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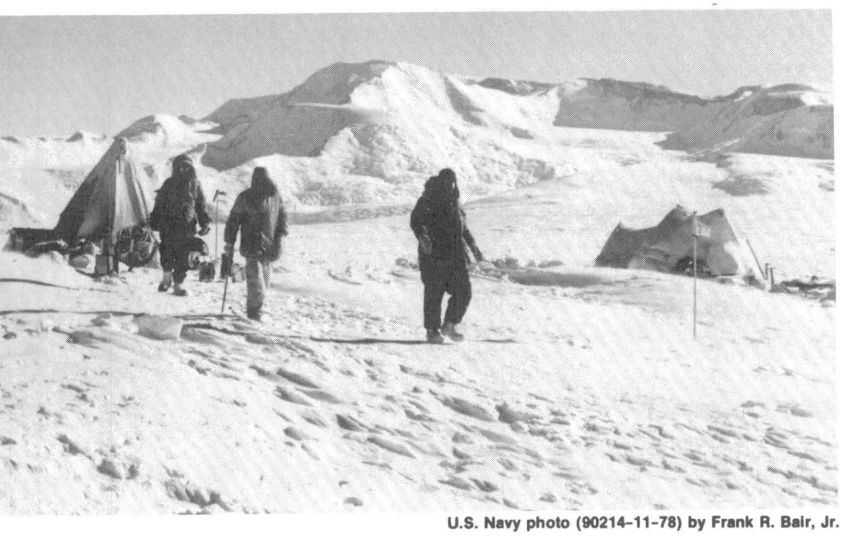

U.S. Navy photo (90214-11-78) by Frank R. Bair, Jr.

Tent camps placed and relocated by helicopters will enable investigators to examine sites throughout the Ellsworth Mountains this season. A similar logistic technique enabled the researchers shown above to study the movement of the Byrd Glacier in 1978-79.

Ellsworth Mountains, Siple Station studies highlight 1979-80 U.S. Antarctic Research Program

This September's WINFLY or "winter fly-in" flights from California to McMurdo Station mark not only the opening of the 1979-80 United States Antarctic Research Program, but also a possible reduction in the high incidence of WINFLY colds among McMurdo and nearby Scott Base (N.Z.) personnel. Winter personnel, isolated from March to September at antarctic research stations, have traditionally been susceptible to cold viruses brought by the WINFLY group. This season one investigator will attempt to interrupt the transmission of cold viruses by distributing highly virucidal paper handkerchiefs to WINFLY, McMurdo Station, and Scott Base personnel. If the handkerchiefs succeed in inactivating the viruses in nasal secretions which are thought to be responsible for the colds, then the 1979-80 U.S. Antarctic Research Program will have gotten off to a more enjoyable start.

More than 300 investigators will follow the WINFLY crews to Antarctica this season (October 1979 to March 1980) to conduct about 80 science projects. Research highlights include an investigation of the geology of the Ellsworth Mountains area and an investigation of wave-particle interactions in the magnetosphere from Siple Station.

The Ellsworths, a rugged mountain chain located about 2,000 kilometers from McMurdo Station between the ice plateau of West Antarctica and the Ronne and Filchner Ice Shelves, are the highest mountains in Antarctica, reaching elevations of 5,100 meters. They are divided into a northern Sentinel Range and a southern Heritage Range. Geologists are interested in the Ellsworths because they represent a bridge between the geologically older shield areas of East Antarctica and the younger province of West Antarctica. Glacial geologists, because the Ellsworths occur precisely at the dividing line between the West Antarctic Ice Sheet and the Ronne Ice Shelf, find the region useful for monitoring ice recessions and advances in the Weddell Sea area.

Small U.S. research parties visited the Ellsworth Mountains periodically from 1958 to 1967. Occasionally they were equipped with small motor vehicles, whose range was limited by the rugged terrain. Helicopter support during the 1963-64 season, however, gave researchers access to much more territory. The results of later laboratory research pointed out several specific unsolved questions about the Ellsworths and indicated that more intensive geological investigations there would be scientifically rewarding. These investigations will take place this season.

Field activities in the Ellsworth Mountains will be supported from a base camp, similar to the one set up last season on the Darwin Glacier. The Ellsworth camp will be able to house up to 55 scientists and support personnel at once. It is expected that no more than 35 scientists will use the camp at one time. The plan is to operate three UH-1N helicopters out of the Ellsworth camp. Approximately 500 helicopter hours will be available. About 800 LC-130 airplane hours will be necessary to transport scientists, equipment, food, fuel, and construction materials to Ellsworth camp and to Byrd Station, a refueling stop which will be used on the return leg of the McMurdo-Ellsworth Mountains flight.

Ellsworth camp will stay open for 10 weeks beginning in mid-November. During that period, geologists hope to construct a detailed picture of a 13,000-meter thick stratigraphic section of the Ellsworths and obtain samples of fossil flora and fauna particularly from the top of the Precambrian and base of the Cambrian sedimentary beds. They will examine the evolution of landforms in the Ellsworth Mountains and chart the sequence of major structural geologic events there. They also hope to locate concentrations of radioactive elements and provide fundamental geologic information about the deposition or crystallization of specific rock types. Data gained this season may clarify the history of this portion of Antarctica as well as its tectonic relationship to the Antarctic Peninsula area.

Glacial geologists will test their hypothesis that during glacial periods the West Antarctic Ice Sheet expands to the end of the continental shelves in the Ross and Weddell Seas and that during interglacials the ice sheet retreats to about its present position and maintains large ice shelves. During particularly warm interglacials—the last about 124,000 years ago—they think the West Antarctic Ice Sheet loses its ice shelves and collapses rapidly. They will be looking at traces of the ice sheet left above the current ice surface to test their theory about the collapse of the ice sheet during the last interglacial period 124,000 years ago.

The meteorite search which has proved so successful in the past two seasons will continue, this time in the Ellsworth Mountains as well as in the McMurdo Sound region. Once again researchers will look for areas where ablation has uncovered meteorites long buried in the ice. As in the past, the meteorites will be handled carefully to keep them from contamination and to preserve their scientific value.

At Siple Station 38 investigators from 7 universities will use rockets, balloons, ground-based instruments, and satellites in a coordinated study of the precipitation of energetic electrons from the magnetosphere. Such precipitation can be caused by very-low-frequency waves produced by lightning discharges in Canada or by the Siple VLF transmitter. An understanding of these wave-particle interactions is critical to an understanding of the radiation belts and the ionosphere, as well as to the development of plasma physics theory.

Seven scientific rockets—three Nike-Tomahawk and four Super Arcas rockets, all furnished by NASA—will be launched from Siple Station this season. The Nike-Tomahawk rockets will carry instruments designed to measure the intensities and directions of precipitating electrons, VLF waves, and electric fields at about 230 kilometers altitude. The Super Arcas rockets will carry instruments that will measure X-rays produced by the precipitating electrons at about 80 kilometers.

X-ray scintillation counters will be launched on 10 balloons in close coordination with the rocket campaign. These counters will record X-rays produced at altitudes of 70 to 90 kilometers above the surface by energetic electrons impinging upon the atmosphere over Siple Station. Ground instrumentation as well, including riometers, magnetometers, and VLF receivers, will complement the balloon and rocket experiments. Measurements taken by polar orbiting satellites and during balloon launches at Roberval will provide more data about wave-particle interactions.

Elsewhere in Antarctica scientists will continue to examine how human beings and other life forms adapt to antarctic conditions. One medical doctor will study the surprisingly persistent shedding of parainfluenza virus by people isolated at South Pole Station throughout the winter. Other investigators will study the synthesis of proteins in certain antarctic fishes, one of which, a glycoprotein, enables them to survive in ice-laden seawater. The researchers will examine the synthesis and molecular structure of this glycoprotein and other plasma proteins and the way specific levels of the antifreeze are maintained in fishes at different temperatures. The goal of these studies is not only to determine the structures of these glycoproteins

Editor: Richard P. Muldoon

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and the processes involved in their synthesis, but to describe protein synthesis in general. Such a description is important because protein synthesis is one of the most fundamental adaptation strategies evidenced in life in all regions of the world.

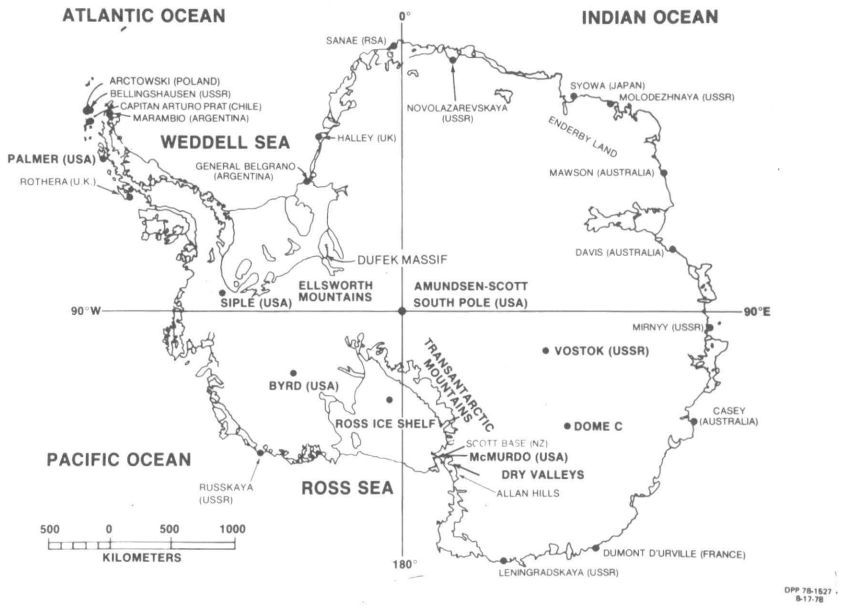
Research also will continue into the movements and feeding habits of seals, especially in relation to their consumption of krill. Studies of diving behavior not only will provide information on the behavioral adaptations of these animals, but also about respiration processes. The latter information may be applicable to studies of human physiology. A new radio tracking system which will be tested this season at McMurdo may enable investigators eventually to track the movement of specific vertebrate species via signals telemetered to satellites.

Astronomers at the U.S. station at the South Pole will use a new and highly sensitive telescope to measure large-scale motions on the surface of the sun. The telescope will enable the researchers to detect coherent velocity patterns on the surface that are caused by oscillations in its interior. Amundsen-Scott South Pole Station offers astronomers a relatively stable research platform where they can obtain long-term observations uninterrupted by a day-night cycle.

Continuing measurements of atmospheric constituents at the South Pole Clean Air Facility will provide additional data for studies of the effects of pollution upon the Earth's atmosphere and for studies of the transport of aerosol particles from lower latitudes to the poles. New meteorological programs include investigations of the katabatic (gravity) winds that fall from the polar plateau toward the coasts. These studies will depend on automatic weather stations set in an array on the East Antarctic Ice Sheet from dome C—one of the three major "domes" or high spots on the East Antarctic Ice Sheet—to the French station Dumont d'Urville. They will collect meteorological data year-round.

Glaciology also will continue at dome C where investigators will study the different ice crystal orientations (anisotropies) within the ice sheet and the effects of bottom topography upon the surface topography and the overall dynamics of the East Antarctic Ice Sheet.

ANTARCTICA: MAJOR U.S. ACTIVITIES, 1979-1980



Near McMurdo, investigators will explore the sediments on the floor of McMurdo Sound in order to describe the geological processes that formed the basins in the Sound. Knowledge of these processes will help scientists reconstruct what happened when the East and West Antarctic tectonic plates met. Investigators in the dry valleys of southern Victoria Land will explore more of the geology of the area. A team from Virginia Tech also will return to the dry valley lakes to continue its studies of algal mats that live in less than one-tenth the light necessary for temperate region algae to photosynthesize.

Finally, research vessel *Hero* and three U.S. Coast Guard icebreakers, *Northwind, Glacier,* and the new *Polar Sea,* will be used as mobile research platforms for marine biologic, geologic, and oceanographic investigations in the Weddell and Ross Seas and in the Antarctic Peninsula area.

Last season two new dormitories, each housing 50 people, were built at McMurdo. Construction crews now at work will have one of the buildings ready for occupancy in mid-October, the other in early November. Three more dormitories will be built this season to replace "temporary" housing built at McMurdo 20 years ago and still in use. Other construction projects include laying the foundation for a new power plant at McMurdo Station and putting finishing touches on the new facilities at Williams Field.

