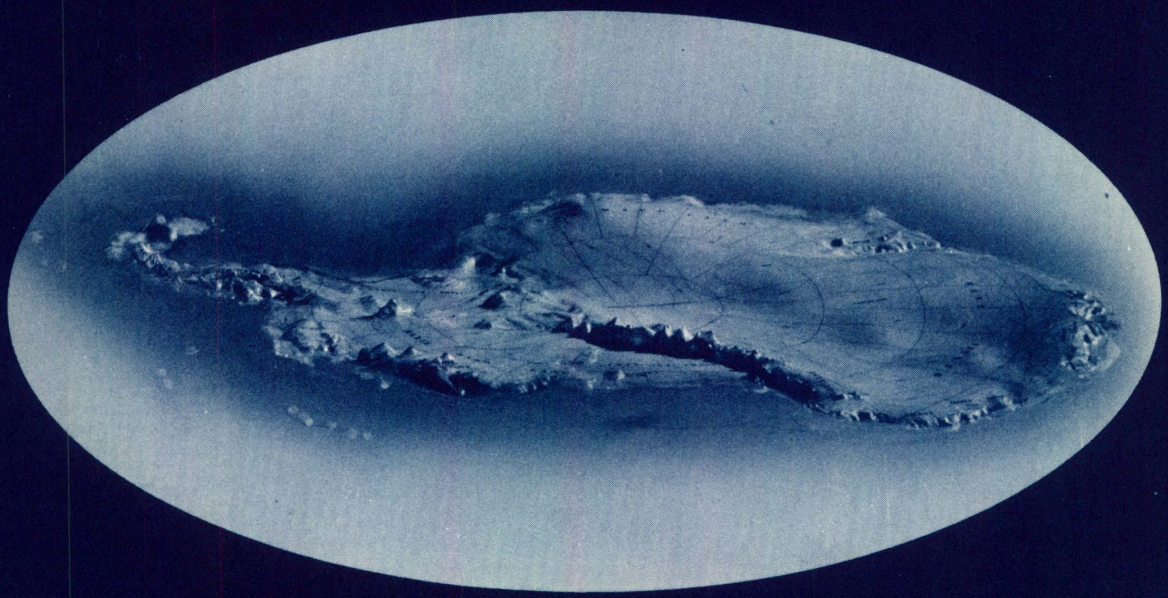
Antarctic report

APRIL 1965



U.S. ANTARCTIC RESEARCH PROGRAM

NATIONAL SCIENCE FOUNDATION

CONTENTS

Communications regarding the Antarctic Report should be addressed to the Office of Antarctic Programs, National Science Foundation, Washington, D. C., 20550.

ANTARCTIC POLICY GROUP ESTABLISHED

The Antarctic Policy Group was established on Apr. 10 by Acting Secretary of State George W. Ball. Members of the group are: Harlan Cleveland, Assistant Secretary of State for International Organization Affairs, who serves as chairman; Leland Haworth, Director of the National Science Foundation; and John T. McNaughton, Assistant Secretary of Defense for International Security Affairs. The group consults other departments and agencies of the Government as necessary.

On May 1 President Johnson received the first report of his Antarctic Policy Group, upon which he made the following statement:

I have been deeply impressed by the sensible way in which the 12 nations active in Antarctica work together. In that frozen continent we have, through international cooperation, shown how nations of many different outlooks can cooperate for peaceful purposes and mutual benefit. National differences are no barrier to a common effort in which everyone gains and no one loses. The scientific findings of all countries are pooled for the benefit of all. Men in danger or in need can call for help knowing that it will be given unstintingly by any country that can provide it.

We are now celebrating International Cooperation Year. It is my earnest hope that the same success that has marked the antarctic program can be extended to every field of international endeavor, not only during this special year but in future years as well.

The United States today pursues a vigorous program in Antarctica. We have begun to explore the southern ocean, and the last great unknown reaches of the polar plateau. We have established new research stations in West Antarctica and on the Antarctic Peninsula. We have completed geologic surveys of most of the ice-free areas of West Antarctica. We have photographed hundreds of thousands of square miles for mapping purposes. We are conducting scientific programs to study the unique physical and biological features of the area.

We are pioneering new concepts of operations on the ice. We introduced nuclear power to Antarctica. Advanced construction techniques soften the rigors of polar life. Specialized aircraft and surface vehicles enable us to reach any point on the continent, and to operate effectively when we get there.

From our activities and those of other countries we acquire increased knowledge of the world in which we all live and which we must understand better to meet the challenge of the future. Already the research program has disclosed facts which may affect profoundly the future of communications, of space travel, and of the world's food

supply.

The kind of international cooperation that has become accepted practice in Antarctica is both practical and mutually beneficial. Argentina provided transportation and logistic support for three U. S. biological teams this year and has also made facilities available to us at its Melchior Station. The United States and four other nations man an Antarctic Weather Center in Melbourne, Australia.

