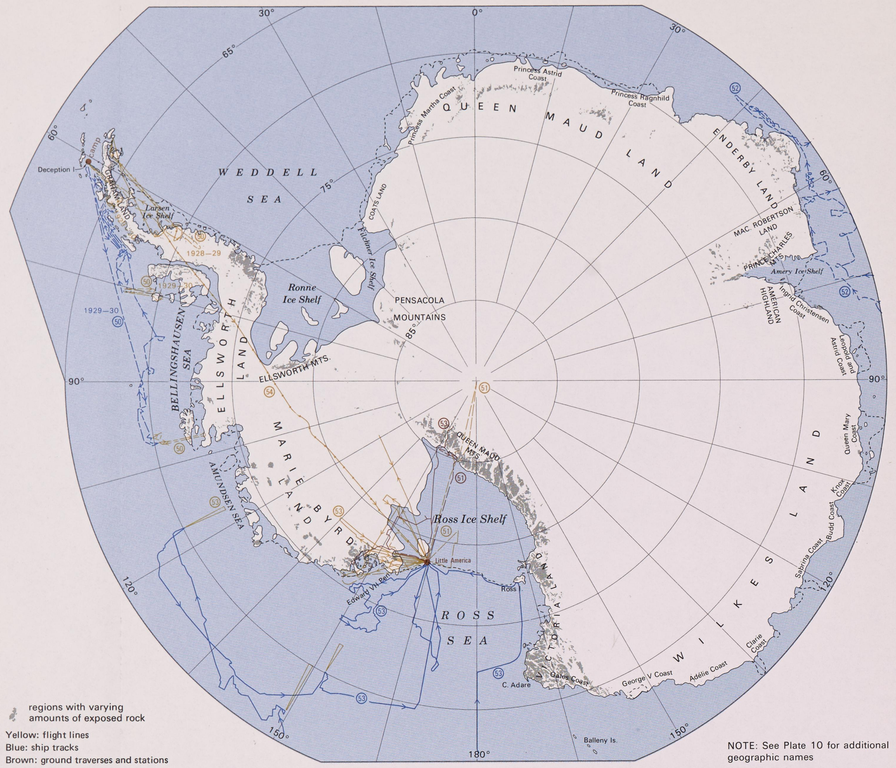
EXPLORATORY EXPEDITIONS

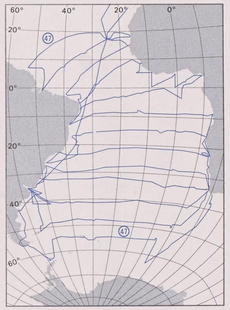
(SHEET 6)

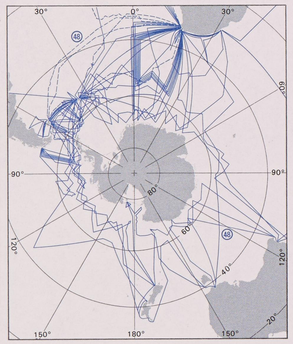


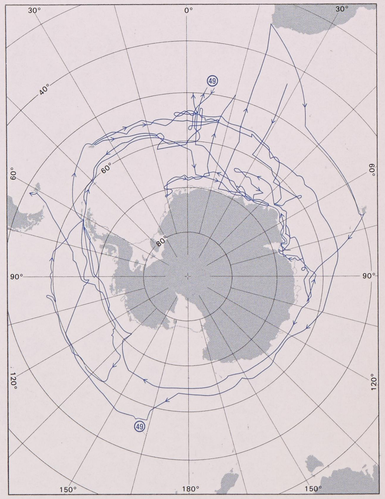
regions with varying amounts of exposed rock

Yellow: flight lines
Blue: ship tracks
Brown: ground traverses and stations

NOTE: See Plate 10 for additional geographic names







Tracks of *Discovery* and *William Scoresbay*

Discovery II

When two cruises followed the same route their tracks have been separated so that they can be distinguished from each other.

Tracks of *Odd I*, *Norvegia*, and *Thorshavn*

NOTES

Bibliographic numerals given with historical summaries refer to the text section headed, "Bibliographic Sources." Bold-face numerals indicate sources of expedition data given on the maps.