About 170 Holmes & Narver Inc. support staff and 675 U.S. Navy personnel will accompany researchers to Antarctica this season. Without their support, few of the research projects planned for this austral summer could be completed. Holmes & Narver will operate the Palmer Station/*Hero* research system, Siple Station, and South Pole Station for NSF and provide administrative assistance at McMurdo. The U.S. Navy will fly the airplanes and helicopters that transport U.S. personnel, equipment, and cargo throughout Antarctica. Navy personnel also will operate McMurdo Station and provide operational meteorology, communications, and other services for the United States Antarctic Research Program.

Following are brief descriptions of each of the research projects planned for the coming season. The 1979-80 United States Antarctic Research Program will mark the 25th consecutive year of U.S. activity in Antarctica in the modern era.

Planned field research projects, 1979-80

Antarctic Peninsula

The role of the leopard seal in the marine ecosystem. *D.B. Siniff, University of Minnesota, Minneapolis, Minnesota.* Leopard seals *(Hydrurga leptonyx)* will be captured, tagged, and released in the pack ice near the Antarctic Peninsula, using R/V *Hero* as a mobile research platform. The objectives are: (1) to obtain data on the diurnal activity patterns and long-range movements of leopard seals; (2) to document social behavior during the pupping, weaning, and mating season; (3) to collect information on seasonal and age-related changes in food habits; and (4) to investigate the reproductive success and survival of specific individuals. A field camp will be maintained in a fast ice area to complement our studies. Temporary radio tags will help track and relocate leopard seals more easily this season. This research is coordinated with studies of food web relationships in the antarctic ecosystem. (S-003)

Biological investigations of antarctic krill. *M.A. McWhinnie, DePaul University, Chicago, Illinois.* We will continue to study the biology of *Euphausia superba,* the dominant species of antarctic krill, using the facilities at Palmer Station and R/V *Hero.* Our major objective is to determine whether data obtained for krill in the Palmer sea water aquaria are applicable to the population in the sea. We will investigate whether different temperatures might cause different growth rates and study embryological development as a function of temperature as well. Other investigations will clarify our understanding of female and male krill reproductive characteristics. (S-008)

Thermoregulatory mechanisms in antarctic birds. *David E. Murrish, State University of New York, Binghamton, New York.* We will study giant petrels and Adelie penguins in an effort to describe some of their thermoregulatory mechanisms. The birds will be captured in the Antarctic Peninsula area for laboratory and field experiments on the transfer of body heat across brood patches. We will use radio telemetry to measure body temperatures and locate penguins in the rookeries and feeding grounds. (S-011)

Ecological and behavioral adaptations to antarctic environments. *David F. Parmelee, University of Minnesota, Minneapolis, Minnesota.* Our study areas near Palmer Station are suited to year-round investigations of the ecological and behavioral adaptations of certain charadriiform birds, especially gulls and skuas. Our principal objectives are to study foraging behaviors, time-energy budgets, and productivity. We will continue banding shags, sheathbills, skuas, gulls, and terns. (S-012)

Aquatic biology of South Georgia endotherms. *Gerald L. Kooyman, Scripps Institution of Oceanography, La Jolla, California.* This season, in collaboration with the British Antarctic Survey, we will try to assess the diving characteristics of fur seals, macaroni penguins, and king penguins off South Georgia Island. We will monitor the diving activities of fur seals using time/depth recorders in an attempt to determine the energy they expend searching for food. We will determine the preferred diving depths of king and macaroni penguins using multiple maximum depth recorders. The determination of diving behavior at this point will enable researchers to measure the impact of krill exploitation on these endotherms if it should occur at a later date. Our data also will be useful in comparing diving behavior in different antarctic and subantarctic regions. (S-026)

Physiological and biochemical bases of freezing tolerance in terrestrial arthropods. *John G. Baust, University of Houston, Houston, Texas.* Our project will examine the physiological and biochemical strategies of freezing resistance demonstrated by terrestrial arthropods in the Palmer Station area. We are examining these insects because they represent the highest phylogenetic system capable of enduring natural prolonged freezing without discernible damage. Our research involves isolating and examining the several enzymatic processes responsible for producing and eliminating a variety of cryoprotectants depending on variations in temperature. Our research on insects that function normally despite core temperatures many degrees below freezing could contribute information critical to low temperature storage of tissues and organs. (S-028)

Fluxes of organic compounds to antarctic food webs. *Robert W. Risebrough, University of California Bodega Marine Laboratory, Modega Bay, California.* We will use R/V *Hero* to obtain water samples which will indicate the levels of petroleum-derived and related compounds and synthetic and natural organic chemical compounds in marine food webs. We also will undertake detailed censuses of penguin colonies and obtain data that will provide a growth curve for Adelie penguin chicks. The growth curve might be a sensitive indicator of present or future changes in the available food supply. (S-036)

Studies of development of antarctic birds. *Robert E. Ricklefs, University of Pennsylvania, Philadelphia, Pennsylvania.* We will study the reproduction and development of the Southern Giant Fulmar (macronectes giganteus) this season at Palmer Station. In particular we will examine parental care, growth, development of homeothermy, and energetics. Chicks will be studied both at their nests and in laboratories at Palmer Station. Our goal is to determine how the environment fashions the reproductive patterns of birds. (S-038)

Evolution of Mesozoic and Cenozoic depositional basins of the northern Antarctic Peninsula and the South Orkney Islands. *David H. Elliot, Ohio State University, Columbus, Ohio.* This summmer R/V *Hero* will transport us to several locations along the Antarctic Peninsula, where there are outcrops of Mesozoic and Cenozoic rocks. We will continue to examine sequences that bear on the evolution of the late Mesozoic depositional basins and the antarctic cordillera. We will also pursue a paleomagnetic program to determine paleomagnetic

pole positions for the Antarctic Peninsula, to determine whether there is paleomagnetic evidence for bending of the peninsula, and to locate the Antarctic Peninsula in a reconstruction of Gondwanaland. (S-060)

Evolution of the West Antarctic-Andean Cordillera in the Scotia Arc region. *Ian W.D. Dalziel, Lamont-Doherty Geological Observatory of Columbia University, Palisades, New York.* We will study the geologic relationship of the Antarctic Peninsula to southern South America by continuing our study of the basement complex rocks in the South Shetland and South Orkney Islands. The data will contribute to our studies of the tectonic history of these islands and of the evolution of the south Scotia Ridge. Other studies will focus on the geology of the southernmost Andes. Our goal is an elucidation of the tectonic processes that influenced the breakup of the Gondwanaland supercontinent and a clarification of orogenic processes in evidence throughout the Scotia Arc. (S-063A)

Late Cretaceous and Early Tertiary biogeography of the southern Circum-Pacific. *William J. Zinsmeister, Ohio State University, Columbus, Ohio.* We will visit the Chilean canals on board R/V *Hero* to document the nature of faunal differences between the Antarctic Peninsula and southern South America. Our goal is to test whether these faunal differences are due to the presence of a physical barrier (a proto-Drake Passage) or to environmental differences associated with changes in latitude. If we determine the cause of these faunal anomalies, we will be closer to understanding the paleoceanographic changes that occurred between the Antarctic Peninsula and South America during the Tertiary period and the associated paleoceanographic changes along the southern Circum-Pacific as well. (S-086)

Very-low-frequency probing of the magnetosphere from Palmer Station. *R.A. Helliwell, Stanford University, Stanford, California.* We will continue to participate in international cooperative direction-finding experiments at Palmer Station, utilizing data gained last season to analyze changes in the bearing of whistler signals. We also will expand our activity in support of Siple Station transmitting experiments, recording background VLF activity, signal reception from Siple, and particle-induced perturbations of the Siple-to-Palmer signal. We will continue to take part in precipitation experiments in which the Siple transmitter and other fixed-frequency transmitter signals are used as probes of particle-induced perturbations of the upper edge of the ionosphere. (S-100B)

Air-sea-ice interaction investigations with X-band radar. *Joseph A. Warburton, Desert Research Institute, Reno, Nevada.* We are interested in how the Antarctic Peninsula, acting as a mountain barrier, affects the tracks of storms approaching Palmer from the southern ocean. We will continue to investigate storms within a 150-kilometer radius of Palmer Station to determine their motions, intensities, and structures, and their effects on sea ice and iceberg formations and movement. We are particularly interested in the structure of precipitating storms, apparently caused by considerable temperature differences between the surface of the ocean and the air masses passing over the ocean. In cooperation with British scientists at Faraday Base, we will study radar reflectivity-precipitation rate relationships during snowfall. (S-252)

Ice crystals near cloud base at Palmer Station using depolarization lidar. *Vern N. Smiley, Desert Research Institute, Reno, Nevada.* We will examine

The 38-meter wooden research vessel *Hero*, will support marine biological and geologic research throughout the Antarctic Peninsula this season. *Hero* finished her annual drydocking and overhaul in August.

NSF photo by William R. Curtsinger

the occurrence and vertical distribution of ice crystals, water droplets, and mixed-phase clouds at Palmer Station and relate these measurements to meteorological conditions. Our lidar (optical radar) system detects the occurrence and height of ice crystals, obtains additional information on the relative amounts of ice and water in mixed-phase clouds, and gives some indication of the types of ice particles present in pure clouds. Our goal is to determine the structure of constituents of the troposphere in Antarctica so that we can understand meteorological glaciation and precipitation processes. (S-260)

Air chemistry studies—antarctic ocean areas. *Elmer Robinson, Washington State University, Pullman, Washington.* The main objective of this research is to obtain air chemistry data between South America and Palmer Station using the USARP Ship *Hero*, ashore at Palmer Station, and between Florida and Palmer Station using the British research ship *Bransfield*. The data to be collected will include: (1) real-time analyses of ozone, N_2O), and halocarbons F-11, F-12, CH_3CCl_3, and CCl_4; and (2) whole-air samples for analysis for CO, CH_3Cl, and a variety of light hydrocarbons in Washington State University Laboratories. A trans-Pacific profile of trace air chemistry constituents will also be obtained on one of the LC-130 ferry flights between Christchurch, N.Z., and California early in the 1979-80 field season. All of these data will be compared with air chemistry results obtained in previous seasons in the region south from Christchurch, N.Z. to McMurdo and the South Pole. Our goal is to establish antarctic air chemistry as a reference for other assessments of the nature of the earth's atmosphere. We are especially interested in determining the impact of natural and anthropogenic trace species upon atmospheric chemical processes. (S-275)

Dome C

Geophysical investigation of dome C. *Charles R. Bentley, University of Wisconsin, Madison, Wisconsin.* The main aspects of our studies of the ice sheet and the subglacial continent in the vicinity of dome C are: (1) upgraded radar sounding equipment that will enable us to study the internal layering of the ice sheet in addition to its thickness; (2) electrical resistivity studies that will detect different temperatures in the ice; (3) magnetotelluric soundings that will provide information about the subglacial rock and, theoretically at least, information about the upper mantle; (4) seismic measurements which, when combined with radar measurements, will help us locate anisotropy in the ice, and which, in combination with gravity and magnetic mapping, will also help determine the subglacial crustal structure; and (5) sonic logging which will provide detailed data about anisotropy. (S-151A)

Deep geoelectric soundings. *F. Thyssen and Charles R. Bentley, Institut fur Geophysik, Munster, Germany, and University of Wisconsin, Madison, Wisconsin.* Deep geoelectric soundings of the ice sheet will be conducted in the vicinity of dome C. Evaluation of similar resistivity experiments on the Greenland ice sheet shows what appear to be two regions with different behavior within the ice. We plan to use longer electrode spacings than those used in Greenland to determine if this difference in ice behavior is also evident in the antarctic ice sheet. (S-151B)

Glaciological investigations in the dome C area. *Ian M. Whillans, Ohio State University, Columbus, Ohio.* With a view toward beginning a field program on the surface regime and flow dynamics of the ice sheet in a later year, two researchers will work at dome C and at the South Pole during the 1979-80 field season. The dome C camp will be the starting point for a future transverse; conditions at the South Pole are more representative of conditions on the side of a dome, where most of our later efforts will be directed. This season temperature profiles will be measured in the 100 meter holes drilled last season at dome C and the South Pole. The thermal conductivity of firn will also be measured. New hot-point drills will be tested and pit work undertaken to assess the importance of local topography on stratigraphy. (S-164)

French participation in the dome C investigations. *Claude Lorius, Laboratoire de Glaciologie, Grenoble, France.* We will continue our glaciological studies of the East Antarctic Ice Sheet. We are interested in determining the origins of chemical impurities in the ice and impurity changes over time, and in studying elevation changes in the ice sheet that tell us about its stability. Our field work will involve collecting shallow snow cores and samples from snow pits and obtaining ice cores from the existing 906-meter-deep hole at dome C. (S-167)

Glaciologists will return to dome C in East Antarctica to continue their studies of the ice sheet. The camp, located about 1500 kilometers west of McMurdo Station, is supported totally by LC-130 flights from McMurdo.

