

# ANTARCTICA AND THE ARCTIC CIRCLE

A Geographic Encyclopedia  
of the Earth's Polar Regions



ANDREW J. HUND, EDITOR

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of the Earth's Polar Regions**

*Volume 1:A-I*

Andrew J. Hund, Editor



Santa Barbara, California • Denver, Colorado • Oxford, England

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# PREFACE

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The polar regions are the most frigid, desolate, and seemingly inhospitable places on the earth. To many people, the polar regions are simply a frozen wasteland that offers little but danger and treachery, while others see only the Arctic for its riches in natural resources. Some people view the frozen lands as a tranquil, captivating, and awe-inspiring place of wonder. Still others have been calling the Arctic home for thousands of years. This interdisciplinary two-volume alphabetically organized encyclopedia has about 350 entries covering polar region topics within the humanities (history, linguistics, and religion); social sciences (archaeology, anthropology, indigenous studies, economics, geography, political science, and sociology); natural sciences (space sciences, earth sciences, life sciences, chemistry, and physics, especially astrophysics); and the applied sciences (environmental studies and forestry, law, military sciences, and transportation).

This encyclopedia covers the Arctic and Antarctic lands, including the abandoned, uninhabited, and presently inhabited places in the Arctic, the disputes between countries over the various lands and island territories, and the continental shelf ownership. The Canadian Archipelago, Franz Josef Land, New Siberian Islands, Hershel Island, and Greenland in the Arctic are discussed. Some of the Antarctic geographic places include the Antarctic Circle, Antarctica Ice Sheet, Antarctic Peninsula, East Antarctica, Transantarctic Mountains, Antarctic volcanoes, West Antarctica, Vinson Massif, Lake Vostok, the Lambert Glacier, and the Paulet, Ross, South Sandwich, and Snow Hill Islands to name only a few.

The original inhabitants of the Arctic region are the central feature of this work. The Northern indigenous groups' history, ways of life (past and present), and world view are highlighted throughout the work. The various cultures of the Northern indigenous people include the Aleuts/Unangax, Chukchi, Dolgans, Enets, Eskimos, Evens, Evenks, Eyak, Gwich'in, Inuit, Ket, Khanty, Koryak, Mansi, Nenets, Nganasan, Sami, Selkup, Siberian Yup'ik, and Yukaghir, which provide a unique window into Arctic life throughout time. The sociopolitical issues of the Northern indigenous groups within their respective countries and the world are examined. Some examples are the recent Inuit lawsuits over climate change, sovereignty and policy issues (past and present), and present political realities for the Northern indigenous groups.

Mixed in the entries are the early Europeans expeditions to the polar regions. Some of the first explorers are highlighted as are the 3 major Arctic expeditions and the 16 major expeditions that make up the Heroic Era of Antarctic Exploration.

The explorers and their triumphs and tragedies are highlighted. Some explorers are well known (Amundsen, Bartlett, Cook, Nordenskjold, and Shackleton) and others are not so well known (Crean, Klënova, Henson, and Gerritsz). The commonly known expedition tragedies are discussed as well as lesser known ones, such as the lost patrol, the Eskimo Coast disaster of 1885, B52G Stratofortress crash of 1968, the Lena Massacre of 1912, the human impacts on the Antarctic wilderness, the radioactive iodine (I-131) human experiments in Alaska, and the Ogotoruk Creek, Alaska radioactive tracer experiment.

The polar regions are the lands of unique animals. Some of the unique animals that live in the polar regions include the Arctic fox, Arctic ground squirrel, Arctic hare, Arctic salmon species, caribou, lemmings, musk oxen, polar bear, and wolverine. The grolar bear species is also highlighted as well as human's use of animals for subsistence and dogs in the Arctic. Prehistoric animals such as dinosaurs and Mesozoic marine reptiles that once roamed the Antarctic region are included. The prehistoric animals of the Arctic include the baby woolly mammoths, woolly mammoth, Yukaghir mammoth, and even a ginger mammoth. There was even an Arctic camel.