Ice shelf limits on the maps are not necessarily in accord with conditions at the time of the expeditions shown.

(41) 1925–1927 Germany
Leaders: Dr. Alfred Merz and Capt. F. A. Spiess
Sponsor: Emergency Fund for German Science
Ship: *Meteor*
Purpose: Oceanographic survey
Bibliography: 88, 145, 223, 257

The expedition in the *Meteor* marked an advance in the science of oceanography; it was the first to have as its objective the intensive study of the Atlantic. Dr. Merz was interested in learning more about the characteristics of ocean water masses. His expedition, under Capt. F. A. Spiess, who took command upon the untimely death of Dr. Merz early in the expedition, spent 512 consecutive days at sea and succeeded in obtaining data to substantiate the existence of four distinct water masses in the South Atlantic, one of which was a bottom layer of cold water formed along the coast of Antarctica. The party also discovered the 'Meteor Deep,' now called the South Sandwich Trench; irregularities of bottom relief became known for the first time through the systematic use of the epoch-making invention, the echo sounder. Because of the sparse wire soundings previously taken, a greater uniformity of bottom features had been assumed.

(46) 1925–1939 Great Britain (Discovery Investigations)
Leaders: Drs. N. A. Mackintosh, Stanley Kemp, D. Dilwyn John, G. E. R. Deacon, H. F. P. Herdman, and G. W. Rayner
Sponsor: Discovery Committee (British government)
Ships: *Discovery, Discovery II*, and *William Scoresby*
Purpose: Oceanographic research
Bibliography: 60, 99, **100**, 117, 118, 132, 133, 194, 249

The British Colonial Office organized the Discovery Committee in 1923 to promote oceanographic research in the region of Great Britain's Falkland Islands Dependencies. Between 1925 and the beginning of World War II, the Discovery Committee commissioned a series of research expeditions to the Antarctic primarily for thorough research into the biological and physical conditions which affect the distribution of whales. The Committee intended to make recommendations for governing the whaling industry; to protect the industry by protecting the stocks of whales.

In January 1925, N. A. Mackintosh went to South Georgia to establish a marine station and biological laboratory at Grytviken. Research was conducted there each whaling season until 1931. Investigations at sea were undertaken in the *Discovery* under Dr. Stanley Kemp during the austral summers 1925–1926 and 1926–1927. In addition to the study of whales and the nature of their environment, research by the two parties included a special study of elephant seals, observations of the bird life of South Georgia, and an analysis of the chemical composition of the ocean. Study of whale habits revealed that the baleen whales near South Georgia eat only *Euphausia superba*, a small, shrimp-like creature commonly called 'krill.' This discovery helped to explain the large number of whales around South Georgia: upwelling waters rich in chemical nutrients provide abundant food for the phytoplankton on which krill feed; consequently, whales too find this a good feeding ground. Before returning to England, the *Discovery* continued investigations outside the Antarctic in hopes of further understanding the biological and physical conditions of the waters into which whales migrate.

In December 1929, Kemp returned to the Antarctic in the modern research vessel *Discovery II*. He sailed to South Georgia, where the first task was to repeat biological and hydrological studies for comparison with the data obtained during his earlier expedition. The *Discovery II* staff then concentrated on soundings and surveys among the South Sandwich Islands, where a landing was made and lichens, mosses, algae, and geologic specimens collected. Soundings, dredgings, and hydrological studies were continued throughout the voyage, which took the party among the South Shetland Islands and into the waters to the west of the Antarctic Peninsula. Soundings among the South Sandwich, South Orkney, and South Shetland islands substantiated the theory formulated by Dr. Merz and others that a submerged ridge in the form of an arc extended from Cape Horn through these islands to the Antarctic Peninsula.

D. Dilwyn John led the second *Discovery II* expedition (1931–1933), which made a circumnavigation of Antarctica, the first to be done largely during the winter. The second summer the staff continued oceanographic work begun during the first season in the waters of the Falkland Islands sector; they also made coastal surveys and geologic observations of the Falkland and South Orkney Islands. The expedition, on its homeward voyage, continued oceanographic observations in the deep basins of the eastern Atlantic as far north as the equator.