U.S. Navy photo (90284-12-78) by Thomas E. McCabe, Jr.

Ellsworth Mountains

Ellsworth Mountains geodetic control. *William J. Kosco and Charles D. Zeigler, U.S. Geological Survey, Reston, Virginia.* Three topographic engineers will establish a geodetic control net in the Ellsworth Mountains using satellite Doppler point positioning and conventional survey techniques. The net will provide data necessary for mapping study sites in the Ellsworth Mountains. The data also will help researchers set up field camps and study areas at precisely identified sites. (S-052B)

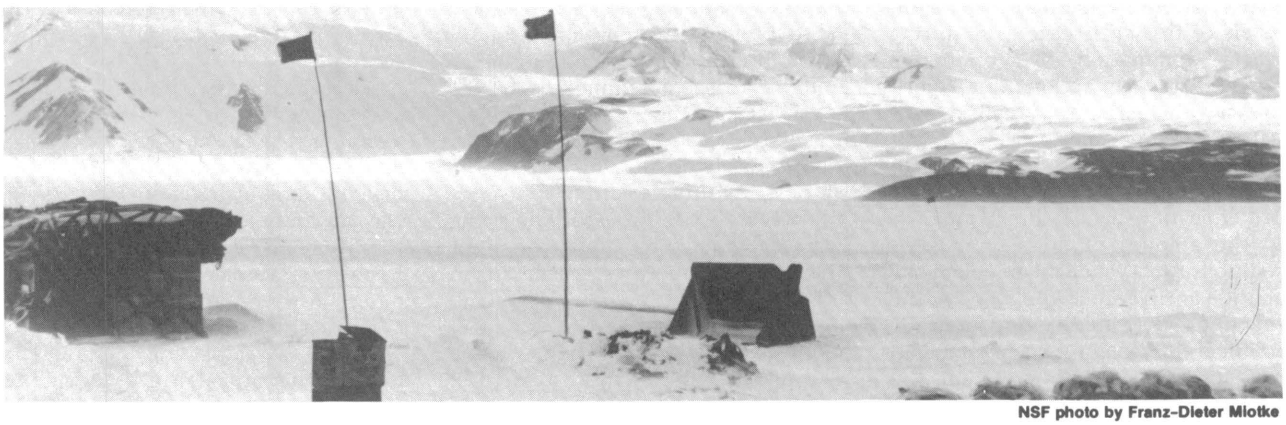
Glacial history of the Ellsworth Mountains and McMurdo Sound region. *George H. Denton, University of Maine, Orono, Maine.* We will map glacial erosional and depositional features in the Ellsworth Mountains this season in order to reconstruct former ice sheet surfaces and chart their recession. We hypothesize that during glacial periods the West Antarctic Ice Sheet expands to the edge of the continental shelves in the Ross and Weddell Seas and that during interglacials the ice sheet retreats to about its present position and maintains large ice shelves. During particularly warm interglacials, however, the last about 124,000 years ago, we think the West Antarctic Ice Sheet loses its shelves and collapses rapidly. Because the Ellsworth Mountains occur precisely at the grounding line between the West Antarctic Ice Sheet and the Ronne Ice Shelf, they are ideal for monitoring ice advances and recessions in the Weddell Sea area. In the McMurdo Sound region we will map the upper Taylor and Wright Valleys and the Mackay Glacier area to gain more data on the last advance of grounded ice in the Ross Sea. (S-056)

Search for meteorites. *William A. Cassidy, University of Pittsburgh, Pittsburgh, Pennsylvania.* In past seasons we have found meteorites at sites where ice flow slows or stops and the ice is eroded by ablation. This season we will continue our search for meteorites and investigate further the ablation mechanism which reveals meteorite concentrations on the surface of the ice sheet. We expect to recover more meteorite specimens and to support researchers who measure earth residence times of meteorites by supplying data on modern ice flow trends and directions to obtain a clearer picture of ice dynamics and past climates. We will concentrate our search this season in the Ellsworth Mountains and at the Allan Hills and Mt. Reckling areas in the McMurdo vicinity. (S-058)

International radiometric survey. *Edward J. Zeller, University of Kansas, Lawrence, Kansas.* We will determine the distribution and concentration of radioactive elements in the folded sediments of the Beacon Supergroup in the Ellsworth Mountains this season using airborne gamma-ray spectrometers. Our objectives are: (1) to locate specific rock types which may have radioactive element concentrations and to evaluate the geochemical characteristics of those rocks; (2) to provide fundamental geologic information about specific rock types and conditions of deposition or crystallization; and (3) to provide baseline radioactivity measurements that may ultimately serve as benchmarks for evaluating the environmental impact of human operations in Antarctica. (S-059)

Geologic investigation of the Ellsworth Mountains. *Gerald F. Webers, Macalester College, St. Paul, Minnesota.* The Ellsworth Mountains occupy a strategic position as a bridge between the geologically younger province of West Antarctica and the older shield areas of East Antarctica. Our goal is to clarify the geologic relationship of the Ellsworth Mountains to the remainder of Antarctica by mounting a major field investigation in the area. Our objectives are: (1) to construct a detailed picture of a 13,000 meter stratigraphic section of the Ellsworths; (2) to obtain samples of fossil floras and faunas throughout the stratigraphic section for correlative, environmental, and evolutionary study; (3) to examine the evolution of landforms beginning with a probable Jurassic uplift through continental glaciation and partial recession; (4) to chart the sequence of major structural geologic events in the area; (5) to analyze the tectonic relationship of the Ellsworths to the Antarctic Peninsula and to the East Antarctic shield; and (6) to obtain information on the nature and composition of igneous rocks exposed in the Heritage Range. (S-094)

Last season geologists and glaciologists were deployed by helicopter from a single base camp to small temporary camps (below) throughout the Darwin Glacier vicinity. This season the same field camp concept will enable researchers to deploy to various sites throughout the Ellsworth Mountains.



NSF photo by Franz-Dieter Miotke

McMurdo Station and vicinity

Satellite tracking and automatic position/activity monitoring for selected vertebrates. *V. Kuechle, D.B. Siniff, and D. DeMaster, University of Minnesota, Minneapolis, Minnesota.* A radio tracking system with remote sensing will be developed that will enable us to monitor species-specific movements of certain antarctic vertebrates. Eventually this technology will be capable of monitoring movements of several vertebrate species from one region of the Antarctic to another and to integrate those movements with other information about the trophodynamic relationships of the marine ecosystem. This season we will test a telemetry package for tracking the Weddell seal *(Leptonychotes weddelli)* and the antarctic cod *(Dissostichus mawsoni)* in the McMurdo vicinity and obtain data on local movements of these species. A data collection system which will telemeter data from key monitoring stations to a central laboratory or satellite will be tested. (S-004)

The effect of temperature on levels of glycoprotein antifreeze in fishes inhabiting different thermal environments. *Arthur L. DeVries, University of Illinois, Urbana, Illinois.* One fundamental strategy of adaptation shown by living organisms is the adjustment of rates of protein synthesis in response to external environmental factors. We will investigate the synthesis of the unique glycoprotein antifreeze in certain antarctic fish which enables them to survive while swimming in ice-laden seawater. In particular we will examine why these fish aparently maintain constant levels of this antifreeze even during warm acclimation by conducting long-term warm acclimation experiments. This season we will investigate the molecular basis of this apparent insensitivity to warm acclimation and whether the amount of protein synthesized is directly related to the amount of messenger RNA coding for it. We will also look at the peptide antifreeze in the blood of the eel pout to determine why a molecule so different from a glycoprotein can produce the same lowering of the freezing point of blood. (S-005)

U.S. Navy photo (9071-11-78) by David Thompson

Dr. Harold Muchmore of the University of Oklahoma takes a blood sample from Gary Foltz of Holmes & Narver, Inc. for studies of human immune responses during the austral winter isolation at South Pole Station. Dr. Muchmore's work is described in the Amundsen-Scott South Pole section of this issue.

Respiratory virus transmission among personnel at McMurdo Station during the WINFLY isolation period. *Elliot C. Dick, University of Wisconsin, Madison, Wisconsin.* Some scientific evidence suggests that respiratory infections are spread through a population by viruses in nasal secretions. Our goal this season is to prevent the dissemination of these infections by having McMurdo and Scott Base personnel use highly virucidal paper handkerchiefs throughout the early September flights to McMurdo which break the station's winter isolation. The personnel at Scott Base will use the virucidal handkerchiefs throughout the 1979-80 summer season in an attempt to create a "cold-free" island in the McMurdo area. We will monitor our success throughout the season at the Ecklund Biological Center. Christchurch Hospital in New Zealand will help us isolate viruses from our samples. (S-010)

The role of seabirds in the marine ecosystem. *David G. Ainley, Point Reyes Bird Observatory, Stinson Beach, California.* A major goal is to estimate the biomass of seabirds in the Ross Sea and to compare their biomass with that of marine mammals. In this way we will determine the relative numerical importance of birds, whales, and seals in this region. We also will examine the food, oceanographic, and ice characteristics that affect the distributions of individual species in the antarctic pelagic seabird community. This season we will operate from the icebreaker *Northwind*, sampling different areas and habitats, particularly at various ice edges, to determine avian feeding habits and to explain the prevalence of different species in different areas. (S-013)

Anatomical studies of fishes. *Joseph T. Eastman, Ohio University, Athens, Ohio.* We will study the anatomy of antarctic fishes from McMurdo Sound. We are attempting to relate gross anatomy, histology and ultrastructure to the physiology, biochemistry, ecology, taxonomy and evolution of these fishes. Our ultimate goal is a better understanding of the role of these fishes in the ecosystem of the southern ocean. This year we will be concentrating on buoyancy control mechanisms in these swim bladderless fishes. We are especially interested in modifications of the body systems that have allowed a few of these fishes to become neutrally buoyant and capable of exploiting the underutilized midwaters. (S-031)

Protein metabolism in cold adaptation of fish *Audrey E.V. Haschemeyer, Hunter College, New York, New York.* Our project focuses on the study of protein synthesis in antarctic fish as a way to assess metabolic adaptation to year-round subzero temperatures. A major objective is to determine rates of protein turnover in living antarctic fish for comparison with protein turnover rates in temperate fish and in mammals. At McMurdo this season we will continue to investigate the biochemical mechanisms responsible for the transfer of information from nucleic acids into protein sequences and to assay protein synthetic rates in living specimens. The results should provide insight into the mechanisms which regulate protein synthesis in lower vertebrates and into the evolution of this fundamental biological process which allows organisms to adapt to extreme environments. (S-032)

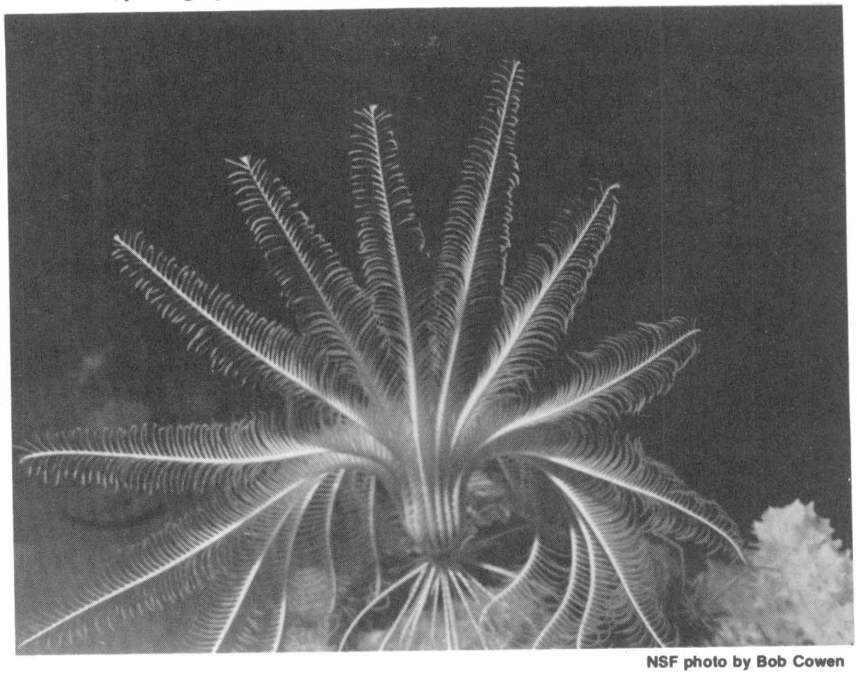
Distribution and ecology of small odontocete whales. *W.E. Evans and J.R. Jehl, Jr., Hubbs/Sea World Research Institute, San Diego, California.* Our field work will be concentrated in the McMurdo area, where we will attempt to obtain vocalizations of local killer whale populations. The research team will then board *Polar Sea* to census and photograph small whales en route to Palmer Station and Ushuaia, Argentina. These studies are intended to obtain information on color patterns to elucidate the movement and distribution of local whale stocks. We also will collect data on other marine mammals and birds. (S-034)