The various birds unique to each of the polar regions include Antarctic penguins (Adélie's, chinstrap, emperor, gentoo, king, macaroni, and rockhopper);, Arctic seabirds; seals from both polar regions, such as the Antarctic fur, bearded, crabeater, harp, hooded, leopard, ribbon, ringed, ross, southern elephant, spotted, and Weddell seals; and many songbirds (Arctic redpoll, Lapland longspur, snow bunting, etc.) and birds of prey (gyrfalcon, snowy owl, etc.) that are characteristics of the Arctic. Special attention is given to how animals survive in the frozen lands.

Beside seals, the other marine mammals of the polar regions include the beluga, bowhead, Gray's beaked, gray, humpback, long-finned pilot, narwhal, northern bottlenose, southern bottlenose, southern right, and sperm whales. Also included are the Orca and two sharks (Pacific sleeper and the Greenland shark). Whaling is discussed as is a tragic whaling fleet disaster in 1871 in Alaskan waters. The special nature parks and reserves for the Arctic wildlife, such as the Arctic National Wildlife Refuge (ANWR), Bylot Island Migratory Bird Sanctuary, Chamisso Wilderness, Gates of the Arctic National Park and Preserve, Northeast Greenland National Park; Lena Delta Wildlife Reserve, Tukut Nogait National Park, and Vuntut National Park of Canada are discussed. There are also international laws protecting the polar regions, such as the Protocol on Environmental Protection to the Antarctic Treaty and the United Nations Convention on the Law of the Sea.

Throughout this encyclopedia, the main characteristic of the polar region is *ice*. Topics covered include ice shelves in both polar regions. The Antarctica Ice Sheet is covered extensively through many entries. Entries are also focused on how ice cores are collected and analyzed, and provide a glimpse into the earth's past climates. The classification and monitoring of icebergs as well as how ice is formed

are included in the discussion. The polar desert and the ice domes Argus, Charlie, and Fuji (Valkyrie) are unique features of Antarctica as is the Arctic drifting ice stations. There are even entries on pink snow, Blood Falls Glacier, and a boat made of ice and saw dust called “Pykrete.” Ice worms, the hibernating abilities of the Arctic wholly bear caterpillar, and the microbial critters’ survival in the cryosphere are also discussed.

The flora of the polar regions are considered, with topics such as Arctic botany, Arctic shrub range expansion, benthic community, climate change and invasive species proliferation in the Arctic, and tundra. Another unusual topic is the snowless McMurdo dry valleys of East Antarctica. In addition to these traditional topics, the encyclopedia covers general science knowledge about the polar regions, such as the three definition of the Arctic, boreholes, pingo formation, magnetic field and longitude, radioactivity in the Arctic, cryoprotectorants, Erebus crystal formation, polar night, and the midnight sun. Unique science topics include how to launch a rocket, the freezing point of a chemical substance, and meteorites in Antarctic.

The marginal seas of the Arctic and Antarctic are covered in detail. These include the Amundsen, Bellingshausen, Ross, and Weddell Seas as well as the Barents, Beaufort, Chukchi, East Siberian, Greenland, Kara, and Laptev Seas. The disputes linked to these seas are also discussed, such as the Arctic shipping, the Beaufort Sea dispute, sector principle in the Arctic, and the Northwest Passage claims and disputes. Beneath the seas are also examined such as the Arctic basin and the continental shelf claims in the Arctic. The rivers and watersheds flowing into these marginal seas are included, such as the Colville, Indigirka, Kolyma, Khatanga, Lena, Yana, Ob, Pechora, Yenisey, Mackenzie, and Yukon Rivers. The effects of human’s interactions on these waters are discussed with such entries as environmental legacy of Novaya Zemlya, nuclear waste in the Arctic, the nuclear tests at Novaya Zemlya, and the sunken Soviet/Russian nuclear submarines.

The various human activities taken place in polar regions are also highlighted, such as the growing tourist industry, the effects of natural resource extraction/development, and influence of climate change on Arctic and Antarctic ecosystems. The polar institutes and the research being conducted in the polar regions are discussed. Some of the research stations and institutes included are the Alfred Wegener Institute, Amundsen–Scott South Pole Station, Bharati Research Station, Dirck Gerritsz laboratory, King Sejong Antarctic Station, and Vostok Station.

