigantic chunks



In 1842, James Clark Ross beat his own Farthest South record when he crossed the Antarctic Circle and located an inlet called the Great Ice Barrier (now called the Ross Ice Shelf). The record remained unchallenged for 58 years. Above, James Clark Ross plants the Union Jack into the Antarctic ice.

of ice against mountain-sized icebergs. Great herds of whales dove around the ships. Ross made a sad prediction about the whales in his diary. These whales “had enjoyed a life of tranquility beyond the reach of persecutors, but would soon be made to contribute to the wealth of our country.”

It was February, and the Antarctic winter was approaching. By mid-March, the *Erebus* and the *Terror* had fought free of the re-forming ice pack and were retreating to Hobart, Tasmania, a safe harbor for the winter. Ross returned to Antarctica two more times, in 1842 and 1843. Although these voyages produced no major discoveries, they sailed along different sections of the coast, identified a number of new landmarks, and produced more charts and geographical data. The *Erebus* and the *Terror* finally arrived back in England in September 1843 without a single crew member having been lost. The exploration was deemed a complete success.

IN THE WAKE OF ROSS

All of the Antarctic explorers of this era had seen such sights as Ross saw. All reported on the incredible beauty of the southern continent. But all also saw no future in this terrible land. No human settlement could ever be possible—or practical. As a result, attempts at exploration in the last half of the nineteenth century were few. The adventurers most often found in the southern ocean were whalers. They were not interested in discovery. They were after the enormous profits reaped by slaughtering the whale herds—in some cases, to extinction.

In 1894, a young Belgian navy lieutenant, Adrien de Gerlache, had written a paper recommending a Belgian expedition to Antarctica. Because the proposed voyage was specifically scientific, Gerlache had difficulty in securing financial backing. Meanwhile, he spent his time raising funds and studying methods of sledging and types of proper clothing and equipment. Finally, in August 1897, Gerlache left Belgium aboard the *Belgica*. He reached Cape Horn in 1898. From there he continued south to the tip of the Antarctic Peninsula. The *Belgica* followed the coast (to the west) of the Antarctic Peninsula. Several times a day, crew members, on boats, would go ashore to gather specimens of rocks and plants. They also caught the wingless insects that inhabit Antarctica. Still heading south, along Palmer Land, Gerlache tried to reach Alexander Land. He probably wanted to best Captain James Cook's farthest point south of 71° S (in 1774), or even Ross's of 78° S. But inevitably, in March 1898, the ice closed in. The ship had reached 71°22' S (300 miles, or 482 km, inside the Antarctic Circle). The *Belgica* was stuck for 347 days. Gerlache and his crew became the first to spend a winter inside the ice pack of Antarctica.

A great deal of scientific work was carried out over the next year, but the first wintering in Antarctica took a terrible toll on the explorers. There was constant darkness and deep cold. The isolation plunged the members of the party into severe depression and psychological instability. Two officers became towers of strength in maintaining morale and order: Roald Amundsen and Frederick Cook, both of whom would later achieve fame for their exploits seeking the North and South poles. In March 1899, the crew freed the *Belgica* from the frozen pack with explosives and ice saws. The explorers returned to Belgium, bringing with them a wealth of scientific data. They shared the valuable information

with the international community. This action set a precedent for a giving spirit that was to characterize future discoveries and findings in the Antarctic.

At about the time that Gerlache was afield, Norwegian explorer Carsten Borchgrevink was conducting scientific research on the other side of the continent. He obtained financial support from various private sources and left London in 1898 on the *Southern Cross*. After a most troublesome voyage, the expedition reached Cape Adare (Victoria Land) in 1899. There, he and nine men built a winter shelter, while the *Southern Cross* retreated to New Zealand. For nine months, Borchgrevink did extensive zoological work and, with dogs, explored the nearby regions. In 1900, Borchgrevink explored the Ross Ice Shelf and with William Colbeck traveled by sledge to 78°50' S, establishing a new farthest-south record. Borchgrevink deserves recognition for being the first to winter over on the Antarctic mainland. His data and his charts of the Ross Sea area provided great assistance to later explorers and helped pave the way to the reaching of the South Pole.

THE ANTARCTIC YEAR

Three international expeditions were undertaken in 1901, which was called “Antarctic Year” by another international geographical congress. A German geographer, Erich von Drygalski, set sail on the *Gauss* in August. The ship became trapped in ice between February 1902 and February 1903 along the side of Antarctica completely opposite the Antarctic Peninsula. This area, the western coast of Antarctica, was almost completely unknown. Drygalski named it Kaiser Wilhelm II Land. Drygalski and his team of scientists set up observatories on the ice floes. Sledging parties were sent inland to collect scientific data. Drygalski himself went up in a balloon to 1,500 feet (457 m) and observed the nearby mountains and the glaciers that fed into the West Ice Shelf. At the end of the polar summer, the *Gauss* was freed from 20-foot (6-m)-thick ice. The party sailed and steamed back to Cape Town.

The second 1901 Swedish expedition was led by Otto Nordenskjöld (nephew of Baron Adolf Erik Nordenskjöld). He sailed aboard the *Antarctica*. The purpose of the exploration was to investigate geological links between the tip of South America and the Antarctic Peninsula. The

expedition was plagued with difficulties, and the *Antarctica* eventually sank. Its crew was trapped for months on a barren island. At one point, Nordenskjöld wrote in his journal, “It is not easy to reconcile oneself to lying here uselessly and to listen to the howling of the storm, and to know nothing but that our provisions are coming to an end and that our poor dogs are becoming weaker.” In 1904, Nordenskjöld and his men were rescued by an Argentine ship. They returned to Sweden with much scientific data and detailed maps.

The most successful of the three 1901 missions was the British expedition. It was headed by Robert Falcon Scott on the *Discovery*. Scott was to follow the path of Ross and explore the region of Victoria Land. The British thought this area was a good starting point for exploration into the interior. The *Discovery* passed through the ice pack and reached the Ross Ice Shelf early in 1902. Scott went aloft in a balloon to 800 feet (243 m), where below he could see his sledging party moving along the top of the shelf, looking for a place to winter. The *Discovery* steamed west to McMurdo Sound. There they found a wintering place on Ross Island.

In October 1902—late spring in Antarctica—Scott decided to make a trek to the south. He probably meant to try to reach the South Pole. He took with him Dr. Edward Wilson and Ernest Shackleton. Shackleton was a young, outgoing Anglo-Irishman. Each man had a sledge and a six-dog team. The going was very rough. The team fought through deep snow, rough ice, scurvy, freezing, snow blindness, and constant hunger. Christmas Day was bleak. Spirits rose when Shackleton produced a Christmas pudding that he had been hiding in a pair of socks. When Scott and the men turned back, they had reached 82°16' S. They were 200 miles (321 km) closer to the Pole than any explorer had previously reached. Scott would write in *The Voyage of the “Discovery”*: “[T]he most imaginative cartographer has not dared to cross this limit.”