Ionospheric and geodetic studies. *Arnold J. Tucker, University of Texas, Austin, Texas.* We will upgrade the equipment at the McMurdo geodetic satellite observatory this season to improve the reliability and the efficiency of the observatory. We will collect dual-frequency Doppler data from polar orbiting satellites which have transmitted similar data to South Pole Station on specific orbits. Data from both stations will help us determine the spacial and time variations of the ionosphere and provide geodetic positioning controls. Other satellite passes will provide telemetered magnetometer data for study of variations in the earth's magnetic field at 1000 km altitude. (S-051)

Cenozoic biostratigraphy. *Peter-Noel Webb, Northern Illinois University, DeKalb, Illinois.* We are studying sediments deposited at various depths in the basins of the McMurdo Sound and Ross embayment region to determine the geologic growth and extent of the basins which separate East and West Antarctica. We will pursue our analysis of microfaunas—diatoms, silicoflagellates, radiolaria, and foraminifera—recovered last season from beneath the Ross Ice Shelf and obtain new bottom samples from the McMurdo Sound region. We are interested in how tectonic elevations and depressions during the Cenozoic period influenced the sedimentary and biostratigraphic patterns of basin deposits and in the possibility that during the late Mesozoic and early Tertiary periods a seaway lay between East and West Antarctica which provided an avenue for water current and biological movements between the Pacific and Atlantic oceans. (S-062)

Meteorological phenomena of the McMurdo area. *Austin A. Hogan, State University of New York, Albany, New York.* Our goal is to define the physical properties of atmospheric aerosols and to determine the meteorological processes that transport aerosol materials from maritime and possibly continental regions to Antarctica. We are also interested in what causes aerosol materials to be precipitated to the surface of the ice sheet and to what capacity the Antarctic serves as a sink for particulate materials which enter the atmosphere in other regions of the Earth. Analysis of the residue in ice crystals also will tell us more about the physical properties of these precipitated particles. (S-255)

This crinoid, photographed at 29 meters depth, is typical of bottom life at New Harbor.



NSF photo by Bob Cowen

Mesoscale atmospheric events. *Robert J. Renard, Naval Postgraduate School, Monterey, California.* We will examine thermal and moisture structures and the circulation of the atmosphere within 100 kilometers of McMurdo Station during tropospheric moisture intrusions. Our goal is to determine the subsynoptic-scale circulations which are precursors of storms in the McMurdo vicinity and to test the reliability of meteorological data gathered by satellites. We use visual and infrared weather satellite observations, data from automatic weather stations, and conventional meteorological measurements in our research at McMurdo. (S-268)

Trace gases from sea ice. *T.A. Gosink, University of Alaska, Fairbanks, Alaska.* We will take air, sea ice, and sea water samples north of McMurdo this season which we will compare to similar samples from the Arctic. Our goal is to determine the sources of trace gases—carbon monoxide, carbon dioxide, methane, hydrogen, and nitrous oxide—in the samples in order to understand atmospheric circulation and to gauge the effect of human activity upon the atmosphere. In addition, our measurements of carbon dioxide content over the sea ice of McMurdo Sound and in the air at the South Pole should provide a clearer understanding of the influence of sea ice upon the atmosphere in the Antarctic. (S-278)

Remote or multiple sites

Bacterial plankton dynamics and adaptation in antarctic waters. *Roger B. Hanson, Skidaway Institute of Oceanography, Savannah, Georgia, and Daniel H. Pope, Rensselaer Polytechnic Institute, Troy, New York.* We are interested in the adaptation and functional role of bacterio-plankton as a food source and a consumer of dissolved organic matter in the southern ocean. We will investigate changes in the physiology, biochemistry, and population succession of microheterotrophs adapted to antarctic surface water as it leaves a region of high primary productivity and low temperature and sinks below the photic zone. We will compare these populations with those of water that has been out of communication with the surface beyond the Antarctic Convergence. Our research will supplement knowledge of the primary productivity of the southern ocean by furthering our understanding of this trophic level. (S-037)

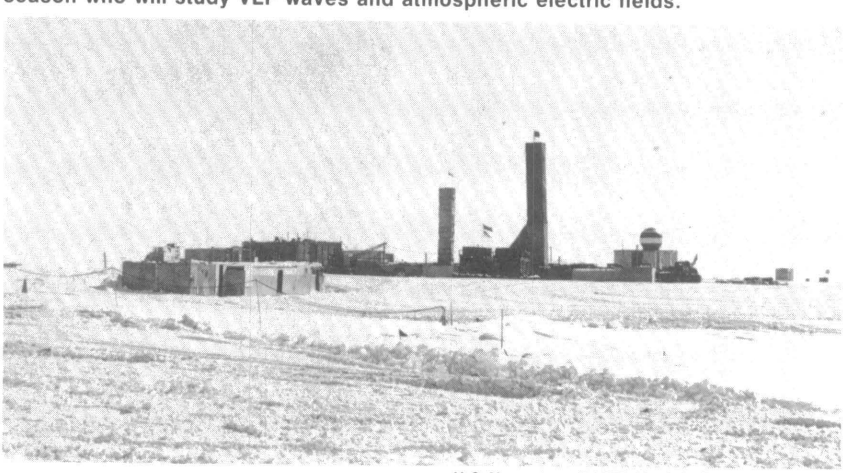
Petrologic study of metamorphic rocks of Enderby Land. *Edward S. Grew and W.G. Ernst, University of California, Los Angeles, California.* Our goal is to estimate the pressure and temperature conditions under which metamorphic rocks in Enderby Land crystallized and to map regional gradients in temperature and pressure. Grew will return to Enderby Land this season with the Australian National Antarctic Research Expedition to collect more samples of the unusual mineral assemblages such as sapphirine-quartz and sillimanite-orthopyroxene which are characteristic of the granulite-facies rocks and to map their distribution. An important concern is the role played by the chemistry of the rocks in stabilizing the unusual mineral assemblages. Combined with age isotopic determinations, our work will help to clarify the geologic history of the Precambrian shield in Enderby Land. (S-069)

Measurements of very-low-frequency waves and atmospheric electric fields at Vostok Station. *R.A. Helliwell, Stanford University, Stanford, California.* Our main objective is to investigate the phase and amplitude characteristics of subionospheric signals propagating to Vostok from the Siple Station VLF transmitter. These signals will be perturbed by the effects of particle precipitation along the path between the stations. Information about the perturbations will contribute to current studies of wave-induced particle precipitation. Our other objectives include: (1) participation in spaced-station mapping of the occurrence of VLF noise forms over the polar regions; (2) a further description of the "hissler" auroral noise phenomenon and a search for its relation to optical auroral forms; and (3) investigation of the properties of the vertical atmospheric electric field with emphasis on its relation to the interplanetary magnetic field. (S-100C)

Ross Ice Shelf Project. *John C. Clough, University of Nebraska, Lincoln, Nebraska.* We will recover recorders and data left at the drill site last summer for two winter long freeze-in experiments. One experiment was designed to record the current and temperature characteristics of the water column beneath the Ross Ice Shelf. The other was designed to measure the freezing or melting rate at the bottom of the ice shelf. (S-150A)

Shallow ice core drilling. *Karl Kuivinen, University of Nebraska, Lincoln, Nebraska.* This year the Polar Ice Coring Office (PICO) staff will drill 100-meter holes at Siple, Byrd, and Vostok Stations, and at dome C, collecting ice core for scientists investigating the physical properties and chemical constituents of snow and ice from the polar ice caps. PICO

Vostok Station (U.S.S.R.) shown below will house a U.S. exchange scientist this season who will study VLF waves and atmospheric electric fields.



U.S. Navy photo (90227-12-78) by Douglas K. Nortell

U.S. Navy photo (90279-12-78) by Thomas E. McCabe, Jr.

Rich Tillson and Philip Marshall of the Polar Ice Coring Office (University of Nebraska) pack an ice core for shipment to the United States. PICO will take more cores this season.

will also provide drilling support for the seismic profile studies to be conducted at dome C. (S-150B)

Relationship of nitrogenous chemical content of polar ice and snow to atmospheric nitrogen fixation. *Bruce C. Parker and Edward J. Zeller, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, and University of Kansas, Lawrence, Kansas.* We are trying to determine fixed nitrogen content at different depths in snow, firn, and glacial ice from various locations in Antarctica. We are also examining the sources of the fixed nitrogen. Currently we are investigating anomalous fluctuations in nitrate and ammonia nitrogen in snow and ice which may be correlated to past solar activity and world climate. If we can establish this correlation, our data will help us investigate past world climates and give us a tool with which to measure the age of ice, places and rates of deposition, and stratigraphic correlations. This season we will collect more samples from Byrd, Siple, and Vostok Stations for later analysis. (S-169)

Physical oceanographic studies. *Theodore D. Foster, University of California, Santa Cruz, California.* We will complete our analysis of temperature and salinity data gathered in the 1978 season during the International Weddell Sea Oceanographic Expedition. Our goal is a better understanding of (1) the mixing of high salinity continental shelf water with intermediate water which intrudes onto the shelf; (2) the subsequent sinking of the mixture down the continental slope; and (3) the formation of bottom water. This season we will attempt to recover current meters set in the southern Weddell Sea and conduct a closely spaced array of conductivity-temperature-depth stations with the aid of USCGC *Glacier*. (S-200)

Sea ice. *Stephen F. Ackley, U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.* We are trying to determine the relationship of antarctic sea ice to the atmospheric and oceanic circulation patterns of the southern polar region because sea ice influences exchanges between ocean and atmosphere, and is itself modified by these exchanges. This season we will: (1) place five buoys in the Weddell Sea to gather meteorological data about the relative effects of winds and water currents upon the pack ice; (2) measure ice thickness distribution through satellite imagery and data buoys to determine its effects on heat and other exchanges across the air-sea boundary; (3) take ice samples to characterize the structural and physical properties of sea ice; and (4) analyze the drift, air temperature, and atmospheric pressure records from buoys deployed last season to determine the forcing fields for sea ice motion in the Weddell Sea. Most of our field work will be performed with the aid of a U.S. Coast Guard icebreaker. (S-205)

Marine geological survey of the Bellingshausen Sea. *John B. Anderson, Rice University, Houston, Texas.* Our objective this season is to examine sediment and faunal distribution patterns on a portion of the antarctic continental margin bounded by mountains and valley glaciers. We will take piston cores throughout the Bellingshausen Sea from USGCG *Glacier*. Our samples should provide information about past and present ice conditions, about the influence of tectonic elements upon terrigenous sedimentation, and about the hydrocarbon potential of the continental margin. (S-207)

Automatic weather stations for meteorological research. *Allen M. Peterson, Stanford University, Stanford,*

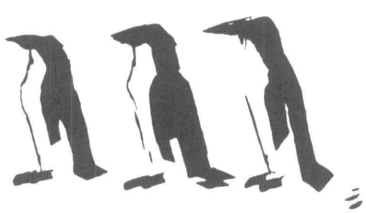
USCGC Glacier will return to Antarctica to help break a channel to McMurdo Station and to support marine biology and oceanography on her subsequent route to Palmer Station. Icebreakers *Polar Sea* and *Northwind* also will work in Antarctica this season.