The *Discovery II* expedition of 1933–1935, led by Dr. N. A. Mackintosh, was specifically concerned with an examination of seasonal changes in the Antarctic; annual temperature ranges, alterations of current flow, quantities of salts and gases dissolved in the water, shifts of the fringes of pack ice, and the profound seasonal changes in the distribution of plankton. An intensive study was also made of the whale population and its environment in the Pacific sector of Antarctic waters.

The whale-marking expeditions led by G. W. Rayner in the *William Scoresby* provided useful supplementary information to the *Discovery II* research. During the 1934–1935 season, marking was done in the waters south of Africa. The 1935–1936 season found the ship in the area of Kemp Coast and Mac. Robertson Land, where extensive charting was done. Later, the *William Scoresby* worked in the eastern part of the Atlantic Ocean, marking a record number of whales for one season. In 1937–1938 her whale marking and oceanographic cruise extended from Bouvetøya westward to Peter I Island.

In October 1935, under the direction of G. E. R. Deacon, the *Discovery II* sailed on her fourth commission. Plans for the expedition were changed to aid in the search for Lincoln Ellsworth, thought to be lost on an Antarctic flight (see summary 54 below). After Ellsworth was found, the party made the most of being in the Ross Sea by undertaking oceanographic research there. Observations were continued along the pack ice, then into the Indian Ocean to the south of Australia. The *Discovery II* returned to South Georgia, via South Africa, for a series of observations to investigate the vertical movements and distribution of zooplankton. Another area of this expedition's research was the South Shetland Islands, where a collection was made of rocks, mosses, lichens, algae, land arthropods, and some flowering plants. A count was made of elephant seals on the islands.

Mackintosh led the initial phase of the fifth commission of *Discovery II* (1937–1939); he was succeeded during the voyage by H. F. P. Herdman. The voyage had two objectives: to circumnavigate the continent collecting data to be compared with that of earlier expeditions, and to run a repeated series of observation lines along the 0° and 20°E meridians. In addition to oceanographic work, surveying was done of the Balleny Islands, and a landing was made on Bouvetøya.

Thus the *Discovery* expeditions and the complementary research done by the *William Scoresby* were concentrated on hydrological studies, geologic analyses of bottom sediments, and thorough research into the nature and distribution of Antarctic marine life. Accurate surveys of islands, coasts, and ocean-bottom topography immeasurably aided future navigation in the Antarctic; this series of expeditions also provided a model upon which much of the later research in the Antarctic was organized and developed.

(48) 1926–1937 Norway
Leaders: Capt. Harald Horntvedt, Capt. Nils Larsen, Capt. Hjalmar Riiser-Larsen, Maj. Gunnar Isachsen, Consul Lars Christensen, and Capt. Klarius Mikkleson
Sponsor: Consul Lars Christensen
Ships: *Odd I, Norvegia, Thorshavn*, and various whaling ships
Planes: Small ship-based planes, used for reconnaissance on some voyages
Purpose: Exploration, scientific research, and whaling reconnaissance
Bibliography: 49, 50, 109, 112, 113, 195

During this period the whaling magnate Lars Christensen sponsored a series of summer exploring expeditions to the Antarctic. The initial voyage was in the *Odd I* to Peter I Island. During the next four seasons the research vessel *Norvegia* continued the program; the ship *Thorshavn* was used after 1931.

In the 1927–1928 season, Capt. Harald Horntvedt was in charge of the *Norvegia*. The party landed on and surveyed Bouvetøya, and a depot hut was left there. Sealing, oceanographical, and meteorological studies were carried out in the area. When the *Norvegia* was forced to retreat north for repairs, scientists continued their zoological and geological studies in the South Shetland Islands and the Palmer Archipelago, transported chiefly by a fleet of Norwegian whaling vessels.

In 1928–1929 Capt. Nils Larsen took over command of the program. The party made an attempt to place a weather station on Bouvetøya, but no suitable site could be found. Peter I Island was landed on, claimed, surveyed, and a hut erected.