Lastly, the encyclopedia also covers topics above the land and seas and include atmospheric and astrophysics topics such as Arctic air pollution, Arctic haze, atomic detonations and weapons in the Arctic, aurora australis, aurora borealis, aurora sound, auroral substorm, grasshopper effect, geospace, incoherent scatter radar, the polar ionosphere, rocket ranges in the Arctic; solar energetic protons

(SEPs), solar winds, and space weather. The effect of climate change and the introduction of invasive species, melting of permafrost, ice caps, and glaciers are examined. Lastly, it is hoped this work will result in people having a better appreciation of the polar regions and even inspire young minds to become a researcher in the polar regions.

*Andrew J. Hund*

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# INTRODUCTION

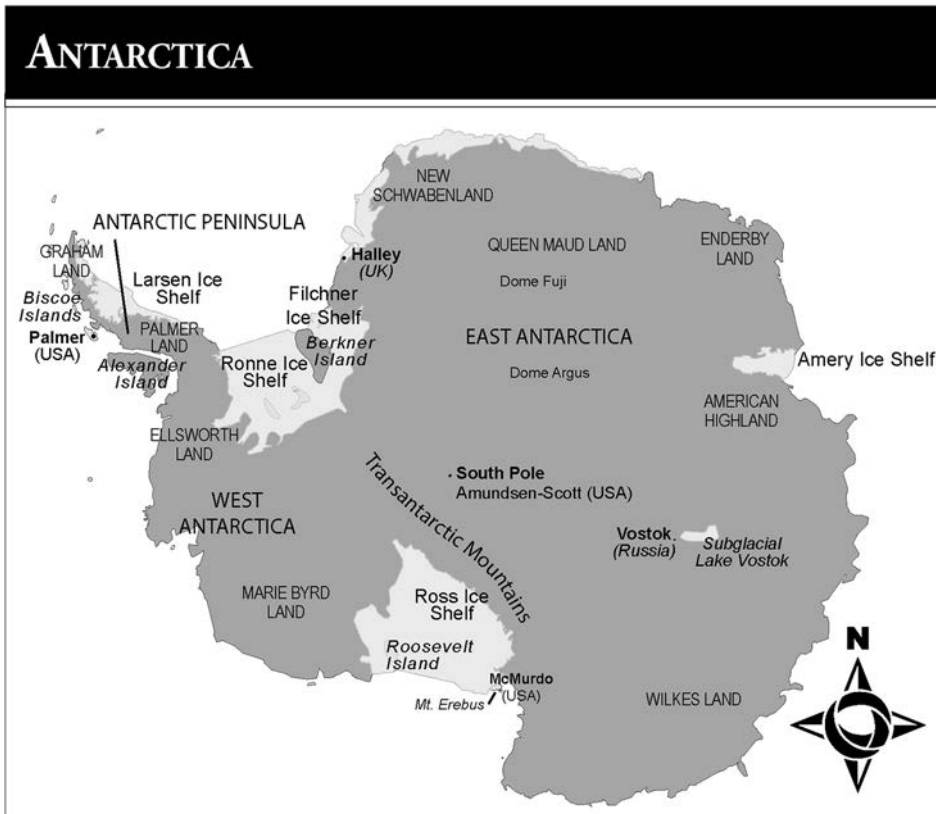
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Polar regions are considered to be the most frigid, desolate, and seemingly inhospitable places on earth. Light and temperatures are extreme and ever changing throughout the year. Summers are short and winters are long, and most of the Arctic terrain consists of large mountain ranges separated by enormous distances that consist of fields of tundra, glaciers, and impassable river systems, which rest atop large areas of permafrost. Antarctica is barren and predominately ice covered. To many people, the polar regions are simply frozen wasteland that offers little but danger and treachery. To others, the frozen lands are tranquil, captivating, and awe-inspiring places of wonder. Some value the Arctic solely for its abundance of natural resources for capital gain, while others value the Arctic as a sacred, interconnected ecosystem that must be protected to maintain a natural/subsistence way of living that has sustained peaceful polar societies for thousands of years. Modern science has also revealed that diverse plant and animal species had developed sophisticated genetic adaptations to survive in the polar regions. Invariably, the study of polar regions contributes to a vast and fascinating repertoire of human knowledge that beckons further study and seemingly serves as a self-perpetuating source of inspiration for learning in several different areas.