When the three men stumbled back to the base, their food had run out and every dog was dead. Shackleton was on his last legs, but had pulled his share up to the final day. He had fallen victim to the lure of the Antarctic and vowed to return again. Scott returned to England in 1904, to great praise. The research accomplished by the scientific staff was massive. It was used by all later expeditions.

THE RACE FOR THE POLE

Ernest Shackleton, recovered from illness resulting from the *Discovery* mission, prepared in 1907 for an assault on the South Pole. After some frantic fund-raising and some last-minute organization of supplies and crew, the *Nimrod* left England and arrived at the Bay of Whales in January 1908. The inlet there was closed, so Shackleton was forced to go to Ross Island in McMurdo Sound. This was Scott's territory, by rights of discovery. Scott had asked Shackleton not to begin his polar quest from there. For Shackleton, however, there was no alternative.

The *Nimrod* retreated to New Zealand for the winter, and the Shackleton party planned three explorations. Two would explore the

DOGS AND TRANSPORT



The Inuit of North America and the indigenous peoples of Arctic Asia had been using dogs to haul sledges for many hundreds of years. They had developed several breeds, all close descendants of the wolf. These dogs are in fact considered the closest relatives of the wolf of all the dog breeds. It is still a custom in the Arctic to tie a female husky to a stake in the wild so that a "visit" by a wolf will produce pups that have the stamina and characteristics of the father. Most huskies, however, are not savage creatures. They may have vicious fights among themselves but will usually not attack their handler.

Husky dogs are loyal to the person who takes care of them. A reasonable driver thinks of his or her dogs before him- or herself. A driver knows each dog by name and by the dog's character. The driver checks the feet of a lame dog or sees to a sore shoulder rubbed by the harness. He or she ensures that each dog gets food and that all dogs are tethered to avoid fights. When all the huskies are bedded down, curled into tight balls and secure from the wind, only then does the driver attend to his or her own needs.

Only one pound of food keeps a dog pulling a sledge for up to 10 hours, with few rest stops. Each dog can pull about 100 pounds (45 kg). A 1,000-pound (453 kg) sledge is hauled by a 10-dog team.

mountains and the Ross Ice Shelf. The third, under Shackleton, would make an assault on the Pole. Four men left McMurdo Sound for the Pole on October 29, 1908. Frank Wild, J. B. Adams, and Eric Marshall were led by Shackleton. They left their dogs behind. Instead, they used man-hauled sledges and Siberian ponies. They spent a month looking for a route to the Pole and by that time much of the food was gone. The four ponies were ill. Not only were they weak and cold, they had developed painful snow blindness. One by one the first three ponies were killed and eaten. The meat from each was buried in the ice for the return trip. Only one pony remained, Socks. On December 2, Socks fell into a crevasse. The men gladly ate the food that had been saved for the pony.



The huskies are put in a harness, and straps on both sides go back to the driver. Several dogs may be harnessed together in a line. The front dog makes a track that the others behind can run in. Other times each dog has its own traces, all of equal length, so that the team spreads out like a fan in front of the driver. The dogs like speed. Each dog pulls hard, with the lead dog showing the way and setting the pace. Sometimes, especially if the going is rough, the driver has to urge the dogs on, sometimes getting off the sled to help lead through rough terrain. If problems are not handled, the whole team could deteriorate into a chaos of tangled harnesses and snarling, fighting dogs.

In 1859, Englishman Leopold McClintock used dogs as well as men to pull sledges in his search for Sir John Franklin. Charles Francis Hall, an American, used dog teams as his main method of travel in his search for Franklin in 1869. Roald Amundsen used the Siberian Samoyed in his race to the South Pole in 1911.

Without the dogs, travel was slow, dangerous, or impossible. Only the rare, exceptional voyager could transport enough food, fuel, and necessities by manpower. Although the snowmobile and other vehicles are used today in the polar regions, the dog will remain an essential element in overland polar travel.

By January 1909, the party had reached 88°23' S. This was a new record. The men were less than 100 miles (160 km) from the Pole. Shackleton knew that to go one step further, however, would eliminate any hope of return. He did not want to die at the Pole. So the explorers returned, fighting through terrible blizzards. At least the sledges were lighter. By now they were empty of food and fuel. They eventually made it home. The expedition was deemed a success.

In 1910, Roald Amundsen and Robert Scott were separately sailing to Antarctica. They had a common goal: to reach the South Pole. On Scott's ship, the *Terra Nova*, were 65 men, 33 dogs, 19 Siberian ponies, 3 motorized sledges, and mountains of scientific equipment. His plans called for experiments and observations. He also wanted to make trips inland. When he heard the Amundsen was heading south, he did not alter his schedule. He was not to be pushed into a race.

In 1910, Amundsen had just set out for the North Pole when he heard of Peary's success there. He immediately headed to Antarctica to be the first to reach the South Pole instead. On Amundsen's *Fram*, there was no mountain of scientific instruments. Where instruments and motor sledges might have been was a special "air-conditioned" deck built for dogs to keep them in tip-top condition. The *Fram* carried 97 dogs. They were handpicked and the best that money could buy. And there were only 19 men, specially chosen as well. They included the best dog team drivers Amundsen could find.

Amundsen chose the Bay of Whales area as his base, based on careful research into the experiences of earlier explorers and his knowledge of polar geology. He knew that the gently sloping ice there was stable. It was also 60 miles (96 km) closer to the Pole than McMurdo Sound, where Scott went. (In the end, 60 miles might have made an enormous difference to Scott.) Furthermore, the weather was better at the Bay of Whales.

By February 1911, Amundsen and his men had built a 26-by-13-foot hut they called Framheim. It was well insulated, with a bunk and stool for each man. Two stoves kept the interior warm and cozy. There was plenty of food. From Amundsen's base, a good route to the Pole was available. The men immediately placed food depots along the route. Each depot was marked with a snow beacon placed every five or six miles to identify the trail. (A snow beacon is a trail marker made of

shiny material that in sunlight shines like a bright light.) The markers were visible for miles. They could be seen even in a snowstorm. Winter was fast approaching. By the time the last depot was placed, the temperature had dropped to -52°F (-46°C). The sun had sunk, not to be seen again for four months. The men retreated to the Framheim to prepare for the attempt when spring came.