In 1929–1930 a more extensive program was carried out under Capt. Hjalmar Riiser-Larsen. A provisions depot was established at Bouvetøya, and the island mapped by air. The ship then proceeded eastward, and an aerial reconnaissance was made of portions of the coast of Enderby Land and Queen Maud Land between 55° and 43°E. After steaming westward toward the Weddell Sea, the ship moved southward once more and discovered Princess Martha Coast. Here a flight was again made from the ship to the coast. During the expedition, extensive oceanographical and meteorological observations were made, and numbers of whales sighted.

In the 1930–1931 season, with Maj. Gunnar Isachsen in command, the *Norvegia* circumnavigated Antarctica, principally to study the habits of whales. In February 1931 Riiser-Larsen took over command of the expedition and discovered and made an aerial reconnaissance of Princess Ragnhild Coast. Regular oceanographical and meteorological observations were made on this expedition. During this final voyage of the *Norvegia* several Norwegian whalers were in the Antarctic; they confirmed and extended the geographical discoveries of the *Norvegia* voyages. Their discoveries included Lars Christensen Coast, Princess Astrid Coast, and Bjerkø Peninsula. Sketch maps of Kemp Coast and the coast of Enderby Land were made.

In 1933–1934 Lars Christensen and Klarius Mikkleson led an expedition to Antarctica aboard the *Thorshavn*. The ship nearly circumnavigated Antarctica; flights were made over Lars Christensen Coast and Mac. Robertson Land. Leopold and Astrid Coast was discovered on this expedition; meteorological and hydrological observations were made.

In the 1934–1935 season Klarius Mikkleson commanded the *Thorshavn*. This expedition discovered and named Ingrid Christensen Coast, the Vestfold Hills, and the Larsemann Hills, and surveyed a portion of the area. In February 1935 a landing was made in an ice-free area at 68°29′S, 78°36′E by a party which included Mikkleson and his wife; Mrs. Mikkleson is probably the first woman to have set foot on Antarctica.

Lars Christensen led the last of this series of expeditions in 1936–1937. He determined to map the area of Antarctica discovered by Norwegians during the previous decade. On January 25, 1937, before the aerial survey was under way, Four Ladies Bank was discovered and named in honor of the four women aboard the *Thorshavn*. Aerial photographs (2200 mapping obliques) were made of most of the coast between 50°E and 80°E. Prince Harald Coast was discovered during a flight with Mrs. Christensen as passenger.

(50) (49) 1928–1930 United States and Great Britain
Leader: Sir Hubert Wilkins
Sponsors: American Geographical Society, William Randolph Hearst, Detroit Aviation Society, and other private, public, and commercial donors
Ships: *Hektoria* and *William Scoresby*
Planes: Two Lockheed Vega monoplanes (*San Francisco* and *Los Angeles*)
Purpose: Transantarctic flight and aerial reconnaissance
Bibliography: 17, 92, 146, 236, **237**

During the Wilkins-Hearst expedition two airplanes were brought to Antarctica for the first time to aid in discovery and mapping. Wilkins had originally hoped to make a Transantarctic flight, but this plan did not materialize. On December 20, 1928, however, he made a ten-hour flight from his base on Deception Island southward across the Antarctic Peninsula, and along its east coast to an estimated southernmost point of 71°20′S; during the flight aerial photographs were obtained. On January 10, 1929 a second flight was made over the northern part of the earlier flight to confirm the previous observations. Soon thereafter weather conditions forced Wilkins to close operations and the party returned to Montevideo for the winter.

The following season (1929–1930) Wilkins made plans for a second attempt to cross the continent by plane, but his intentions were again frustrated by a combination of bad weather and unsuitable surface conditions. Instead, the *William Scoresby* carried the expedition southward on two cruises along the west coast of the Antarctic Peninsula. From the ship Wilkins and his copilot were able to make several flights. One of them crossed the Peninsula at about 66°S; another two explored Charcot Island; and two were flown at about 100°W. One of these western flights went south along the 101° meridian to a point estimated to be 73°S, judging by elapsed time. No land was seen, however, so it is doubtful that the flight reached the latitude estimated.