This year the first leg of a great traverse across the savage and unknown polar plateau was made by an American team which included a Belgian and a Norwegian.

A number of Chilean scientists participate in our activities. When our research ship, the Eltanin, encountered a medical emergency, the Chilean Air Force and Navy provided drugs to the ship at sea and hospital facilities in port.

New Zealand continues to welcome our advance headquarters in Christchurch, New Zealand, and to participate in the research programs on the ice. We, in turn, provide them with transportation and other logistic support.

This year again an American scientist is doing research at the Soviet Mirnyy Station and a Soviet scientist is studying at our McMurdo Station. One of the monitoring instruments of our cosmic ray program is installed at a Soviet station, where the Russians are operating it for us.

France, Japan, South Africa, and the United Kingdom are actively cooperating with the United States on a variety of antarctic projects.

The peaceful framework on which these widespread activities depend is the Antarctic Treaty. The countries adhering to the treaty have pledged that Antarctica shall be used for peaceful purposes only. No activities of a military nature are permitted. Nuclear explosions or dumping atomic waste is prohibited. But scientific research is open to all, and international cooperation in that research is encouraged.

Any signatory country may satisfy itself that the treaty is being observed by inspecting any station or expedition anywhere in Antarctica. In short, the United States and other signatories have agreed that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord.

[From Department of State Bulletin, June 21, 1965]

HEARINGS RESUME ON THE RICHARD E. BYRD ANTARCTIC COMMISSION

THE HONORABLE HARLAN CLEVELAND TESTIFIES

With the opening of the 89th Congress, four bills were introduced in the House of Representatives to establish the Richard E. Byrd Antarctic Commission. The bills, by Mr. Clement J. Zablocki, Mr. Craig Hosmer, Mr. John P. Saylor, and Mr. Rogers C. B. Morton, closely parallel similar bills introduced in previous sessions of Congress.

On April 12 the Subcommittee on Territorial and Insular Affairs of the Committee on Interior and Insular Affairs began hearings on the four bills. The first witness for the executive agencies was the Honorable Harlan Cleveland, Assistant Secretary of State for International Organization Affairs. In his opening statement, Mr. Cleveland said in part:

Mr. Chairman and members of the Committee: You invited me to discuss with you today the United States Government's program in Antarctica. The focus of your concern, I understand, is a number of proposals to provide for an Antarctic Commission, and to provide in various ways for continuity and support of United States activities related to Antarctica.

In agreement with our close collaborators in the National Science Foundation and the Department of Defense, we thought that your purpose in this hearing might best be advanced by presenting here a statement of what the Federal Government has accomplished in and around the Antarctic Continent since the Antarctic Treaty came into force on June 23, 1961. Against that background I will then describe how we are organized to tackle the difficult and exhilarating tasks that lie ahead of us.

It falls to me, as Chairman of the Antarctic Policy Group in the Executive Branch, to make this statement. I must say that I do so with great enthusiasm. For this program, remote and obscure as it may seem to most Americans, is greatly in our national interest. And the way it is now working, it is a triple success story:

> A story of scientific exploration at the very fringe of man's knowledge of his environment.
>
> A story of heroic deeds by the U. S. support force, Task Force 43; and
>
> A story of international cooperation that really works.

Members of this Committee well know that the United States has long

played a proud and important role in the south polar region. One hundred and fifty years ago our whalers and sealers were among the first to penetrate the forbidding oceans of the Antarctic. Later Rear Admirals Charles Wilkes and Richard E. Byrd led the way to discovery of the Continent and the early probes into its interior. Today the scientists, and those who make it possible for them to get there and stay there, live and work in stations spotted from the edges of the Continent to the South Pole.

But Antarctica has never been a private domain. Other nations pursued programs similar to our own. Some of them even established territorial claims - three of them overlapping - to wedges of the antarctic pie. Access to the frozen Continent was attracting more and more scientists and explorers, and so began to be an issue in international politics.

Then in 1957 and 1958 the International Geophysical Year threatened to convert the national rivalries into troublesome confrontations of power and prestige. Twelve countries mounted IGY expeditions to Antarctica. The always touchy question of sovereignty - who could come into which part of the icy waste - became acute. And as the fringes of the Continent began to see ships and airplanes, more and more people feared that this vast uncharted area might become the site of military installations designed to alter the balance of power elsewhere in the world.

It was these latent fears and potential troubles which led to one of the most sensible treaties in the not-always-rational history of international diplomacy. The Antarctic Treaty, signed on December 1, 1959, and ratified by the United States on August 18, 1960, was an innovation without precedent on the world's land surface.