What lay ahead of Amundsen? First there was the Ross Ice Shelf. After 400 miles (643.7 km) of that, they would reach “land.” This land was rock covered by two miles (3.2 km) of ice cap. Then there were the glaciers leading to the mountains (Queen Maud Range), some of which rose to 16,000 feet (4,876.8 m). Finally, there was the central frozen plateau. The dangers there were unknown. All in all, 870 miles (1,400 km) of terrain lay between Amundsen and the Pole.

The party left in early September, but soon returned when the temperature dropped to -72°F (-57°C). Five weeks later, spring had really come. On October 19, 1911, five men began the quest: Helmen Hansen (an outstanding dog driver), Oscar Wisting, Sverre Hassel, Olav Bjaaland, and Amundsen. From the start, it was clear that this was to be an easy trek. The sledges were lightly loaded because the depots of food awaited them. The dogs pulled with gusto. The drivers were pulled along swiftly on skis.

As the edge of the Ross Ice Shelf was reached, the men realized they were over land. The slope became slightly uphill as the mountains that lay between the ice shelf and the central plateau loomed into sight. The weather was good, and the temperature never dropped below -30°F (-34°C). The way now was marked by crevasses. Most were hidden by innocent-looking drifts of snow. They were deadly to dogs and men. Many of the crevasses were so deep that the men could not see the bottom. This was the most difficult part of the journey. Amundsen reached a pass between mountains. He spotted a glacier that led to the central plateau. He realized that this was his avenue through the mountains to the plateau on top. Just before leaving the mountain range, there was a brief but sad pause. Here, 24 of the dogs were killed. They were no longer needed to pull sledges. Instead, they were fed to their surviving mates. Any man who had depended on these faithful creatures for his survival could face such a moment only with extreme regret and sadness. As the first shots were fired, Amundsen would later write, he remained in the

tent stirring a big cooking pot with a big spoon, making as much noise as possible, drowning out the sounds. Amundsen also wrote that his men named the site “Butcher’s Shop.”

When the high plateau was reached, victory was just a matter of careful navigation. On December 8, the party passed Shackleton’s “farthest-south” point. They put a Norwegian flag on the front of the lead sledge. On December 14, 1911, Hanssen, driving the lead sledge, asked Amundsen to walk in front. He told him that “the dogs run better with someone in front of them.” Thus, the men ensured that Amundsen was the first to cross the South Pole. Amundsen described it in his book, *The South Pole*:

After we had halted we collected and congratulated each other . . . After this we proceeded to the greatest and most solemn act of the whole journey—the planting of our [Norwegian] flag. . . . I had determined that the act of planting it—the historic event—should be equally divided among us all. It was not for one man to do this; it was for all who had staked their lives in the struggle, and held together through thick and thin . . . Five weather-beaten, frost-bitten fists they were that grasped the pole, raised the waving flag in the air and planted it as the first at the geographical South Pole.

The return to base was almost ridiculously easy. The party followed the trail, marked with snow beacons and flags, with ease. The depots were still stocked with food and fuel. The men were annoyed that Amundsen limited their speed to seventeen and a half miles per day. The dogs were eating biscuits now and even chocolate. They were gaining weight. Never had such an expedition been carried out with such ease. Amundsen called it luck. Others called it a masterful job of organization, preparation, and discipline. The men sailed back to celebrations in Norway. At the South Pole, the men had left a tent. Inside

(opposite page) Roald Amundsen and Robert Scott departed from their base camps within two weeks of each other. This set off an official race to the Pole. Scott reached the South Pole on January 17, 1912, only to find that Amundsen had preceded him by five weeks.

Road Amundsen's and Robert Scott's Routes to the South Pole, 1911–1912



there were two letters. One was to King Haakon VII of Norway. The other was addressed to Captain Robert Falcon Scott.

SCOTT'S FINAL WEEKS

On February 2, 1912, as the *Fram* was beginning its victory voyage home, Scott was writing in his journal: "Friday, February 2nd, three out of five of us injured. We shall be lucky if we get through." They were huddled in a tent, low on food. They were lower on fuel. Scott's party was pinned down by bad weather and physically broken down. Scott must have realized that about 700 miles (1,126 km) lay between the worn-out explorers and base camp. It was 700 miles that they could not possibly survive.

On January 17, Scott and his team had reached the South Pole. They found the evidence of Amundsen's earlier arrival. The five disappointed explorers began the 900-mile (1,448-km) trek back to base. Nothing went well for them. Supplies of food and fuel at the depots were short. Smaller amounts of food per day were eaten. The weather had turned bitterly cold and stormy. On February 17, the first man died quietly in the tent. Two others were suffering from snow blindness. One man's feet had been frozen for weeks. They had turned completely black, and it was a miracle that he could walk. One day he went out into the blizzard and was not seen again.

The blizzard continued throughout March. The weather was severe, even for summer in Antarctica. The wind kept the men in the tent. On March 20, the three remaining explorers were just 11 miles (17 km) from a depot. It contained plenty of supplies. In the tent was fuel enough for two cups of tea per man, but no food. Survival time outside was perhaps 100 yards (91 m), because of the wind. The 11 miles might just as well have been 100. Scott wrote messages to the families of his companions. He wrote of their strength and bravery. On March 29, Scott wrote in his journal:

Great God! This is an awful place and terrible enough for us to have laboured without the reward of priority. . . . We took risks, we knew we took them. . . . Had we lived, I should have had a tale to tell of the hardihood, endurance, and courage of my companions. These rough notes and our dead bodies must tell the tale.

On March 31, Scott's final message "to the public" ended this way: "It seems a pity but I do not think I can write more. R. Scott Last entry. For God's sake look after our people."

The search party came in November 1912. It found the three men peacefully lying in the tent, covered by snow. The tent was lowered over them and a cairn was built above. The grave is now at least 50 feet (15 m) under the snow and 20 miles (32 km) nearer the edge of the Ross Ice Shelf.

MAWSON'S ACHIEVEMENTS

Douglas Mawson began his expedition to the southern continent in December 1911. Mawson had been asked to join Scott's mission, but he had declined. He had his own scientific exploration in mind. Mawson, an Australian geologist, had accompanied Shackleton on his 1907 "farthest-south" journey. In 1909 he had been first at the South Magnetic Pole with Edgeworth David and Alistair Mackay. Thus, at the age of 29, Mawson had significant Antarctic experience. Mawson wanted to explore Adélie Land, which had not been visited since Dumont d'Urville discovered it 50 years before. He planned to send out parties to the east, the west, and south toward the Pole. They would not, however, try to reach the South Pole.