From these first flights numerous previously unknown mountains, glaciers, bays, and nunataks were discovered and later were approximately mapped from aerial photographs. Wilkins mistook for straits the transverse glaciers which flow both east and west from a low divide in the Antarctic Peninsula. As a result, the map which was compiled from the observations of this expedition depicts the region as a series of islands rather than the peninsula which it had previously and correctly been thought to be.

(51) (52) 1928–1930 United States (1st Byrd Antarctic Expedition)
Leader: Rear Adm. Richard E. Byrd, USN (Ret.)
Sponsors: John D. Rockefeller, Jr., Edsel Ford, and many other private donors, as well as scientific organizations
Ships: *City of New York* and *Eleanor Bolling*
Planes: Ford trimotored monoplane (*Floyd Bennett*), Fokker Universal monoplane and Fairchild folding-wing monoplane
Purpose: Geographic exploration and scientific investigation
Bibliography: 9, 17, **36**, 37, 40, 43, 58, 95, 114, 207

American interest in Antarctic exploration was revived in 1928 after a lapse of almost ninety years. The return of American explorers also marked the firm establishment of modern technology in Antarctica. Admiral Byrd led a party of forty-two men to the Ross Ice Shelf, where in January 1929 a camp with three main buildings and more than a dozen smaller ones was erected and named Little America. Three airplanes, an aerial mapping camera, extensive radio communication equipment, and a Ford snowmobile were included among the expedition's apparatus. Before winter set in, the Rockefeller Mountains were discovered during a test flight. A second flight was made to these mountains for geological exploration under Laurence Gould, geologist and second in command of the expedition. The winter was spent in preparation for the two major undertakings of the expedition, a flight to the Pole and a geological journey by dog sledge to the Queen Maud Mountains. With the advent of spring, provision depots were laid for the geological party, which was in the field from November 4, 1929 to January 19, 1930. Gould's party not only accomplished its primary objective of geological exploration but also provided weather reports by radio to the main base. Finally, on November 28 and 29, 1929, the polar flight was successfully made. The flight was not an easy one; the rise through the Liv Glacier passage up to the polar plateau was made against treacherous downslope winds. More than 300 pounds of food had to be jettisoned to make the lift. In addition to this important polar flight, numerous shorter flights were made from Little America; Marie Byrd Land was explored and the Ford Ranges were discovered. Aerial photos were taken of these newly found regions. Further geographical contributions were made by the base camp party, which extensively surveyed the Bay of Whales. Despite the unusually solid pack ice that season, the *City of New York* was able to penetrate the Ross Sea and pick up the men from Little America in February 1930.

(52) 1929–1931 Great Britain, Australia, and New Zealand (British-Australian-New Zealand Antarctic Research Expedition)
Leader: Sir Douglas Mawson
Sponsors: Australian, New Zealand, British governments; MacPherson Robertson and other private, public, and commercial donors
Ship: *Discovery*
Plane: Small ship-based plane, used for reconnaissance
Purpose: Scientific and geographical investigation
Bibliography: **140**, **141**, 189, 244

This expedition left Cape Town on October 19, 1929 and, after making stops for scientific activities at Crozet, Kerguelen, and Heard islands, continued on to eastern Antarctica. The party roughly charted the Antarctic coastline between 75°E and 45°E. High winds prevented any significant use of the airplane brought along for coastal reconnaissance; but a few aerial photographs were obtained along Enderby Land. The party also named Mac. Robertson Land after a sponsor of the expedition.

Extensive hydrological data were recorded and a series of 750 soundings was made in the same coastal region. After wintering in Australia, the party returned to Antarctica, this time traveling westward along the coast from approximately 179°E to 61°E. Scientific studies made by the expedition during its two voyages to Antarctica concentrated on geology, biology, and oceanography. Biological work concentrated primarily on small marine life, though observations were made regularly of whales, seals, and birds. Research on plankton included plotting the horizontal and vertical distribution of different forms.