Essentially, the Treaty applied to the whole southern end of the globe, south of 60° south latitude. Its doctrine is simple: that all nations would have access to Antarctica, as long as that access was for peaceful scientific purposes.

The Treaty obligates the fourteen Treaty partners to cooperate with each other in scientific investigation. It prohibits military activities, and forbids nuclear explosions; it was, among other things, history's first nuclear test ban agreement. It authorizes any signatory nation to inspect the activities of all other nations in Antarctica.

For the United States, as the nation with the greatest capability to mount and support scientific investigations in Antarctica, this Treaty was clearly better than limiting ourselves to one slice of a much-divided pie. As things stand, we are at liberty to investigate anywhere, build anywhere, fly anywhere, traverse anywhere in this vast and still mysterious Southland.

The Treaty did not set up an international organization as such. Every year or two, the nations meet and recommend measures to improve the Treaty's operation. Twenty-six measures from three such meetings have already been approved by governments since the Treaty went into force in June 1961.

The nations operating in Antarctica have agreed, for example, to exchange detailed reports about their expeditions. The inspections called for by the Treaty have actually been carried through; we have sent inspectors to the installations of a number of our antarctic partners, including the Soviet Union. And we have opened our own peaceful stations to their scrutiny whenever they care to come.

The United States has given and received help from almost every other country active in Antarctica. Many a life has been saved, and many an expedition completed, only because of timely help across national lines made invisible by the realities of human hardship and the prospect of scientific gain.

Outside the Antarctic Continent itself, the same cooperative spirit prevails. For example, our advance base for Antarctica is actually at Christchurch in New Zealand, and we provide logistic support for some of New Zealand's operations in Antarctica.

Even in the formal meetings of the Treaty powers, national delegations are impressed to see a spirit of accommodation seldom matched in the meetings of other international bodies. There are heated discussions, and national positions defined with vigor; but the debators are more bent on achieving a constructive purpose which all regard as common. Antarctica is not what the war gamers call a "zero-sum game", where one nation must lose for another to gain. In the land of ice and penguins, discoveries by one nation are a gain for all.

The Executive Agencies of the Government have given careful thought to where we are going and what we are trying to do in Antarctica. I can summarize the policy by which we are now guided in seven simple sentences:

1. The United States supports the principles of the Antarctic Treaty, and will do what is necessary to insure that Antarctica is used for peaceful purposes only.

2. We foster international cooperation among the nations active in Antarctica, seeking further areas for agreement wherever that is possible.

3. We continue to attach major importance to programs of scientific research for which Antarctica affords unique conditions.

4. We pursue vigorously our efforts to explore and chart the south polar region.

5. We shall not overlook the possibility that Antarctica may, at some indiscernible time, disclose resources which the world needs.

6. As part of the attempt to master Antarctica's difficult environment, we give special attention to the technicality of transport and other logistics.

7. In all our activities, we make special efforts to preserve antarctic animal and plant life.

This political framework has enabled us to devote our full and unfettered energies to investigating the mysteries of the Continent. Since the Treaty was signed, we have made enormous progress, both in practical knowledge and in scientific research.

The first and most practical question of all was that of man's future on the hostile ice. Could this wasteland be subdued so that man might inhabit it for long enough periods of time to get useful work done?

The support force established by the United States Navy has proved that human ingenuity is equal even to this gruelling task. American Seabees built an ice-runway which permits easier air connection with the outside world. Aircraft equipped with skis can now land in the furthermost reaches of the Continent. Primitive Quonset huts are being replaced by permanent barracks of double-wall construction.

Admiral Reedy, the Commander of the support force, has demonstrated the feasibility of transpolar flight from outside lands. He flew non-stop from South Africa to McMurdo Sound, a distance of 4,700 miles, and from Australia to Byrd Station. These were the pioneer flights between the continents of the Southern Hemisphere across the frozen bottom of the globe. They showed that transpolar flights can use Antarctica as a landing place for emergencies now and perhaps later as a regular feature of air traffic in that part of the world.

To improve the flexibility of our programs, we developed a modular station -- buildings and equipment weather proofed for year-round use. This station consists of a set of prefabricated components, and a tractor to offload and shift them into position. The whole package, tractor included, can be flown wherever it is needed. When the program there is ended, the whole station can be picked up and moved to the next location.

To reduce our dependency on costly oil supplies, a nuclear reactor was installed at McMurdo Station to supply heat and power. The same

reactor will soon supply the power for a desalting operation, already proved out with thermal power, to provide fresh water for the base.

In the past year the support force again demonstrated its increasing mastery of man's most forbidding environment. On the slush and snow of McMurdo the Seabees built the first hard-surface road on the Antarctic Continent. Supplies can be moved over this surface directly from the ships in McMurdo Sound to the supply depots more than a mile away.