Mawson's ship landed on Cape Denison. The site was a rocky, uninviting spot along an icy coast with little shelter. The night of landing, the wind reached 70 miles (112 km) per hour. It was several days before the men could go outside.

The Adélie Coast was a place where the winds poured down from the Polar Plateau. The wind in that location is as violent as any on Earth. Mawson named his base the "Home of the Blizzard." The men learned to walk at a 45° angle into the wind. They always wore crampons and carried ice axes. They also learned to communicate with hand gestures and signs. There was no point in trying to hear voices in howling wind.

Somehow the men managed to build their living hut and a few buildings housing scientific equipment. They raised a radio mast time after time. Each time the wind ripped it down. Eventually that task was securely completed, and the party settled down to wait for spring. They gathered around the stove while the wind outside whipped up to 200 miles (321 km) per hour.

In November 1912, five parties set out from base camp. Mawson with B. E. S. Ninnis and Xavier Mertz traveled east. They crossed over two large glacier tongues and explored and mapped the Oates Coast. The two glaciers were a great hazard because Antarctic glaciers hide the trekker's worst nightmare: the crevasse. Sometimes dogs can sense a crevasse. Sometimes an explorer can tell from the sound of his or her pole striking the surface that there is a hollow beneath. Sometimes there is no warning.

On December 13, Mawson repacked his two sledges. The lead sledge was the one most likely to be lost in an accident. On it he placed a 10-day supply of food. On the rear sled he placed the tent, the dogs' food, and most of the men's food. These were the most needed items. The next day, Mertz, in the lead, found a snow bridge. He and Mawson crossed safely, but suddenly Ninnis and the six best dogs disappeared without a sound. "For three hours," wrote Mawson, "we called unceasingly but no answering sound came back." They were 317 miles (510 km) from base with food for 10 days and no tent.

Mawson's journey back—alone because Mertz died soon after—is certainly one of the most terrible stories in all of polar exploration. There were times when Mawson was tempted to give up but against all odds he returned to Cape Denison.

The 15 scientists who were on Mawson's mission produced a lot of data deemed by the international scientific community to be of great importance. The most difficult and hostile part of East Antarctica was now on the map. Mawson returned to Antarctica in 1929 and in 1930. He followed the coastline of King George V Land to Enderby Land, charting about 1,000 miles (1,609 km) of the coast. Sir Douglas Mawson must be considered one of the greatest explorers of Antarctica. His contributions are equal to those of any modern human in advancing knowledge of the southern continent.

SHACKLETON'S EPIC VOYAGE

In 1911, it was still not known whether Antarctica was one massive piece of land or two large islands. In 1914, Ernest Shackleton planned the British Trans-Antarctic Expedition. The scope of the operation was most ambitious. Three groups, under Shackleton on board the *Endurance*, were to establish a base as far south as possible in the Weddell

Sea area. From there, one party would strike out for the east, another to the west (toward Graham Land on the peninsula). The main party, led by Shackleton, was to travel due south, cross the South Pole, and approximately follow Scott's return route to McMurdo Sound. A huge portion of interior Antarctica would, as a consequence, be explored by this three-pronged attack.

A support ship, the *Aurora*, under the command of Aeneas Mackintosh, was sent directly to McMurdo Sound. From Scott's old base, the crew would establish depots of food and supplies. Shackleton would desperately need these supplies for the last stage of his trek over the Pole.

On August 1, 1914, Shackleton left London on the *Endurance*. The group who would sail to McMurdo Sound was already on their way to Tasmania, where they would pick up the *Aurora*, loaded and ready for their part of the vast exploration. Shackleton, with the experienced and reliable Frank Wild as his assistant, reached the South Georgia Islands (in the Scotia Sea off the southern tip of South America) at the end of October.

In January 1915, the *Endurance* struggled south in the Weddell Sea. The ice became more and more impossible. The ship approached the coast of Luitpold Land. It was 80 miles (128 km) offshore when it became stuck in the ice. The *Endurance* would never be free again.

Huge pressure ridges twisted and crushed the doomed ship. The movement of the ice in this area was relentless. Shackleton wrote in his classic account of this expedition, *South*, "We seem to be drifting helplessly in a strange world of unreality." By October 26, 1915, the ship had been trapped by the ice for 280 days. It had moved 573 miles (922 km) to the northwest. The men began to evacuate the ship. Supplies were unloaded, and the men were soon living on the ice in what Shackleton called Ocean Camp. Among the items saved were 120 glass plates with photographs taken by Frank Hurley. These would provide dramatic documentation of the expedition.

Shackleton knew they should strike out for land somewhere, but with 28 men and three heavy boats weighing more than a ton each, travel was next to impossible. Attempts to drag the boats overland by pulling the boats and supplies by dogs and men never resulted in more than one mile per day. On November 21, Shackleton called out, "She's gone, boys," and the *Endurance* sank. The men were now alone on the frozen Antarctic Ocean. On New Year's Day 1916, the crew celebrated



Ernest Shackleton and his crew worked constantly to free the *Endurance* from its trap in the icy Weddell Sea. The men chipped away at the ice with picks, saws, and chisels, but the ship could not break free. Above, dogs watch the *Endurance* in the final stages of its drift shortly before it sank to the bottom of the Weddell Sea.

by having cups of cocoa all around. It was the last of that delicacy. The men were not yet starving. Now and then a seal or penguin was shot. But one by one, the dogs were killed and eaten. “It was the worst job,” wrote Shackleton, “that we had throughout the Expedition.” The next four months were a nightmare of living on breaking-up ice floes and narrow escapes in the three boats when they entered water leads as they opened up. Their goal was to reach Elephant Island. This barren, rocky place lay off the tip of the Antarctic Peninsula.

On April 15, 1916, the island was sighted. With great difficulty, the three boats landed. The men kissed the beach. After all, it had been a year and a half since they had set foot on land. That night, wrote Shackleton, they enjoyed a “safe and glorious sleep.” On April 24, Shackleton set out with five men in one of the boats. He promised to return with a rescue ship.

Shackleton was a leader—“the Boss.” He took responsibility for his crew. The crew of the *Endurance* understood this sense of duty. They knew he would get them off the ice. They knew when he left them to go for help that he would return. “Lash up and stow, boys, the Boss may come today,” was Frank Wild’s wake-up call every morning to the men stranded on Elephant Island. And one day, August 30, 1916, a ship appeared. A small boat pulled toward shore. A man was standing on the bow. It was the Boss. His first words were: “Are you all well?” And the answer was, “We are all well, Boss.”