The study of polar regions offers a rich historical account of early inhabitation, exploration, and trade in Arctic and Antarctic regions. The Northern indigenous people were the first humans to settle in and call the Arctic home. After that, the earliest explorers to the Arctic were the Vikings, who voyages pre-dated those of other Europeans by several hundred years. Erik the Red is perhaps the most famous Viking known to have traveled to Greenland around 982, even though other Norsemen are believed to have traveled to Greenland prior to that time. European Exploration into the polar regions started during the “Age of Discovery,” or what is sometimes called the “Age of Exploration.” The Age of Discovery began in the early fifteenth century and ended in the seventeenth century, a period that represented a noteworthy span of time between the Middle Ages and the Modern Era. This time period started around 1453, when the Ottoman Empire captured Constantinople. In 1494, the Treaty of Tordesillas was signed, and with it, the trade links between Europe and Asia were cut off. With the loss of access to the profitable Asian markets, Europeans began exploring the world by sea and land with the intention of locating new trade routes to Asia.

During the Age of Discovery, attempts to travel and explore every corner of the world were undertaken, and with these attempts, a wealth of new cartographic





knowledge was gained. This new knowledge was distributed widely via Johann Gutenberg's (1395–1468) invention of the printing press in 1452. New maps and knowledge about the world included the Americas, Oceania, and the polar regions. The new information about the existence of these other largely unexplored parts of the world captured popular imagination and inspired expeditions, some described of a heroic nature. Those persons willing to travel to largely unexplored regions of the world commonly lacked the necessary resources and were thus dependent on governments and wealthy benefactors for providing the vessels, supplies, and men to carry out the expedition. Nations and benefactors sought a return on their investment in the form of precious metals (e.g., gold and silver) and trade goods (e.g., tea, silk, textiles, and spices).

A trade route to Asia that would bypass the Ottoman Empire was highly desired by the Europeans because the journeys around Africa or South America, though possible, were extremely time consuming. Naturally, European merchants sought a shorter trade route. At the time, the two possible shorter alternate trade routes were the Northwest and Northeast Passages. These routes had not yet been established,

so many explorers were sent out with the distinct goal of locating these passages. In 1497, King Henry VII of England enlisted John Cabot (1450–1499) to search for the Northwest Passage. The Northwest Passage is a series of Arctic maritime passages from the Atlantic to the Pacific running through the northern waters of Canada and North America (Alaska). The Europeans also sought to find a suitable Northeast Passage, that is, a trade route from Atlantic and Pacific over northern Russia. One of the first to locate the Northeast Passage was the Englishman Hugh Willoughby in 1553.

Navigating the Arctic waters for an Asian trade route proved to be more of a challenge than the Europeans had envisioned. Early explorers who searched unsuccessfully for the Northeast and Northwest Passages were Richard Chancellor (1533), Martin Frobisher (1576), John Davis (1587), Willem Barentsz (1554), John Hearne (1769), Semyon Dezhnev (1648), James Cook (1776), and George Vancouver (1793). Notable Northwest Passage expeditions included the Baffin (1616), Foxe (1632), and Middleton (1746) explorations. During the eighteenth and nineteenth centuries, other expert land and sea explorers continued to search for the northern maritime passages, including Joseph Billings (1785), William Edward Parry (1819, 1821, and 1827), Peter Warren Dease (1836–1839), Ferdinand Petrovich Wrangel (1820), Pyotr Fyodorovich Anjou (1820), and John Ross (1829). All failed to locate an Asian trade route. Collectively, these early polar explorers experienced extreme weather conditions and were mostly ill-prepared for traveling, which resulted in unnecessary mishaps, tragedies, and even death from various illnesses (e.g., scurvy, starvation, and exposure to the cold).