U.S. Navy photo (90424-1-79) by Douglas K. Nortell

California. We will recalibrate and service the automatic weather stations at Minna Bluff, Ross Island, Marble Point, White Island, Byrd Station, and the Asgard Range. We will shift the unit at Byrd Station to dome C, where it will provide data for katabatic wind studies. As a part of the katabatic wind studies, two additional stations will be deployed at sites D-59 (68° 20′ S, 137° 21′ E) and D-49 (67° 33′ S, 138° 26′ E) during 1979-80. (S-272)

Katabatic winds. *Gerd Wendler and John Kelley, University of Alaska, Fairbanks, Alaska.* To obtain data on the katabatic wind we will establish an array of automatic weather stations in cooperation with French investigators from dome C to Dumont d'Urville Station. The French scientists under the leadership of A. Poggi have already established an instrumented 80 meter tower recording temperature, humidity, atmospheric pressure, wind speed, and wind direction; four more stations will be established this austral summer. We will also establish four: one for intercomparison, one at dome C, and two at intermediate points. This will give us the first systematic data set from dome C to the ocean on a year-round basis of the katabatic wind which will result in a better understanding of this phenomenon and will be the basis for the development of models. (S-277)

The United States and the Antarctic since World War II. *Lawrence J. Baack, University of Nebraska, Lincoln, Nebraska.* The goal of this project, supported in cooperation with the National Endowment for the Humanities, is a history of U.S. involvement in Antarctica since World War II. The major objective of this visit is to examine research projects in the field and to gain an historical perspective on the activities of U.S. researchers and support personnel. (S-311)



Siple Station

Very-low-frequency probing of the magnetosphere from Siple Station. *R.A. Helliwell and J.P. Katsufrakis, Stanford University, Stanford, California.* Our operation of the VLF transmitter at Siple Station will include further investigation of the response of the magnetosphere to changes in transmitter power. We also will begin studying the response of the magnetosphere to transmissions at multiple frequencies. A major objective in our studies is to determine more clearly how wave-induced particle precipitation events contribute to the loss of energetic particles from the magnetosphere. We will continue special VLF transmission to satellites to study details of magnetospheric wave-particle interactions *in situ*, and conduct active and passive probing campaigns in support of rocket and balloon investigations of precipitation effects in the ionosphere and subionosphere. An improved monitoring system at Siple will handle and display photometric and VLF wave information on precipitation activity. (S-100A)

Flux-gate magnetometer installation at Siple Station. *L.J. Lanzerotti, Bell Laboratories, Murray Hill, New Jersey.* The flux-gate magnetometer and digital data acquisition system at Siple Station are used extensively for studies of hydromagnetic wave phenomena and sub-auroral magnetic activity in the Earth's magnetosphere. Our present concentration is on measuring azimuthal wave lengths and phase velocities of hydromagnetic disturbances at sub-auroral latitudes. Simultaneous magnetometer measurements at different longitudes will enable us to test different theories of hydromagnetic wave generation and propagation in the magnetosphere. Siple data will be crucial in defining the standing waves that will be used in the analysis. In cooperation with University of Maryland scientists, we also will use riometers to detail the latitude dependence of particle precipitation events at mid-latitudes and the effects on precipitation of hydromagnetic waves. (S-101)

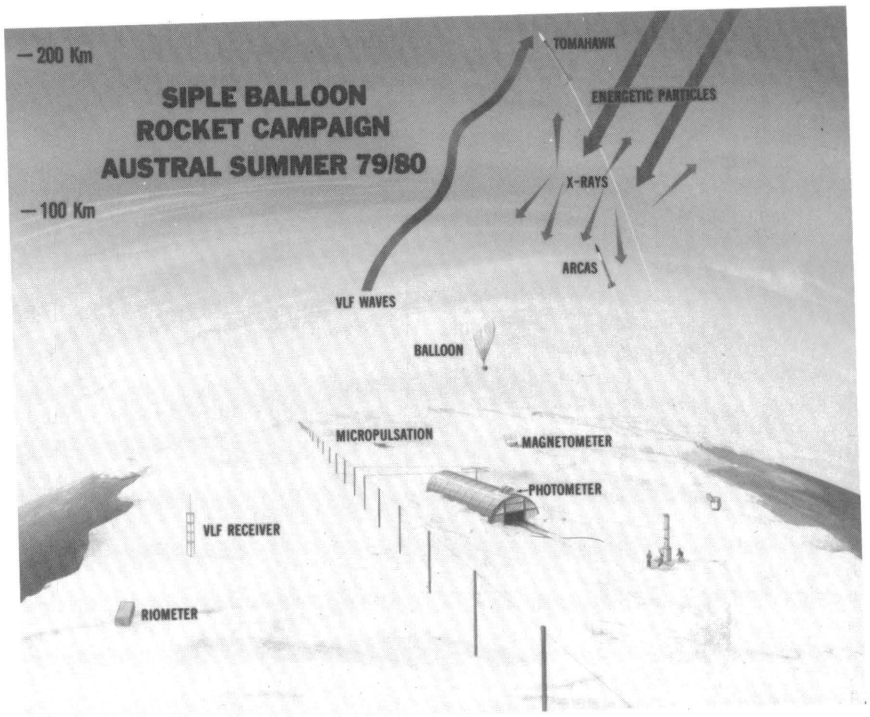
Micropulsation research at Siple Station and Roberval, Quebec. *Laurence J. Cahill and Roger L. Arnoldy, University of Minnesota, Minneapolis, Minnesota.* The goal of our research is to characterize the role of the plasmapause in the generation of micropulsations. We will visit Siple Station this season to perform routine maintenance and recalibration of the micropulsation detector. Our past observations from an auroral light detector and from the micropulsation detector enabled us to determine the entry region in the ionosphere for the micropulsations and to propose an interaction between upward moving ULF waves and downward moving ions. We will continue to examine simultaneous auroral light emissions and ULF pulsations at both Siple and Roberval to extend our understanding of these wave-particle interactions at the plasmapause. (S-102)

Photometer observations of particle precipitation. *Stephen B. Mende, Lockheed Palo Alto Research Laboratory, Palo Alto, California.* Our scientific objectives are to make photometric measurements of mid-latitude optical emissions caused by energetic particles. In 1977 we demonstrated that the detection of ULF and VLF waves was correlated with optical emissions. Photometry provided spectral evidence that the correlated emissions are caused by ionizing precipitating particles. This year we will install better diagnostic instruments to pursue our study of wave-particle interactions. In cooperation with investigators from Boston College, we also will install a monochromatic all-sky television which will detect the spatial extent and the location of the correlated pulsing regions. (S-104)

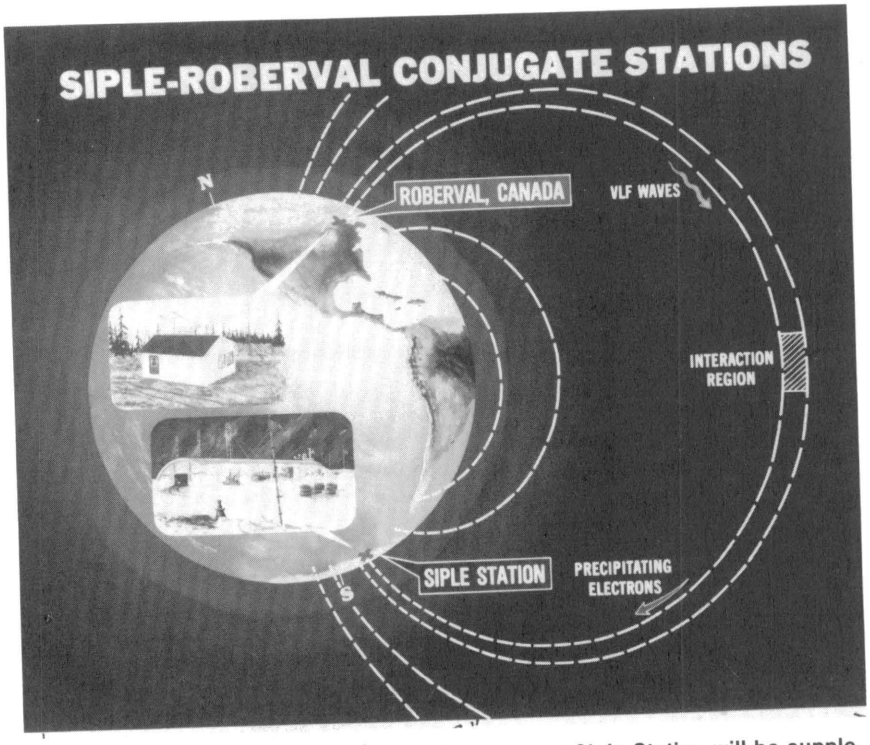
Naturally and artificially stimulated electron precipitation near the plasmapause. *T.J. Rosenberg and D.L. Matthews, University of Maryland, College Park, Maryland.* We will launch 10 balloons equipped with X-ray scintillation counters from Siple Station in close coordination with the rocket campaign this season. These counters will record X-rays produced at altitudes of 70-90 kilometers above the surface by energetic electrons impacting the atmosphere over an area 150 km in diameter centered above the balloon. On 5 of the balloons three-axis electric field detectors provided by the University

of Houston will record the DC field and variations at ultra-low-frequencies (ULF < 1Hz). Each of the other 5 balloons, will carry a VLF radio receiver provided by the University of Oslo to record signals in the frequency range from 0 to 10 kHz. Also coordinated with the Siple program is the launch of 4 balloons by the Universities of California and Washington from the geomagnetically conjugate region near Roberval, Canada. These balloons will be instrumented with X-ray and electric field detectors. Complementary ULF and electron precipitation data also will be obtained by a magnetometer and riometer at Siple and from a 4-station latitude array of similar instruments in the conjugate region operated jointly by Bell Laboratories and the University of Maryland. The data obtained will be used to determine the degree of conjugacy of various particle and field phenomena and the relationship of these phenomena to the plasmapause. The objectives of this multi-experiment balloon and ground-based program are to study the physical processes involved in VLF and ULF wave-particle interactions as they affect the origin of the waves and the injection, drift, modulation, and precipitation of energetic electrons. This project will be supported by the Siple VLF transmitter and by extensive analysis and interpretation of VLF emission data in real time by Stanford University scientists at Siple and Roberval. (S-111)

Rocket investigation of electron precipitation. *David L. Matthews, Institute for Physical Science and Technology, University of Maryland, College Park, Maryland.* Three sounding rockets will be launched at Siple to measure interactions between electrons and very-low-frequency (VLF) waves in the ionosphere and magnetosphere. Each payload comprises wide-range directional electron spectrometers (Maryland) and full electric and magnetic wave vector measurements (Cornell University, University of Southampton (England), and University of Oslo (Norway)). Vehicle, telemetry, ground station, and launch support will be provided by the NASA Goddard Space Flight Center. Both natural events and those triggered by the Siple VLF transmitter will be investigated.



At Siple Station investigators will launch 3 Nike-Tomahawk and 4 Super Arcas sounding rockets and 10 balloons to measure the precipitation of energetic electrons from the magnetosphere. Ground instrumentation—the Siple VLF transmitter, riometers, photometers, magnetometers, and micropulsation detectors—also will be employed in the study.



The balloon and rocket investigations this season at Siple Station will be supplemented at Roberval, Quebec, Canada, the geomagnetic conjugate to Siple. Four balloons equipped with X-ray and electric field detectors will be launched from Roberval during the rocket and balloon soundings at Siple Station.