Shackleton had made it to the whaling station at the South Georgia Islands through 800 miles (1,287 km) of the most storm-ridden seas in the world, in a 22-foot (6-m) open boat. There followed a two-day hike overland to a Norwegian whaling station. It then took four attempts to get through the ice back to Elephant Island.

While the aims of the trans-Antarctic mission had not been met, Shackleton’s 1914 expedition has been called a “glorious failure.” Shackleton did not return immediately to Europe. He hurried to McMurdo Sound in aid of that section of his party. They had had a dreadful time. Two members of the expedition did not survive. When he did finally return to England, Shackleton served in World War I. After the war, he set off on another polar mission in 1921. At Grytviken, South Georgia, he suddenly died. He was 48 years old. He is buried there, beneath the mountains he crossed to seek rescue for his comrades.

It would be more than 40 years before a trans-Antarctic crossing was completed. Briton Vivian Fuchs and New Zealander Sir Edmund Hillary teamed up for the crossing in 1958–1959. They walked from the Weddell Sea to the Ross Sea via the South Pole. The Fuchs party consisted of 10 men. They had four Sno-Cats (heavy-duty treaded vehicles), three Weasels (lighter treaded vehicles), and a muskeg tractor (a farm tractor, modified to move through deep snow or over ice). Hillary established depots from McMurdo Sound to the Pole. The two explorers met at the Pole. Fuchs continued on to the base on McMurdo Sound. He reached it in February 1958. He had trekked for 99 days and 2,158 miles (3,472 km).

AERIAL EXPLORATION AND RICHARD BYRD

The airplane soon became the primary tool for exploration. A low-flying plane could photograph and map an area of undiscovered territory in 20 minutes that a land party might spend three months doing. Richard Evelyn Byrd led a huge aerial exploration in 1928. Byrd was a U.S. Navy officer. He had flown over the North Pole in 1926. He now planned to fly to the South Pole. He also intended to survey the whole continent. On the advice of Amundsen, he took along 95 dogs. Later, in his account of this expedition, *Little America*, he wrote: “I can see now that the wisest thing we ever did was to insist on bringing them.” His two ships, *City of New York* and *Eleanor Bolling*, carried dogs, three airplanes, and tons of coal and airplane fuel. They also carried 1,200 boots and 1,200 pounds (544 kg) of cookies.

Byrd left New Zealand in summer 1928. His base was near the Bay of Whales. By January 1, 1929, a station was built, Little America. It had three main buildings, many small huts for research use, three hangars, storage places for airplane fuel, and a cluster of high radio masts. In mid-January, Byrd made his first flight. In an hour, he photographed 1,000 square miles (2,589.9 square kilometers) of Antarctic territory never seen before.

The winter passed uneventfully. The men were comfortably dug into their cavelike quarters. They had plenty of food and radio contact with New York. On September 1, they learned that the temperature in New York City was 94° F (34° C). Outside the radio hut, the thermometer read –63° F (–52° C).

Spring arrived in October. The land parties left on motor sledges that lasted 80 miles before they broke down. Then the dogs took over. On November 28, the weather was fine at Little America. The Queen Maud land party radioed in that the weather was fine and clear at and beyond the mountains ringing the central plateau. The airplane took off for the Pole after noon, with Byrd as navigator. Bernt Balchen was pilot. Harold June operated the radio, and Ashley McKinley took photographs. They reached the plateau safely. At 1:14 A.M., they passed over the Pole. The explorers returned to Little America the next day. Byrd was the first person to fly over both the North Pole and the South Pole. What Amundsen and Scott had done in months, Byrd had accomplished in 16 hours. In that time, he had seen more of Antarctica than Scott and Amundsen had in their entire careers. The *New York Times* observed, “A new dimension has been added to the exploration of our planet.” From this point on, there would be no significant exploration in Antarctica that did not involve the use of the airplane.

ANTARCTICA BECOMES INTERNATIONAL

By the 1940s, nations began claiming pieces of the southern continent. Argentina, Chile, France, the United States, Great Britain, Norway, Sweden, the Soviet Union, and Germany, among others—each wanted a share. They rushed to set up scientific bases. The U.S. Navy in 1946 appointed Admiral Richard Byrd head of Operation Highjump. He sailed to Antarctica with 13 ships, 23 planes, several helicopters, and 4,700 men. Only 24 of the men were civilian scientists. The rest were military personnel. By 1957, there were 40 stations on the continent. There were 20 more on the subantarctic islands.

U.S. president Dwight D. Eisenhower wanted an agreement among nations in regard to Antarctica. In October 1959, 12 nations met. They came up with one of the most incredible documents in human history. In the Antarctica Treaty, the nations agreed to share Antarctica. The opening sentence of the treaty states: “[I]t is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord.” Antarctica would be a haven for scientific work. It would help provide all the people of the world with knowledge of their world—past, present, and future.

The Evolution of Polar Exploration

THE GREAT ARCTIC EXPLORER VILHJALMUR STEFANSSON BELIEVED that reaching the North Pole should not be the only goal of Arctic exploration. He believed that explorers needed to lay the groundwork for future discoveries. This attitude should serve as a reminder that the attainment of the North pole as well as that of the South Pole was the result of centuries of Arctic and Antarctic activity and exploration. Getting to the North and South poles was an expression of personal ambition. Genuine exploration is more a quest for knowledge and understanding of things not yet found or understood.

The spirit of exploration is not necessarily a pure, lofty, noble thing. There was usually some more basic reason why explorers went off into the unknown. Perhaps it was a story about a sea passage that led from England directly to the riches of Asia. Perhaps it was tales of rich furs, whales, or seals. The profit motive was certainly behind the expeditions that went in search of the Northwest Passage. It was a strong factor in the voyages of the whalers and sealers who sailed the Antarctic seas and first set foot on Antarctica. However, in polar exploration, the profit motive was soon left behind. Ernest Shackleton, for example, first went to Antarctica to make money. He ended up as one of the greatest heroic explorers of all time.

THE MOTIVE FORCES

There have always been those human beings who were dissatisfied within the bounds of the safe, known world. Perhaps it is basic human

nature to strive to know the nature of the physical Earth. Long before the Northwest Passage was finally found, it was known that it was too frozen to be useful. Yet the search continued with increased passion. Why did the quest for the North Pole attract generations of explorers, leading many of them to their deaths? The Inuit knew that there was nothing there. They thought the explorers' mania for that useless spot was madness.

The lure of the frontier is simply the desire to go beyond the edge of what is known. And there is a particular satisfaction in being the first to do so. In all Arctic and Antarctic exploration, being the first to see or do something was the most important goal. It is hardly noted who was the second person to reach the North Pole. Many American polar explorers did not even intend to try for the North or South Pole. They were satisfied with a "farthest north" or "farthest south." Doing this ensured them a hero's welcome upon their return.