(53) (54) (55) 1933–1935 United States (2nd Byrd Antarctic Expedition)
Leader: Rear Adm. Richard E. Byrd, USN (Ret.)
Sponsors: Edsel Ford, William Horlick, Col. Jacob Ruppert, Thomas J. Watson, National Geographic Society, and numerous other public, private, and commercial donors
Ships: *Bear of Oakland* and *Jacob Ruppert*
Planes: Curtiss-Wright Condor (*William Horlick*), and three smaller planes
Purpose: Scientific research and exploration
Bibliography: 17, 20, 38, 102, 187, 203, 210, 229

One of the outstanding features of this elaborately planned and equipped expedition was the resourcefulness with which the advances in technical knowledge from diverse fields were adapted to meet problems in Antarctic research and exploration. For example, seismic techniques developed for the discovery of petroleum were used for studies of the subice topography of the polar plateau, and methods were devised to keep delicate instruments functioning despite freezing conditions and frequent blizzards.

A major part of the scientific research was centered on meteorological studies; the main station at Little America II maintained a continuous 360-day record of surface and upper-air observations. Adm. Byrd spent a solitary winter 200 km south of Little America II, at 80°08′S, 163°57′W, to collect meteorological records for comparison with those from Little America II. For almost a full year relative and absolute variations in the earth's magnetic field were studied at Little America II. About 800 hours were devoted to observations of cosmic rays in cooperation with a worldwide survey. The scientific program included extensive biological research. Bird and seal life was studied; lichens and mosses were collected in Marie Byrd Land and in the Queen Maud Mountains. Cultures of bacteria and molds were taken, and algae and land arthropods were found in mud and water samples. Extensive geological collections from Marie Byrd Land and the Queen Maud Mountains included the southernmost known (to that time) fossils, found at the head of Scott Glacier.

During this expedition, tracked vehicles were successfully used for the first time. This permitted transportation of heavy seismic equipment to the polar plateau in Marie Byrd Land. Other exploration seismic work confirmed the existence of Roosevelt Island, just south of Little America. Tractors were also used to support dog-team sledging parties to Marie Byrd Land and the Queen Maud Mountains. Aerial reconnaissance indicated the approximate outline of the east coast of the Ross Ice Shelf and established with reasonable certainty that there was no strait from the Ross Sea to the Weddell Sea, as had been suggested by previous expeditions.

(54) 1933–1936 United States
Leader: Lincoln Ellsworth
Sponsor: Lincoln Ellsworth
Ship: *Wyatt Earp*
Plane: Northrup monoplane (*Polar Star*)
Purpose: Transantarctic flight and aerial reconnaissance
Bibliography: 17, 70, 71, 115, **116**, 158

On November 23, 1935, after unsuccessful attempts in the two preceding years, Lincoln Ellsworth made the first flight across Antarctica. Among the questions that Ellsworth wanted to answer about Antarctica was one that had been posed by others: did a channel connect the Weddell and Ross Seas. Ellsworth and his pilot, Herbert Hollick-Kenyon, flew from a snowfield on Dundee Island, at the tip of the Antarctic Peninsula, to a point near the northern end of Roosevelt Island in the Ross Ice Shelf; here they were forced to land because of lack of fuel. The two men completed the journey to the Bay of Whales on foot. During the flight four landings were made; a tent was set up at each of these landing sites and at two of the sites sextant observations of the sun were obtained for position determination. Bad weather kept the men in camp a total of eleven days and caused a further four-day delay at Roosevelt Island. The men finally reached Byrd's deserted camp at the Bay of Whales on December 15, after a circuitous foot journey of six days. They settled down to wait for the *Wyatt Earp*, unaware that they were thought to be lost and that the *Discovery II* was also on her way to rescue them.

The flight resulted in the first sightings of the Eternity Range in Palmer Land; the Sentinel Range in Ellsworth Land; and Ellsworth Land itself. Aerial photographs taken during the flight seemed to show that the Antarctic Peninsula was not cut by straits as Wilkins had thought; a revised map was drawn by the American Geographical Society using Ellsworth's photos.