In 1851, Robert McClure (1807–1873) was credited with being the first to discover the Northwest Passage, but his route was not passable. In 1854, John Rae (1813–1893) discovered a usable passage. In 1845, the Franklin Expedition under the command of John Franklin (1786–1847) attempted to navigate the passage, but the vessels HMS *Erebus* and HMS *Terror* became trapped in the ice, and the crews of about 130 men perished by the late 1840s. The search for Franklin and his crew was monumental and helped popularize the dangers and adventure of Arctic exploration. Some of the Franklin search expeditions were the Rae–Richardson Polar Expedition and the expeditions led by James Clark Ross and William Pullen, all in 1848; and those led by Saunders in 1849; Horatio Austin, Erasmus Ommaney, William Penny, and John Ross in 1850; Edward Belcher and Edward Augustus Inglefield in 1852; John Rae in 1854; and Francis Leopold McClintock in 1857.

The Northwest and Northeast Passages were not successfully crossed until the early twentieth century. In 1906, Roald Amundsen and his crew of six spent three years successfully navigating through the Northwest Passage in the small ice-fortified fishing ship, the *Gjøa*. Boris Vilkitsky (1885–1961) was the first captain to successfully lead a Russian expedition from Vladivostok to Arkhangelsk with the icebreaker vessels *Taymyr* and *Vaygach*, in 1915. In 1909, Robert Peary became



the first person to reach the North Pole (90° N). Unfortunately, Peary’s North Pole accomplishment is accepted only by some.

During the Age of Discovery, a great deal of knowledge about the Arctic was discovered with less known about Antarctica. A significant reason for this was that Antarctica did not have a trade route nor did it lead to the prized Asian markets. Early exploration in Antarctica was limited to whalers and the occasional explorers. Some early explorers to venture near Antarctica included Ferdinand

Magellan (1520), Anthony de la Roché (1675), James Cook (1773), and James Clark Ross (1839–1843). The first explorers to discover Antarctica were Fabian von Bellingshausen, Edward Bransfield, and Nathaniel Palmer in 1820. An American sealer and captain, John Davis, is believed to have been the first person to set foot on Antarctica in 1821. The next confirmed people to set foot on Antarctica included Alexander von Tunzelmann, a New Zealander, and Henrik Johan Bull and Carsten Borchgrevink, both from Norway. They landed in 1895, 74 years after Davis.

In 1895, the Sixth International Geographical Congress (1895) passed a general resolution claiming that Antarctic was the last unexplored area on the earth. The European countries were no longer searching for trade routes, so the focus became showcasing the honor, status, and prestige of a particular country. In short, the explorations to Antarctica served nationalistic purposes. The resolution of the Sixth International Geographical Congress sparked nationalistic rivalries and launched 16 major expeditions, as well as numerous scientific and geographical quests. Some of the early vessels became ensnared in the ice, trapping them for extended periods of time or even crushing them. Media coverage of the Antarctic explorations and tragedies popularized and highlighted the difficult and seemingly hopeless rescue missions in the harsh frozen Antarctic region as well as personified individual courage, bravery, and, at times, impetuous actions. These reports made heroes of the explorers and helped solidify the idea that the polar regions were a place for ensuring bravery, manhood, and even bravado. The primitive nature of modes of transportation and technology used during these early expeditions resulted in heroic feats of human endurance. Collectively, the expeditions resulted in 17 people losing their lives (13 died during service and 4 from expedition-related illnesses). This period of time in Antarctic history is called the “Heroic Age of Antarctic Exploration” and lasted roughly 20–25 years. Nonetheless, the politics of early exploration and discovery in polar regions offers a treasure trove of excitement for connoisseurs of ironic accounts of history, survival, and heroic adventure.

The heroic age ended with the Imperial Trans-Antarctic Expedition or Endurance Expedition (1914–1916) or with Shackleton’s death during the Shackleton–Rowett Expedition (1921–1922). The achievements during the heroic age were considerable in regard to gaining scientific knowledge and in the mapping and exploration of coasts and the interior of Antarctic, and also saw the reaching of the South Pole and the traversing of numerous ice shelves, mountains, volcanoes, and glaciers. After this time period, the explorers commonly used modern machinery for exploration and expeditions.

During the 1940s and 1950s, activities in the polar regions were primarily military based. For example, the U.S. Navy directed several operations in the Antarctic, such as Highjump (1946–1947), Windmill (1947–1948), and Deep Freeze (1955–1956). In 1943, the British military conducted Operation Tabarin” After World War II,

the U.S. military regarded the Arctic as a vitally and strategically important region for U.S. defense forces. The U.S. military conducted Operation Chrome Dome and Operation Iceworm, and set up the DEW line and conducted nuclear tracer and radioactive iodine experiments in rural Alaska. These military operations during and after World War II and into the Cold War set a hostile tone over the polar regions, which fortunately thawed at the end of the Cold War.