Many of the explorers who were the first to visit unknown places speak of the thrill of discovery. What fabulous things there were to see! Sir Martin Frobisher in 1576 sailed into a bay of Baffin Island. He convinced himself that he was seeing America to the west and Asia to the east. Members of James Clark Ross's expedition in 1841 experienced the grandeur of the Transantarctic Mountains. These sights justified all the preceding hardships. All polar explorers felt the thrill of discovery. They saw herds of reindeer on the Siberian tundra. They saw the aurora borealis. All these things and a thousand others were new and amazing to the explorers' eyes.

The Arctic and the Antarctic were regions of strange and eerie beauty. The thousands of drawings and paintings, and later photographs, are evidence of how impressed the generations of explorers were with the beauty of the polar regions. It was as though the explorer was seeing nature in its purest forms. It was powerful and indifferent to the attempts of people to master it.

Many expeditions of the nineteenth and twentieth centuries took along artists, and later photographers. It was their job to record the sights that so impressed the explorers. Interestingly, many of the drawings were of storms at sea. They show towering black mountains of ocean about to drop on the frail, wind-tossed vessels. Other favorite scenes show the pack ice jammed up into pressure ridges higher than



The Aurora Borealis (light displays in the sky produced by a collision of charged particles) glows in the Greenland town of Kangerlussuaq. Also known as the Northern Lights, it is most visible closer to the poles due to the longer periods of darkness and the magnetic field.

the ship. They threaten to smash the imprisoned ship into matchsticks. Many an artist also painted the setting Arctic sun. The sun is a thing of rare beauty when it will not be seen again for half a year. A storm at sea is a terrible thing of beauty when it is survived. Seamen can later boast of getting the best of nature at its worst. There were softer, more ordinary beautiful things in the polar regions, too. The Arctic has more than 1,000 varieties of flowers. In the brief summer, they bring a carpet of color to many of the Arctic islands. The ever-changing colors of crystal-like Antarctic icebergs are a memorable sight. Many explorers have written about the beauty of the Arctic winter night. The sky contains countless bright stars. The air is so clear and cold that the observer seems to be seeing and hearing forever.

But all beauty in the polar regions is tinged with danger. There were only a few polar explorers who did not fear the dangers of their

expeditions. But there were fewer, or perhaps none, who came back from a polar expedition and announced, "I never want to go there again."

Understanding the lure of the Arctic and the Antarctic is difficult. The rewards of discovery were always mixed with the possibility of disaster and death. There is no doubt that polar exploration was popular with the explorers themselves. Regular people, too, eagerly awaited the news of discoveries. They welcomed the return of their heroes with parades, honors, and fame.

FORESIGHT AND PREPARATION

The expeditions of the seventeenth century could be excused for not knowing how cold the Arctic was. They did not know their ships would be frozen in over the winter. But what explains why Sir John Franklin's party, in 1845, wore top hats on the ice? And how could a newspaperman from Cincinnati like Charles F. Hall leave for the North Pole?

Before the twentieth century, just getting to the Arctic and Antarctica was an ordeal. Many expeditions failed before reaching the polar regions. There is no other form of exploration where mistakes are so likely to result in casualties. There were those explorers who understood and accepted the inherent danger of polar exploration. Franklin had already suffered through a disastrous mission in the Arctic when he demanded to be made leader of his famous final exploration, from which he never returned. It is safe to say that explorers of the eighteenth century and later knew the hardships they would face. The knowledge did not stop them.

Certainly they knew about the conditions to be found at the South Pole. Anyone who got through the pack ice surrounding the southern continent had already experienced the worst weather the planet had to offer. There was no reason to think that the continent itself would be any better. It turned out, in fact, to be more terrible than could be imagined. The Russian station Vostok is located on the central plateau. It records temperatures of -130°F (-90°C) and lower. Explorers learned to live under these and other hostile conditions. They adapted just as the expeditions to the Arctic eventually had.

Despite the hardships, the explorers of the polar regions kept on. Great credit must be given to the leaders and generations of hearty crewmen who time and time again ventured into regions where certain

UNPREPAREDNESS



The plain fact is that the early explorers were hardly prepared for Arctic exploration. They were without charts and maps and had no real sense of the weather conditions they would encounter. How long was an Arctic summer? Explorers were to find that it was very short, as they spent an unexpected winter frozen in ice eight feet thick and that daily threatened to crush their fragile wooden sailing vessels. The unknown doomed many expeditions. A passage might be open for one winter and then be impassable for the next five.

In addition, there was no effective communication. If a ship were frozen in or lost, it might easily be a year before that was known and another year before a search was begun. Often the search vessel would be marooned or lost as well. Navigational instruments and skills were not adequate for Arctic travel, and the ships themselves were not made to withstand the destructive force of Arctic storms and ice packs that could crush like eggshells the frail wooden planks of the deck and hull.

In the early decades of Arctic exploration, very little was known about the clothing required for Arctic travel. Wool was the preferred material. However, once wool becomes wet and freezes, it is useless. Finally, in the mid-eighteenth century, explorers copied the Inuit. They wore animal skins and furs. Even then food was a problem. Scurvy killed more Arctic mariners than did cold and exposure. Franklin, in 1845, carried a three-year supply of rations. He had 1,000 pounds (453 kg) of raisins, 900 pounds (408 kg) of lemon juice, and 170 gallons (643.5 liters) of cranberries. These items were to prevent scurvy. But in the seventeenth century, such stocks of fruit were not taken. The result was an outbreak of the disease on almost every mission.

Thus it was that many of the expeditions were doomed to failure from the beginning. Some limped back to Europe with no success. Others ended tragically with great loss of life. Success went to those explorations where the ingenuity and perseverance of the leader was a match for the unexpected and unfamiliar hazards of the Arctic territory.

hardship and possible death could be the outcome. With a little luck, success and discovery might reward the dedicated labors of the heroic explorer.

THE PRESENT AND THE FUTURE OF THE ARCTIC

In 1990, the International Arctic Science Committee (IASC) was formed. All the major nations of the world, not just those in the polar region, participated in this organization. It encouraged all forms of Arctic research. In 1991, the Arctic Environmental Protection Strategy (AEPS) was established. It helped preserve the environment in the Arctic. The AEPS finds areas of unique ecological systems or of some other interest to scientific investigation. It grants them special protection. These two agencies are nongovernmental. They have international cooperation, not competition, as their preferred approach.