These will be the first comprehensive *in situ* measurements of the remarkable phenomena previously observed on the ground and in satellites, and are essential to the development of a convincing physical interpretation of these phenomena. Other objectives of the program are to measure the signal intensity actually produced by the Siple transmitter at the base of the ionosphere, and how both upgoing and downgoing waves are affected in direction and intensity as they pass through the ionosphere. In addition to their scientific value, these results will be used to improve the understanding and design of VLF direction-finding systems. (S-112)

Super Arcas rocket program at Siple Station. *W.R. Sheldon and J.R. Benbrook, University of Houston, Houston, Texas.* We will launch an X-ray detector and a small geiger counter from Siple Station to measure the low-energy X-ray flux generated by the precipitation of high-energy electrons. We will try to measure any charged particle fluxes that penetrate below 80 kilometers altitude. Our campaign will concentrate on an altitude range of 65 to 80 kilometers. These studies, combined with high altitude rocket investigations, low altitude balloon ascents, and satellite and ground observations, will help us determine the location, size, and effectiveness of the wave-particle interaction region over Siple Station. (S-115)

Measurements of DC and AC electric fields and plasma density above the Siple VLF transmitter. *M.C. Kelley and P.M. Kintner, School of Electrical Engineering, Cornell University, Ithaca, New York.* We will fly electric field and electron density experiments aboard the three high altitude sounding rockets launched from Siple Station this season. Our plan is to investigate the plasma processes which are responsible for the amplification of VLF waves transmitted from the Siple Station transmitter by taking *in situ* measurements at 250 kilometers altitude. The equipment provided by the Cornell team aboard the rockets will enable us to analyze four components of waves in a plasma; equipment provided by other investigators will extend our coverage to all seven wave components. (S-118)

Siple low-light level television experiments. *Robert H. Eather, Boston College, Chestnut Hill, Massachusetts.* Our project, in collaboration with investigators from Lockheed Palo Alto Research Laboratory, is to conduct auroral photometric experiments in Antarctica. This season we will provide a new low-light monochromatic level television device to study particle precipitation induced by wave-particle interactions over Siple Station. The instrument will enable observers to make chart recordings of the total light intensity in selected regions of the sky and to obtain direct measurements of the size and shape of the wave-particle interaction regions. Such information until now could only be obtained by indirect inference from wave properties. In addition, we will be installing an image intensified meridian slit camera at South Pole Station. The camera will image a 3° wide slit of sky from horizon to horizon in the geomagnetic meridian onto continually moving 35 mm film. The images will provide a continuous record of latitudinal shifts of the dayside aurora. We will discontinue operation of our 6-channel meridian scanning photometer at South Pole. (S-119)

Digital ionosonde studies of the ionosphere at Siple Station and Roberval, Quebec. *G.S. Stiles and J.R. Doupnik, Utah State University, Logan, Utah.* We will visit Siple Station this season to arrange for the installation of a high frequency radar system during the 1980-81 season. This year we will check the availability of space and power systems and choose suitable sites for the antenna. (S-120)

Southern Victoria Land

Ecosystem comparisons of oasis lakes and soils. *Bruce C. Parker and George M. Simmons, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.* We will return to Lakes Fryxell and Hoare in lower Taylor Valley to continue our studies of benthic algal mats and their role in the biological activity of antarctic oasis lakes. This season half our team will repeat underwater scuba observations and perform immediate analyses of samples at Lake Hoare. The rest of our team will remain at McMurdo to conduct more sophisticated analyses of mat specimens at the Ecklund Biological Center. (S-002)

Endolithic microorganisms in the dry valleys. *E. Imre Friedmann, Florida State University, Tallahassee, Florida.* We will continue our studies of the microbial flora living inside rocks in the dry valleys of southern Victoria Land and other arid areas. The existence of cyanobacteria, lichens, and eukaryotic algae has been confirmed in Beacon sandstone, marble, granite, and anorthosite rocks. Several of the organisms have been successfully grown in laboratory cultures. We estimated the amount of biomass of the microflora. We established that the main source of nitrogen is not biological nitrogen fixation, but abiotically fixed nitrogen probably formed by aurora activity and deposited by snow. Our goals are (1) to sample further rocks and culture more organisms; (2) to determine ecological and micrometeorological factors that affect the distribution and growth of endolithic microorganisms; and (3) to study the possible effects of microorganisms on the rock substrate such as weathering, mineral leaching, etc. (S-015)

Seismic studies in the Transantarctic Mountains. *Lyle D. McGinnis, Northern Illinois University, DeKalb, Illinois.* This season we will investigate the upper few kilometers of the Earth's crust in the McMurdo Sound—Transantarctic Mountains boundary region near Taylor Valley.

International participation, 1979-80

About 50 scientists from Argentina, Chile, France, Israel, Japan, New Zealand, Norway, the Soviet Union, and West Germany will participate with U.S. colleagues in the 1979-80 United States Antarctic Research Program. U.S. scientists will participate in Australian, British, French, New Zealand, Soviet, and West German expeditions. The international exchange of scientists and scientific observations has been characteristic of antarctic research since the signing of the Antarctic Treaty on 1 December 1959.

U.S. Navy photo (90435-1-79) by James Gillcrist

Investigators will return to Lake Hoare in the dry valleys, shown here in January 1979, to study and retrieve samples of the algal mats that live on the bottom of the lake.

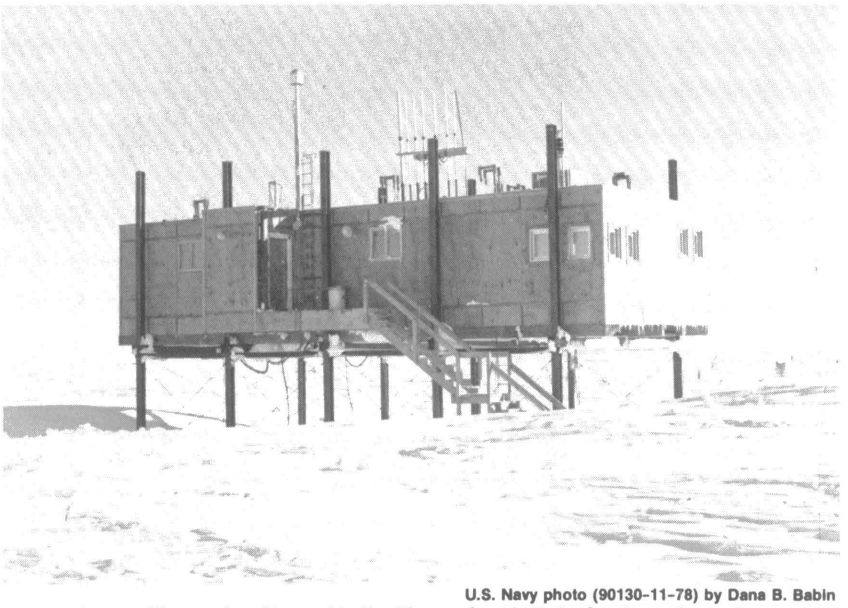
We will use standard seismic refraction and reflection techniques to determine the types and thicknesses of sediments above the basement rock complex, the structure of the basement complex, and the depth to crystalline basement rocks. Our studies on sedimentation rates and the configuration of the basement surface will tell us whether Taylor Valley had a preglacial history and give us an approximate date when the valley was formed. Our seismic measurements from New Harbor seaward will diagnose the history of sea level elevation and glacial thickness in McMurdo Sound. Our objective is to chart the transitional geology and structure of this area to determine whether the Transantarctic Mountains represent an active tectonic plate boundary or an older, inactive plate boundary. (S-053)

Investigations of Ferrar Group rocks from southern Victoria Land. *Philip R. Kyle, Ohio State University, Columbus, Ohio.* We will sample and investigate Ferrar Group dolerite sills in the Transantarctic Mountains of southern Victoria Land. Our primary objective is to understand the unusual geochemical nature and origin of these rocks and the processes which modified them after emplacement as sills. These studies will help us understand the structure of the Earth's upper mantle, the interaction of the mantle with the crust, and magma genesis in continental environments. A second phase of our project will involve occupying a hut at the summit of Mt. Erebus to monitor volcanic activity associated with the persistent anorthoclase lava lake. We will make audio-visual observations and temperature measurements of the lava lake, perform heat flow studies, and take samples of volcanic ejecta. (S-081)

Characteristics and significance of rock glaciers in southern Victoria Land. *Paul A. Mayewski, University of New Hampshire, Durham, New Hampshire.* We will examine the dynamic characteristics of approximately 20 rock glaciers in southern Victoria Land this season to investigate mass wasting in a polar environment. In addition, we will revisit experiments set up during the 1968-69 austral summer in Wright Valley to gather similar data. Results of these studies will aid in further understanding the mode of formation and history of development of the features. In addition, examination of the characteristics of these features will be used to determine their former and current states of activity in order to develop a record of this activity for comparison with the glacio-geomorphic record already available in this area. (S-092)

This instrumentation was used by Dr. Miotke last season to measure temperature changes in rocks in the dry valleys. The goal of the study is a better understanding of rock weathering.

NSF photo by Franz-Dieter Miotke



U.S. Navy photo (90130-11-78) by Dana B. Babin

Researchers will use the Clean Air Facility at South Pole Station, shown here as of November 1978, to monitor carbon dioxide, ozone, certain fluorocarbons, and aerosols in the atmosphere. Continual measurements year after year provide data for studies of long-term variations in atmospheric constituents.

Amundsen-Scott South Pole Station

Human immune responses during bio-isolation. *Harold G. Muchmore, Veteran's Administration Medical Center, Oklahoma City, Oklahoma.* We are investigating immunity and the viral respiratory infections in South Pole personnel which occur long after station closure, and which have been observed each winter since 1974. In 1978 we identified an unexpected and remarkable high rate of parainfluenza virus recovery in samples taken from South Pole personnel before, during, and after bio-isolation. Our goal is to confirm this occurrence of virus shedding during the isolation period, and to investigate immunological and environmental factors which may be responsible for this virus persistence. This viral persistence and shedding, which occurred in asymptomatic as well as symptomatic personnel, is contrary to present concepts of respiratory virus epidemiology, and if confirmed by this research may lead to revision of these concepts. (S-007)

Search for the pendulum mode of the Earth's inner core. *Leon Knopoff, University of California, Los Angeles, California.* We are trying to determine the deep structure of the earth by analyzing seismograms of distant earthquakes recorded at the South Pole. This season we will again measure free oscillations of the Earth with two ultra-long-period seismometers (modified LaCoste-Romberg gravity meters) and continue our search for the pendulum mode of the Earth's inner core. It may be that the inner core pendulum mode has not yet been excited strongly enough for detection by present technology. For that reason we will continue to improve the sensitivity of our instruments. A pendulum installed at distance from the dome at South Pole will provide information on horizontal Earth tides and help us evaluate the stability of the South Pole location as a research platform for horizontal tide measurements. (S-050)

South Pole Doppler studies. *William J. Kosco and Charles D. Zeigler, U.S. Geological Survey, Reston, Virginia.* The U.S. Geological Survey will continue to operate a fixed satellite Doppler station at Amundsen-Scott South Pole Station to obtain data on ice sheet movement, polar motion, and the Earth's spin axis. We will support the worldwide geodetic net program and serve as a translocation station for refining satellite Doppler point positioning in support of glaciological, geophysical, and mapping projects. In addition, the two-person winter team will operate and maintain a seismometer in support of worldwide earthquake studies. (S-052A)

Investigations of cosmic ray intensity variations. *Martin A. Pomerantz, Bartol Research Foundation of the Franklin Institute, Newark, Delaware.* The cosmic ray detectors located at McMurdo and South Pole Stations and at Thule, Greenland, enable us to monitor the dynamic state of interplanetary "weather" by keeping track of the changing flow patterns of cosmic rays in the vicinity of the Earth. The sea level counterpart stations at McMurdo and Thule record north/south assymetries in the flow patterns; the high altitude South Pole station, equipped with extremely sensitive detectors, records the presence of relativistic solar cosmic rays—the highest energy particles the sun can produce. We will continue to study cosmic ray modulations and anisotropies this season and will also attempt to detect more of the ground level enhancements that herald the arrival of relativistic solar cosmic rays which cannot be observed with other techniques. (S-109A)

South Pole solar observatory. *Martin A. Pomerantz, Bartol Research Foundation of the Franklin Institute, Newark, Delaware.* We will begin a program of direct optical observations of the sun this season, using a special solar telescope that was tested last season at the South Pole. The purpose of our collaborative experiment with French astronomers is to detect large-scale motions on the surface of the sun caused by oscillations in its interior (solar seismology). The unique telescope with its sophisticated instrument package can detect coherent velocity patterns with a sensitivity of less than 1 meter per second, well below the background arising from varying atmospheric effects encountered at any other location on Earth. (S-109B)

Solar-terrestrial effects on atmospheric electric fields. *R.A. Helliwell and C.G. Park, Stanford University, Stanford, California.* We will measure the fair-weather atmospheric electric field at South Pole and Vostok Stations and use our electric field

data to investigate the effects of solar flares, solar magnetic sector boundary crossings, and transpolar magnetospheric convection electric fields upon the atmospheric electrical field. We are especially interested in the role played by the atmospheric electric field in the coupling between the upper atmosphere and the lower atmosphere as demonstrated, for example, in apparent correlations between the fair-weather electric field near the ground and solar-terrestrial events. (S-117)