Modern exploration of polar regions focuses on social, environmental, and natural resource research. For example, the effects and influence of climate change, rapid economic growth, and technological advances on terrain, plants, animals, and humans in polar regions are of considerable interest. The changes in the well-being of indigenous people are of concern and interest to indigenous people and scientists alike. In addition, modern Antarctic and Arctic regional exploration primarily centers on the use of natural resources and the generation of scientific research.

*Antarctica and the Arctic Circle: A Geographic Encyclopedia of the Earth's Polar Regions* is an interdisciplinary encyclopedia that covers the past and present of the polar regions through topics within the humanities (history, linguistics, and religion); social sciences (archaeology, anthropology, indigenous studies, economics, geography, political science, and sociology); natural sciences (space sciences, earth sciences, life sciences, chemistry, and physics, especially astrophysics); and the applied sciences (environmental studies and forestry, law, military science, and transportation). It is designed to provide a holistic view of the past and present as well as future directions in polar research. The entries in this work redesigned to raise curiosity in readers to further explore the lands, cultures, animals, plants, and anything else that can be envisioned and discovered of interest in polar regions.

In the book, *The Worst Journey in the World* (1922), Apsley George Benet Cherry-Garrard (1886–1959) sums up polar exploration as follows:

Polar exploration is at once the cleanest and most isolated way of having a bad time which has been devised . . . There are many reasons which send men to the Poles, and the Intellectual Force uses them all. But the desire for knowledge for its own sake is the one which really counts and there is no field for the collection of knowledge which at the present time can be compared to the Antarctic. Exploration is the physical expression of the Intellectual Passion. And I tell you, if you have the desire for knowledge and the power to give it physical expression, go out and explore. If you are a brave man you will do nothing: if you are fearful you may do much, for none but cowards have need to prove their bravery. Some will tell you that you are mad, and nearly all will say, “*What is the use?*” For we are a nation of shopkeepers, and no shopkeeper will look at research which does not promise him a financial return within a year. And so you will sledge nearly alone, but those with whom you sledge

will not be shopkeepers: that is worth a good deal. If you march your Winter Journeys you will have your reward, so long as all you want is a penguin's egg.

May those who read from this book experience the joy of exploring their own quest for knowledge of polar regions; may you each find your own penguin's egg!

*Andrew J. Hund*

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# TIMELINE

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<b>Mesozoic (252–65 mya)</b>	Antarctic seas are populated by marine reptiles
<b>Cretaceous (between 145 and 65 mya)</b>	Paleoecology of Antarctica
<b>Pliocene (5.332–2.588 mya)</b>	Pliocene Arctic
<b>200,000–4,000 years ago</b>	Woolly mammoths roamed the Arctic Rock Carvings in Alta (4,200–500 BC)
<b>325 BC to sixteenth century</b>	Thule Culture Dorset Culture
<b>1614</b>	Smeerenburg
<b>1768–1771</b>	First Voyage of James Cook
<b>1772–1775</b>	Second Voyage of James Cook
<b>1776–1779</b>	Third Voyage of James Cook
<b>1819–1821</b>	Russian Antarctic Expedition
<b>1868</b>	First German North Polar Expedition
<b>1871</b>	Whaling Fleet Disaster
<b>1875–1876</b>	British Arctic Expedition
<b>1882–1883</b>	International Polar Years (IPY)
<b>1885</b>	Eskimo Coast Disaster
<b>1901–1903</b>	Gauss Expedition
<b>1901–1903</b>	Swedish Antarctic Expedition
<b>1901–1904</b>	Discovery Expedition
<b>1902–1904</b>	Scottish National Antarctic Expedition
<b>1907–1909</b>	Nimrod Expedition
<b>1910</b>	Lost Patrol
<b>1910–1912</b>	Japanese Antarctic Expedition
<b>1910–1913</b>	British Antarctic Expedition
<b>1911–1912</b>	Second German Antarctic Expedition



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