The placing of research stations in the Arctic is somewhat of a problem. The Arctic is largely water, not land. Most of the stations are located on the rim of the Arctic Ocean. All are at or above the Arctic Circle. The Canadians have stations at Resolute Bay and on the shore of the Beaufort Sea. The second station studies the continental shelf. The Americans have stations at Toolik Lake and Barrow in Alaska. These research centers study Arctic ecosystems and climatology. Russia, Sweden, Norway, Finland, Denmark, and Iceland also have stations throughout the Arctic. Each has its own special interests.

Scientists also study the history, evolution, and characteristics of the Arctic peoples. Experts have done extensive work on the literature written in and about the Arctic. A great deal has been written about the history of Inuit art. An industry has developed in the collection of ancient and contemporary objects of art. All in all, an enormous wealth of knowledge has resulted from the opening of the Arctic. Such knowledge is the aftermath of exploration.

THE PRESENT AND THE FUTURE OF ANTARCTICA

From the beginning of Antarctic exploration, wintering on the southern continent was a necessity. Explorers built bases there for current and future operations. Robert Falcon Scott's base was in use for many



Environmentalists have expressed concern about waste left by researchers at Antarctic scientific stations. Pre-1980s disposal methods have left polluted sites in the mostly unspoiled Antarctic. A 1998 agreement committed all countries working in the Antarctic to remove all waste unless the action of transporting it would cause more environmental damage. In this 1997 photo, scrap and abolished vehicles are seen near the Japanese Showa base in Antarctica.

years and many explorations. Ships, and later airplanes, supplied the bases. The explorers left behind learned how to survive the cold winters. They burrowed into quarters under snow or ice. The Americans built the Amundsen-Scott Base at the South Pole. At about the same time, the Soviets established Sovietskaya base. They later built Vostok on the Polar Plateau, the coldest place on Earth. By 1971, there were more than 40 occupied stations on Antarctica. The bases are well attended by aircraft. They are well stocked with scientists in all fields. The scientists work in cooperation with one another. They freely exchange data. They meet at conferences to test their findings before an international audience.

The discoveries of the many research centers are extensive. Scientists study ozone depletion and marine life (whales and seals). They study the age, history, and former conditions of the continent itself. Each year brings about new and unsuspected findings. In 2001, it was discovered that warm water lakes exist a half mile under the South Polar ice cap. Modern scientific exploration is almost as exciting as the tales of Scott and Shackleton.

The torturous voyages and treks across the polar wilderness may be a thing of the past. But today's wonderful discoveries will always have the Franklins, the Scotts, the Amundsens, the Pearys, and the Byrds as their foundation. Perhaps the Canadian explorer-seaman Captain Henry Larsen, steaming through the Northeast Passage in 1944, most aptly described the present age and its relationship to earlier times: "Tribute is due to those early explorers; their sacrifices and exploits blazed most of the trail we took."

Chronology

1576

Martin Frobisher makes voyage from England to the New World to look for Northwest Passage. Reaches Baffin Island off of northern Canada.

1607–1611

On four separate voyages, Henry Hudson reaches Greenland and Spitzbergen, Novaya Zemlya, in the Arctic Ocean; sails from Nova Scotia down to present-day New York Harbor, then up the waterway now called the Hudson River; reaches Hudson Bay in northeastern Canada on fourth

Timeline

1675

Antonio de La Roché discovers South Georgia Island and Clerk Rocks while rounding the tip of South America

1728

Vitus Bering proves that Asia and North America are separate landmasses

1845–1849

John Franklin maps almost two-thirds of northern coastline of North America

1607

1607–1611

Henry Hudson reaches Greenland; reaches Hudson Bay in northeastern Canada

1839

Charles Wilkes names “Antarctica” and proves it is a continent

1854

1850–1854

Robert McClure becomes first to circumnavigate the Americas and to transit the Northwest Passage

voyage before his crew puts him and eight others in a small boat and is left to die.

1675

Antonio de La Roché discovers South Georgia Island and Clerk Rocks while rounding the tip of South America.

1728

Vitus Bering proves that Asia and North America are separate landmasses.

1772–1774

James Cook circumnavigates the globe at high southern latitudes, reaches farthest-south record at that time, and crosses the Antarctic Circle three times.

1819–1820

William Parry finds starting point of Northwest Passage.

1878
Nils Adolf Erik Nordenskjöld becomes first to sail through the Northeast Passage and pass around the Eurasian continent

1900
Umberto Cagni proves the greater efficiency of dogs over men for Arctic exploration

1903–1906
Roald Amundsen becomes first person to lead an expedition through Northwest Passage

1910–1912
Roald Amundsen is first person to reach both the North and the South poles

1914–1917
Ernest Shackleton rescues the *Endurance* crew on Elephant Island and the *Aurora* crew in McMurdo Sound

1917

- 1829–1833** James Clark Ross locates the position of the North Magnetic Pole on the Boothia Peninsula in far northern Canada.
- 1839** Charles Wilkes names vast landmass “Antarctica” and proves it is a continent.
- 1841** James Clark Ross discovers the Ross Sea, Victoria Land, and the Ross Ice Shelf (formerly Victoria Barrier).
- 1845–1849** Sir John Franklin and his party maps almost two-thirds of northern coastline of North America. Disappears while on an expedition to chart the Northwest Passage.
- 1850** Edwin J. DeHaven finds John Franklin’s campsite on Devon Island and his wintering spot on Beechey Island. There are three gravesites for the first fatalities of the mission.
- 1850–1854** Robert McClure becomes the first to circumnavigate the Americas and to discover and transit the Northwest Passage.
- 1853–1854** John Rae makes solo walks through the Arctic and finds evidence of what happened during the last days of John Franklin’s expedition.
- 1878–1879** Nils Adolf Erik Nordenskjöld becomes first to sail through the Northeast Passage and pass around the Eurasian continent.
- 1888** Fridtjof Nansen crosses Greenland ice cap from east to west.
- 1900** Umberto Cagni proves the greater efficiency of dogs over men for Arctic exploration.
- 1903–1906** Roald Amundsen becomes first person to lead an expedition all the way through the Northwest Passage.
- 1908** Frederick Cook claims to be the first to reach North Pole, but is later discredited.
- 1909** Robert Peary reaches the North Pole; Matthew Henson becomes first black man to reach the North Pole.

1910–1912

Roald Amundsen reaches the South Pole. He is the first person to reach both the North and the South poles.

1910–1913

Robert Falcon Scott leads five-man team to the South Pole only to find that Roald Amundsen's team had beaten them by 34 days. Scott and his men perish on the return from the Pole.