Geophysical monitoring for climatic change. *Kirby J. Hanson, National Oceanic and Atmospheric Administration, Boulder, Colorado.* We are trying to detect changes over long periods of time in background concentrations of atmospheric trace gases and particles resulting from human activities that may affect the Earth's climate. In recent years a network of observatories in Alaska, Hawaii, Samoa, and at the South Pole has been the principal source of information on the gradual build-up of carbon dioxide in the atmosphere and on injections of volcanic debris into the stratosphere. We will continue to monitor levels of carbon dioxide, surface and total ozone, certain fluorocarbons, and aerosols in the atmosphere from the South Pole Clean Air Facility, and make wind, pressure, temperature, and solar radiance measurements as well. (S-257)

Measurement of trace gases and aerosols in the stratosphere. *David J. Hofmann and James M. Rosen, University of Wyoming, Laramie, Wyoming.* We plan to fly and recover balloons carrying trace gas samplers, aerosol counters, and a condensation nucleus counter from South Pole and McMurdo Stations to measure selected stratospheric constituents. These constituents are important in determing, among other things, the stratospheric ozone profile, the level of major volcanic activity, and the way condensation nuclei in the troposphere and stratosphere affect precipitation. Our previous measurements have enabled us to begin a study of long-term variations of nitrous oxide and certain chlorofluorocarbons in the atmosphere. (S-264)

Tritium. *H. Gote Ostlund and Allen S. Mason, University of Miami, Miami, Florida.* Because it is so remote, South Pole Station is ideal as a global baseline station for measuring the amount of tritium gas and tritiated hydrocarbons in the atmosphere. We will analyze the samples taken during 1979 when they are sent to the U.S. Our data will be used in studies of air exchange between the hemispheres, of atmospheric hydrogen and hydrocarbon residence times, and of the flux of water vapor between the stratosphere and the troposphere. (S-267)

Measurement of atmospheric constituents. *David G. Murcray, University of Denver, Denver, Colorado.* Our goal is to measure the total overburden of a number of chemical species in the atmosphere. We use a moving-mirror interferometer at South Pole Station to collect solar absorption spectra which are then analyzed once the field season is over. Our project will supply data necessary to test the accuracy of models of photochemical processes in the stratosphere. (S-270)

LC-130 Hercules airplanes, such as this one unloading cargo at Byrd Glacier in November 1978, will play a crucial part in ferrying personnel, equipment, food and fuel across Antarctica. Effective scientific investigation would be impossible without the mobility provided by air support. The LC-130 Hercules airplanes used in Antarctica are owned by the National Science Foundation and flown and maintained by the U.S. Navy.

U.S. Navy photo (90203-11-78) by Thomas Bama

U.S. Navy photo (90014-10-78) by Frank R. Bair, Jr.

Darwin Glacier camp, shown here partially completed in October 1978, housed up to 58 scientists and support personnel last season during an examination of the Byrd and Darwin Glacier areas. This season a similar camp will be installed in the Ellsworth Mountains. Major field camps are one way in which the United States Antarctic Research Program stretches logistics in support of scientific investigations.

Major summer camps: what sites, what research?

U.S. Navy photo (90342-12-78) by Michael P. Helms

UH-1N helicopters deployed to field camps provide mobility for researchers. This one landed on a frozen lake near Derrick Peak during a December 1978 survey.

The United States Antarctic Research Program frequently establishes large camps at remote locations in Antarctica for support of a suite of research projects during a summer operating season. In the 1978-79 season, a camp was established at the Darwin Glacier (see table), 240 kilometers south of McMurdo. In previous years, camps have been placed in Marie Byrd Land, at dome C in East Antarctica, and in the central Transantarctic Mountains. The advantage of a large camp is that it provides a base for helicopter operations, surface vehicles, and numerous research projects in locations remote from existing stations. (See the June *Antarctic Journal of the United States* for a description of Darwin Glacier camp activities.)

This season a large camp will be placed in the Ellsworth Mountains to support a geological investigation of that area. Three helicopters will deploy to the camp to transport investigators to remote field sites. Additional snowmobile support will enable some researchers to range even further. Similar multi-disciplinary, multi-investigator field projects will be mounted during the 1980-81 and 1981-82 seasons based on the capacity of the United States Antarctic Research Program to mount at least one major field project each season without preempting support for smaller remote camps.

During 1980-81 a major field camp will be installed at site D-59 (near the French Dumont d'Urville Station) on the East Antarctic Ice Sheet, where earlier glaciological investigations under the International Antarctic Glaciological Project took place. Camp personnel will attempt to repair and recover an LC-130 airplane that crashed in 1971 at the site. During the 1981-82 season researchers will investigate the geology of northern Victoria Land out of a helicopter-supported camp in that area. A symposium was organized and chaired by Dr. Edmund Stump at

Arizona State University in September for preliminary discussions of the projects slated for the northern Victoria Land investigation.

The United States Antarctic Research Program will consider support of other major field investigations after the 1981-82 season. Possible future projects include a study of the West Antarctic ice stream, further examinations of antarctic glaciology, research in southern Victoria Land, or wider-ranging investigations using airborne research instrumentation. Additional projects may involve obtaining deep ice core to bedrock or further investigations of the Ross Ice Shelf.

The Division of Polar Programs invites researchers to suggest projects or groups of projects which would justify placing major field camps away from existing stations. Write to the program manager in the appropriate discipline, care of the Division of Polar Programs, National Science Foundation, Washington, D.C. 20550. Formal proposals would be premature at this stage.

U.S. Navy photo

During the 1980-81 season the major field effort will be recovery of an LC-130 airplane which crashed on the East Antarctic ice sheet. This photo shows the plane shortly after its 4 December 1971 crash.

Major U.S. field camps in Antarctica,* 1977-1982

Season	1977-78	1978-79	1979-80	1980-81	1981-82
Location	Marie Byrd Land	Darwin Glacier	Ellsworth Mountains	D-59, near Dumont d'Urville	Northern Victoria Land
Purpose	geology, geophysics, biology	geology, glaciology, geophysics	geology, glaciology, geophysics	airplane recovery	geology, glaciology, geophysics
Days	50	65	60	40	70
Number of projects	5	12	10	?	8-15
Number of investigators	13	50	45	?	50-60
Peak camp population	35	58	65	40	65
Number of helicopters	3	3	3	0	3
Number of surface vehicles	0	3	13	2	7-9

*All figures for 1979-80 through 1981-82 are projections and may change as planning continues.

United States now has ratified all Antarctic Treaty recommendations

Since 1961, when the Antarctic Treaty was ratified by its 12 signatories, 118 recommendations have been made at nine consultative meetings. These recommendations cover a broad range of topics, including uses of the region, preservation and conservation of wildlife and living resources, facilitation of research and international cooperation, exchanges of information, and operation of the Treaty and its consultative meetings.

The recommendations do not carry force until accepted or ratified by a government that adheres to the Treaty. They then apply only to governments that have implemented the ratifications.

As of 31 July 1979, the United States of America has adopted all 118 Antarctic Treaty recommendations. A major accomplishment was passage of the Antarctic Conservation Act of 1978 (see June 1979 *Antarctic Journal of the United States*), which ratified Recommendation III-8—the Agreed Measures for the Conservation of Antarctic Fauna and Flora.

Three other Antarctic Treaty nations have ratified all the recommendations: Belgium, New Zealand, and the Republic of South Africa. Argentina, France, Poland, Norway, and the U.S.S.R. have ratified all recommendations except those made at the 9th Consultative Meeting which took place in London in 1977.

Even before ratification, the United States adhered informally to most recommendations. Now adherence is official. And, in the case of the Agreed Measures, penalties are provided for noncompliance.

Supplies air-dropped to McMurdo Station

On 13 July a U.S. Air Force C-141 dropped 2,068 pounds of parts, 1,185 pounds of mail, and 6,022 pounds of fresh food to McMurdo Station winter personnel. The supplies, dropped by parachute in 24 bundles, were recovered undamaged by the McMurdo crew near the Williams Field skiway.

Aside from radio communications, the airdrop was the first contact McMurdo has had with the outside world since the beginning of the austral winter last March.

The parachutes and containers will be stored at McMurdo until October. They will be returned to Christchurch, New Zealand, for use in subsequent airdrops.

Byrd's 1929 flight to be commemorated

On 29 November 1929, Admiral Richard E. Byrd made antarctic and aviation history when he and his three companions—pilot Bernt Balchen, photographer Ashley C. McKinley, and radioman Harold I. June—became the first men to fly over the South Pole. Their flight from Little America on the Ross Ice Shelf to the Pole and back in a Ford trimotor airplane, the *Floyd Bennett*, took 18 hours and 39 minutes.

This November, in commemoration of Byrd's achievement and in recognition of the contribution that airplanes have made to the exploration and scientific investigation of Antarctica, a United States Antarctic Research Program LC-130 Hercules airplane will re-fly Byrd's route to the Pole. The round trip will take the Hercules about 6 hours. Other ceremonies in recognition of Byrd's achievements will be staged in the United States this fall.

New National Science Board Members sworn in

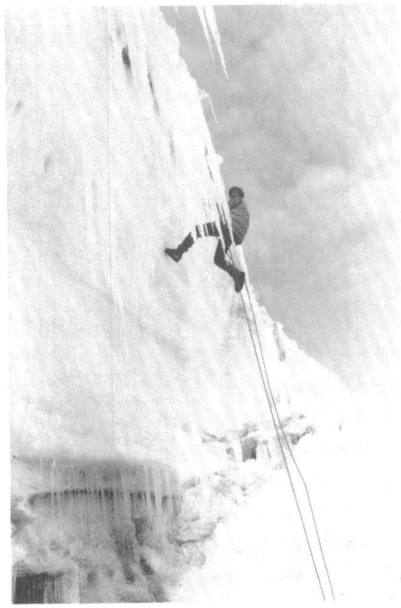
Eight new members have been appointed to 6-year terms expiring in May 1984 on the National Science Board. The 24 part-time members of the National Science Board plus the Director ex officio constitute the National Science Foundation.

The new members are:

- Lewis M. Branscomb, Vice President and Chief Scientist, IBM Inc., Armonk, New York.
- Eugene Cota-Robles, Professor of Biology, University of California, Santa Cruz, California.
- Ernestine Friedl, Professor of Anthropology, Duke University, Durham, North Carolina.
- Michael Kasha, Director, Institute of Molecular Biophysics and Professor of Physical Chemistry, Florida State University, Tallahassee, Florida.
- Walter E. Massey, Director, Argonne National Laboratory, Argonne, Illinois.
- David V. Ragone, Dean of the College of Engineering, University of Michigan, Ann Arbor, Michigan.
- Edwin E. Salpeter, J.G. White Professor of Physical Sciences, Cornell University, Ithaca, New York.
- Charles P. Slichter (renominee), Professor of Physics and in the Center for Advanced Study, University of Illinois, Champaign, Illinois.

The National Science Foundation Act of 1950 charges the National Science Board with responsibility for the overall health of fundamental science in the United States. The Members are selected by the President with the advice and consent of the U.S. Senate so as to represent scientific leadership in all areas of the United States. The National Science Board is the policymaking body of the National Science Foundation.

The new members replace W. Glenn Campbell, T. Marshall Hahn, Jr., Anna J. Harrison, William H. Meckling, William A. Nierenberg, Russell D. O'Neal, and Joseph M. Reynolds.



U.S. Navy photo (90422-1-79)
by Michael P. Helms

Andy Brown, a New Zealand survival instructor, demonstrates rapelling on an ice cliff near Cape Evans. The survival class is given each year for personnel who will be working in the field. Rapelling is just one of the ice climbing skills taught in the course.

SCAR group announces BIOMASS Newsletter

The Scientific Committee on Antarctic Research (SCAR) Group of Specialists on Living Resources of the Southern Ocean has made its "BIOMASS Newsletter" available to interested scientists. The newsletter is intended to facilitate and enhance the exchange of information and news related to the international BIOMASS program.

Interested scientists should write to Dr. Sayed Z. El-Sayed, Department of Oceanography, Texas A&M University, College Station, Texas 77843.

The U.S. National Academy of Sciences is assembling a group of scientists under joint sponsorship of the Ocean Affairs Board and the Polar Research Board to provide guidance and recommendations for U.S. participation in BIOMASS.