1914–1917

Ernest Shackleton leads Imperial Trans-Antarctic Expedition. After the *Endurance* is crushed and his men are stranded on Elephant Island, Shackleton and five companions rescue his crew. He later rescues the stranded crew of the *Aurora* in McMurdo Sound.

Glossary

Admiralty—In the United Kingdom, the department of the government that once controlled the Royal Navy.

antipodes—Ancient Greek name for the inhabitants of the southern continent, Antarctica. In Greek, the term means “opposite feet,” a reference to the fact that the ancients believed the feet of any people living on the “bottom” of the globe must have faced in the opposite direction of people’s feet in the Northern Hemisphere.

archipelago—A sea or smaller body of water containing many islands; also a group of such islands.

Beaufort scale—This scale rates the speed of winds on a scale from 0 to 17. 0—“calm”—is less than 1 mile (1.6 km) per hour; 6—“strong breeze”—is 25–31 miles (40 to 49 km) per hour; 12 to 17—“hurricane”—is 74 miles (119 km) per hour and above.

cairn—A pile of stones or ice blocks, four to seven feet (1.2 to 2 m) high, used as storage for food, clothing, or messages, or as a grave. Most important, a cairn was used as a marker or signpost.

calving—The process by which the leading edge of a glacier breaks off into the ocean and floats away as an iceberg.

fool’s gold—A mineral (pyrite) containing iron disulfide; in its natural state, it has yellowish particles that have often misled people to think it is gold.

gill—Four fluid ounces in U.S. system of measurement (closer to five U.S. ounces in the British system).

glacier tongue—A floating, narrow extension of a glacier; eventually the extended end of it will break away and float off as an iceberg.

hard tack—A hard baked biscuit made of little more than flour and water; it was the standard ration on ships at sea because it did not spoil easily.

head—The outermost part of a projection of land into the surrounding water.

- homeothermous**—From the Greek for “same temperature,” it refers to maintaining a relatively stable body temperature independent of the environment.
- horst**—A raised rock mass, surrounded on both sides by a fault or a break in the stratification.
- hydrography**—From the Greek for “water recording,” the scientific study of bodies of water.
- ice floe**—A moderate-size piece of floating ice.
- ice pack**—The ice covering large areas such as the entire Arctic Ocean in winter. It is always in motion, and with warm weather and severe wave action, it will break up into pack ice.
- ice shelf**—A glacier (or ice sheet) that has built up at the coast, sometimes to a depth of 200 feet (60 m) or more. As it extends further out into the water, it still remains attached to the coast. When its furthest edge is no longer sufficiently supported underneath, it breaks off and becomes a tabular iceberg.
- krill**—A group of tiny shrimplike marine animals that form the main diet of certain whales, penguins, and other creatures that feed in the ocean.
- lead**—Pronounced “leed,” a width of open water that opens in the pack ice. A lead may vary from a few inches to hundreds of yards. Leads may open up and close quickly, without warning.
- muskeg**—A farm tractor, modified to move through deep snow or over ice; the motor was adapted to start and function in extreme cold. The muskeg was mainly used in Antarctica.
- pack ice**—Sheets of ice, sometimes smooth, but more often jammed together in layers and heaps, always in motion by wind and sea action.
- pemmican**—A foodstuff prepared from meat from which all fluid has been evaporated. The dried fibers are then mixed and pounded with an equal weight of animal fat (and sometimes with dried berries or nuts). The resulting product is nourishing and lightweight and will not spoil.
- peninsula**—A body of land surrounded by water on three sides and connected to the mainland by a narrow strip known as an isthmus.

point—A small landmass that protrudes out from the shoreline into the surrounding water.

pressure ridge—An irregular ice form on a frozen ocean or sea caused by sheets of ice forced together. Since there is no place for the colliding ice layers to go, they usually buckle upward.

protozoa—A large group of single-celled, usually microscopic organisms.

rookery—The breeding ground on land for birds or sea animals.

sledge—A vehicle with runners like a sled but drawn by work animals such as dogs or horses; it is used to transport loads across snow or rough ground.

Sno-Cat—The work-horse vehicle of polar travel since the 1940s, this vehicle has an enclosed (warm) cab, and two steel treads front and back. The Sno-Cat can deal with almost any terrain, but it requires a lot of fuel.

snow beacon—A trail marker, or a locator of provisions stocked for a return trip. Made of shiny and reflective material, it shines like a light in the sun and is highly visible during a snowstorm as a dark object.

snow blindness—Temporary blindness caused by exposure of the unprotected eyes to the glare of sun reflecting off ice and snow. The blindness and excruciating pain lasts for several days.

snow bridge—A thin covering of snow over a hidden crevasse. A snow bridge is usually unable to support a person, let alone a dog team.

sound—A passage of water connecting other bodies of water. The term, as used as a place-name in the Arctic, is hardly distinguishable from a strait. Sometimes sound is used when a large body of water is connected to a smaller one.

strait—Water that connects two other larger bodies of water. In the Arctic and the subarctic, straits, because they tend to be shallow, were often frozen solid the year round.

tundra—The permanently frozen Arctic terrain between the frozen ice cap to the north and the forest to the south; it supports only low-growing vegetation.

ventifact—A large stone mass, shaped into sculpturelike figures and objects by wind-blown sand. Ventifacts are found in the dry valleys of Antarctica.

Weasel—A lightweight motorized vehicle with steel tracks, made to travel over ice or through heavy snow.



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<http://astro.uchicago.edu/cara/southpole.edu>

Established an observatory on the South Pole in 1991 to research the Antarctic. The center's scientists perform experiments and share their results via the Internet with classrooms around the world.

Ernest Henry Shackleton

<http://indigo.ie/~jshack/ernest.html>

Site operated by Jonathan Shackleton, a descendent and family historian of the Shackletons.

Exploratorium: Origins—Looking Into Our Search for Beginnings, Antarctica: Scientific Journeys from McMurdo to the Pole

<http://www.exploratorium.edu/origins/antarctica>

Live Web casts, features, and notes from the South Polar region about life in Antarctica.

The Frederick A. Cook Society

<http://www.cookpolar.org>

Web site about the life of Frederick A. Cook, American Polar explorer.

Matthew A. Henson

<http://www.matthewhenson.com>

Site created by Matthew Henson's descendents in Greenland. Features audio files, family photographs, Arctic photos, and other types of information about the Arctic.

Robert E. Peary and Matthew Henson Foundation

<http://pearyhenson.org>

An educational resource for students, teachers, and parents about polar exploration and explorers Peary and Henson.

Robert Falcon Scott

<http://www.south-pole.com/p0000089.htm>

Biographical Web site about the explorer and the Discovery and the Terra Nova expeditions.

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