Foundation awards of funds for antarctic projects 1 April to 30 June 1979

Following is a list of National Science Foundation antarctic awards made from 1 April to 30 June 1979. Each item contains the name of the principal investigator or project manager, his or her institution, a shortened title of the project, the award number, its duration, and the amount awarded. If an investigator received a joint award from more than one Foundation program, the antarctic program funds are listed first, and the total amount of the award is listed in parentheses. Amounts followed by an asterisk are funding increments. International Southern Ocean Studies awards were made by the Division of Ocean Sciences. All other awards were made by the Division of Polar Programs.

Services and support

Bawden, John. British Antarctic Survey. Annual resupply of R/V *Hero/* Palmer Station research system by RRS *Bransfield.* DPP 77-00455. 12 months. $3,309.

Johnson, James R. Holmes & Narver, Inc., Orange, California. R/V *Hero/* Palmer Station research system. DPP 74-03237. 3 months. $800,000.

Overton, R.H., III. Department of Transportation, Washington, D.C. Icebreaker support, 1978-79. DPP 77-01365. 4 months. $686,700.

Westbrook, Darrel E. Department of Defense, Washington, D.C. Logistics and other support. DDP 76-10886. 4 months. $6,832,000.

Glaciology

Ewing, Richard E. Ohio State University, Columbus, Ohio. Heat transfer in firn and ice. DPP 78-23834. 24 months. $11,098 ($49,335).

Whillans, Ian M. Ohio State University, Columbus, Ohio. Glaciological investigations of dome C. DPP 76-23428. 12 months. $55,818.

Upper atmosphere physics

Eather, Robert H. Boston College, Chestnut Hill, Massachusetts. Siple low-light level TV experiment. DPP 78-23513. 33 months. $73,959.

Helliwell, Robert A. Stanford University, Stanford, California. Very-low-frequency probing of the magnetosphere from Vostok Station. DPP 78-18316.12 months. $47,858.

Mende, Stephen B. Lockheed Missile & Space Co. Inc., Palo Alto, California. Photometer observations of particle precipitation. DPP 71-01668. 48 months. $121,779.

Pomerantz, Martin A. Franklin Institute, Newark, Delaware. Long-term continuous observations of large-scale motions and structures on the sun. DPP 78-22467. 36 months. $181,750.

Rosenberg, Theodore J. University of Maryland, College Park, Maryland. Naturally and artificially stimulated electron precipitation near the plasmapause. DPP 76-82041. 12 months. $29,000.

Meteorology

Robinson, Elmer. Washington State University, Pullman, Washington. Air chemistry studies in ocean areas. DPP 78-16614. 12 months. $37,415.

Smiley, Vern N. Desert Research Institute, Reno, Nevada. Study of ice crystals near cloud base at Palmer Station, using depolarization lidar. DPP 78-23835. 36 months. $82,728.

Warburton, Joseph A. Desert Research Institute, Reno, Nevada. Air-sea-ice interaction investigations with X-band radar. DPP 78-21718. 36 months. $79,980.

Biology and medicine

Baust, John G. University of Houston, Houston, Texas. Physiological and biochemical bases of freezing tolerance in terrestrial

Continued On Back Page

Monthly climate summary corrections

The table below presents corrected monthly climate summary data for the stations and months listed. These revised numbers should be substituted for the data that appeared in the March and June 1979 issues of *Antarctic Journal of the United States.*

Feature	December Palmer (date)	January Palmer (date)	February McMurdo (date)	February Palmer (date)	March Palmer (date)	March South Pole (date)	April Palmer (date)	April South Pole (date)
Average temperature (°C)	1	2	-8.8	2	1	-51.7	-1	-53.4
Temperature maximum (°C)	9 (25)	8 (20)	-1.7 (16)	6 (21)	5 (26)	-34.9 (27)	3 (25)	-38.3 (29,30)
Temperature minimum (°C)	-2 (6)	-3 (10)	-17.1 (22)	-3 (19,28)	-2 (22,29,30,31)	-66.1 (24)	-8 (9)	-66.5 (21)
Average station pressure (mb)	983.3	993.4	986.3	985.9	991.8	678.6	979.6	683.5
Pressure maximum (mb)	1005.2 (31)	1009.8 (18)	995.1 (20)	1006.2 (19)	1016.5 (21)	691.0 (3)	1012.8 (1)	697.8 (10)
Pressure minimum (mb)	961.0 (10)	973.2 (23)	973.7 (26)	955.0 (7)	967.5 (26)	670.3 (24)	960.8 (15)	669.9 (5)
Snowfall (mm)			5.1			Trace		Trace
Prevailing wind direction	220°	050°	120°	030°	220°	045°	220°	045°
Average wind speed (m/sec)	4.2	4	6.4	5	3	4.2	9	5.2
Fastest wind speed (m/sec)	15 030° (11)	18 030° (20)	34.0 270° (26)	18 010° (16)	13 030° (10)	10.8 295° (27)	26 030° (10)	12.9 025° (10)
Average sky cover	9/10	8/10	8.2/10	9/10	9/10	7.2/10	10/10	3.0/10
Number clear days	1	2	0	.3	0	6	0	19
Number partly cloudy days	11	9	1	6.3	6	5	4.7	8
Number cloudy days	10	20	27	21.4	25	20	25.3	3
Number days with visibility less than 0.4 km	0	0	0.7	0	0	0.9	0	2.4

Monthly climate summary

Feature	May 1979				June 1979				July 1979			
	McMurdo (date)	Palmer (date)	Siple (date)	South Pole (date)	McMurdo (date)	Palmer (date)	Siple (date)	South Pole (date)	McMurdo (date)	Palmer (date)	Siple (date)	South Pole (date)
Average temperature (C°)	-25.7	-5.0	-23.0	-61.5	-21.6	-6.0	-31.4	-57.1	-30.0	-7.0	-34.3	-63.8
Temperature maximum (C°)	-14.0 (1)	0.0 (30)	-7.9 (10)	-42.3 (27)	-9.0 (25)	2.0 (18,30)	-18.0 (10)	-45.6 (24)	-13.1 (3)	1.0 (3)	-13.9 (23)	-44.5 (16)
Temperature minimum (C°)	-35.6 (22)	-13.0 (22)	-42.5 (20)	-72.7 (23)	-33.9 (18)	-15.0 (22)	-46.0 (28)	-69.2 (22)	-42.7 (11)	-22.0 (18)	-51.8 (27)	-76.3 (29)
Average station pressure (mb)	984.0	997.4	864.3	673.5	979.3	988.6	859.2	678.7	976.5	986.5	851.1	664.9
Pressure maximum (mb)	1000.9 (1)	1020.2 (28)	882.8 (27)	688.7 (1)	999.4 (16)	1012.5 (10)	877.2 (9)	686.8 (9)	992.4 (30)	1007.8 (24)	862.8 (1)	676.3 (2)
Pressure minimum (mb)	968.2 (31)	967.2 (30)	848.2 (2)	662.3 (16)	965.3 (7)	970.2 (27)	844.6 (13)	667.2 (1)	957.3 (16, 24)	965.2 (6)	828.1 (7, 8)	648.9 (31)
Snowfall (mm)	33.0		68.6	Trace	249.0		165.1	Trace	96.5		195.6	Trace
Prevailing wind direction	065°	030°	250°	090°	090°	030°	200°	070°	070°	360°	135°	070°
Average wind speed (M/sec)	4.7	4.0	9.1	3.8	5.2	4.0	4.8	4.4	4.0	5.0	6.6	4.1
Fastest wind speed (m/sec)	31.7 160° (8)	13.0 210° (21)	27.3 020° (21)	8.8 135° (3)	33.1 160° (26)	14.0 020° (1)	20.6 020° (16)	12.7 360° (5)	27.3 160° (2)	26.0 360° (5)	23.2 260° (29)	10.8 045°,135° (24, 31)
Average sky cover	4.3/10	8.0/10	6.5/10	1.8/10	5.8/10	9.0/10	5.7/10	3.5/10	4.8/10	9/10	6.1/10	2.3/10
Number clear days	2	4	10	25	2	1.2	12	18	0	1	12	20
Number partly cloudy days	14	8	4	3	11	5.1	4	5	19	8	5	8
Number cloudy days	15	19	17	3	18	23.7	14	7	12	22	14	3
Number days with visibility less than 0.4 km	0	0	11	0	0.6	0	7	0	0.3	0	11	0.3

Prepared from information received by teletype from the stations. Locations: McMurdo 77° 51'S, 166° 40'E. Palmer 64° 46'S, 64° 03'W. Siple 75° 55'S, 83° 55'W. Amundsen-Scott South Pole 90° S. Elevations: McMurdo sea level. Palmer sea level. Siple 1000m. Amundsen-Scott South Pole 2850m. For prior data and daily logs contact National Climatic Center, Asheville, North Carolina 28801.

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arthropods. DPP 78-21116. 24 months. $50,205.

Haschemeyer, Audrey E. City University of New York, Hunter College, New York. Role of protein metabolism in cold adaptation of fish. DPP 77-20461. 12 months. $60,000.

Ichiye, Takashi. Texas A&M University, College Station, Texas. Physical oceanographic study of ARA *Islas Orcadas* winter cruise 17. DPP 79-09258. 12 months. $21,259.

Murrish, David E. State University of New York, Binghamton, New York. Thermoregulatory mechanisms in birds. DPP 77-21861. 12 months. $26,813.

Earth sciences

Askin, Rosemary A. Ohio State University, Columbus, Ohio. Palynology and paleobotany of Mesozoic rocks of the Antarctic Peninsula area and southern South America. DPP 78-21128. 24 months. $25,000.

Elliot, David H. Ohio State University, Columbus, Ohio. Geology and paleomagnetism of Mesozoic rocks, northern Antarctic Peninsula. DPP 78-21102. 24 months. $24,342.

Kyle, Philip R. Ohio State University, Columbus, Ohio. Investigations of Ferrar Group rocks and Mt. Erebus. DPP 77-21590. 24 months. $26,000.

Stump, Edmund. Arizona State University, Tempe, Arizona. Field investigations of the LaGorce Mountains and data reduction on rocks from the Leverett and Scott Glaciers. DPP 78-20624. 18 months. $30,614.

Stump, Edmund. Arizona State University, Tempe, Arizona. Science and logistics symposium on northern Victoria Land. DPP 78-23515. 8 months. $8,160.

Tucker, Arnold J. University of Texas, Austin, Texas. Geodetic and upper atmospheric studies using artificial earth satellites. DPP 68-00508. 12 months. $1.

Webers, Gerald F. Macalester College, St. Paul, Minnesota. Geological investigation of the Ellsworth Mountains. DPP 78-21720. 48 months. $171,545.

Zeller, Edward J. University of Kansas, Lawrence, Kansas. Resource and radioactivity survey by airborne gamma-ray spectrometry. DPP 77-21504. 12 months. $90,079.

Zinsmeister, William J. Ohio State University, Columbus, Ohio. Late Cretaceous and early Tertiary biogeography of the southern Circum-Pacific. DPP 77-21585. 12 months. $24,989.

Ocean sciences

Ackley, Stephen F. Department of Army, CRREL, Hanover, New Hampshire. Sea ice. DPP 77-24528. 12 months. $129,527.

Anderson, John B. Rice University, Houston, Texas. A marine geologic cruise to the Bellingshausen Sea, and *Glacier* sediment core description. DPP 79-08242. 12 months. $39,743.

Dick, Henry J.B. Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. A joint petrology, geophysics, and coring cruise along the antarctic plate boundary in the far South Atlantic and Drake passage. DPP 79-00036. 12 months. $121,064.

Foster, Theodore D. University of California, Santa Cruz, California. Physical oceanography. DPP 78-07797. 12 months. $105,100.

Huang, Ter-Chien. University of Rhode Island, Kingston, Rhode Island. History of bottom current scour in the southern ocean. DPP 78-08511. 12 months. $27,661.

Kennett, James P.University of Rhode Island, Kingston, Rhode Island. Micropaleontological and paleoenvironmental studies of marine sediment from the southern ocean. DPP 78-08512. 12 months. $52,607.

Wise, Sherwood W. Florida State University, Tallahassee, Florida. *Islas Orcadas* piston and trigger core studies. DPP 78-07183. 12 months. $59,602.

International Southern Ocean Studies

Spillane, Michael W., and Julian McCreary. Nova University, Fort Lauderdale, Florida. Lee-wave model of the Drake Passage circulation. OCE 78-21963. 12 months. $44,749.