In the six-month darkness of this past austral winter, they took a giant step forward. Last July, a Seabee was seriously injured in a fall, and needed hospital care not available at the wintered-in base. No one had ever flown into Antarctica during the winter night. But somehow the men at the station cleared the skiway in sub-zero temperature, working by the light of improvised flares. Air Squadron Six had the pilots with the skill, the courage, and the antarctic experience to bring in the plane, and take it out, without mishap.

Just a few months ago, Admiral Reedy's Task Force 43 had to rise to another challenge. Great cracks appeared in the ice of the bay. A large part of the snow-compacted runway was swept out to sea and installations at Williams Field were in danger of following it. It took a heroic effort to avert disaster, but these remarkable Americans believed the impossible could be accomplished. In two days the threatened buildings and equipment were successfully moved to a safe location five miles away. The damage to the ice runway cannot be fully assessed now. But no lives were lost, and the base is operating.

Thus with trouble and effort and not a little heroism, Americans are learning how to cope with the harsh and unpredictable environment of Antarctica. It is now a fair claim that the United States knows how to place and maintain year-around working units anywhere on the Antarctic Continent.

The extraordinary efforts required just to get to Antarctica, and to stay there, are amply justified by the rich returns of scientific investigation in and around this darkest of all continents.

Scientists have already completed three-quarters of a major geological reconnaissance. With one exception every exposed range in West Antarctica and the edges of the continent have been explored by experts. Scientists have identified the types of rock, estimated their age, and compared them with similar rocks elsewhere in the world. More detailed geology - including the effort to find any mineral content - is the next step.

A major study of the earth's magnetic field is now under way. We have learned that impulses fed into the magnetic field in Antarctica

are flung far into space to return with nearly undiminished energy at the magnetic North. When more is known of this phenomenon it may be of vital importance to telecommunications, including satellite systems.

To shed more light on these curious magnetic fields, last November a small band of men started by tractor from the South Pole on a traverse of 4000 miles. They will follow a zig-zag course in an unknown area where climate and altitude combine to create the most savage of all antarctic conditions, making measurements as they go. At the end of each austral summer planes will pick up the men, wherever they are, leaving the equipment on the ice. The following summer the traverse will resume from where it stopped.

From glacial studies, our scientists are compiling a record of the earth's travel through space. Preserved in the snows of Antarctica are space particles which have bombarded this planet in past ages. The particles can be dated by their position in the snow layers, and by radio-active techniques. If later studies show that these particles have a recurring pattern we may some day be able to predict the kinds of particles and radiation conditions our astronauts will encounter as they travel through outer space.

Still another program uses the information relayed by the picture-taking weather satellites. One of the earliest results of this research is the discovery of "hot spots" in the snow and sea-ice. These are areas where the temperature of the snow is higher than the temperature of the surrounding snow. The cause of this difference is still an enigma; the scientists are determined to unravel it by further research.

As a final example of this fruitful antarctic research, the National Science Foundation is now embarked on a program which may have profound significance for the world's food supply. Aboard their laboratory ship, the Eltanin, scientists from many disciplines have begun studies of the oceans surrounding Antarctica. These waters cover an area as large as the Pacific Ocean. Little is known about them. Yet the first insight from the research so far is of enormous importance. For it seems that the antarctic seas are the source of all the major ocean currents around the globe. The antarctic waters are peculiar, it seems, in that turbulent vertical currents sweep from the ocean bed to the surface, tearing loose the rare and elemental nutrients necessary to sustain life, and spreading them through the vast bodies of water. The precious food elements are then transported along the ocean currents to all the other seas of the world. The antarctic oceans may therefore be the major source of all life in the sea, and thus of all the marine foods of which man now extracts only a tiny fraction.

It is already clear that the scientific work sponsored by the National Science Foundation in Antarctica has a very great importance, both in pushing out the frontiers of our knowledge about our physical world, and in enabling man, by applying that knowledge, to control and escape his natural environment. It is arguable, I think, that any one of these investigations - in geology, in glacial studies, in the physics of outer space, in meteorology, and in the behavior of the southern oceans - may prove to be worth the $27 million which the United States Government invests each year for the scientific program and the logistic support that makes it possible.

Agencies of the Federal Government are not given to eulogizing each other. But having watched the Antarctic Program with some care - though regrettably from Washington - for four years now, I can testify to a remarkable combination of imagination and prudence which characterizes the work of the National Science Foundation and the Department of Defense in this remote but exciting frontier of our national interest.

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[A statement by Dr. Leland J. Haworth, Director of the National Science Foundation, given to the Committee on May 6, will be reported in the May issue of the Antarctic Report.]

ACTIVITIES OF OTHER NATIONS

CHILE

Chile maintains four permanent bases in the Antarctic Peninsula area: Arturo Prat (62°30'S, 59°41'W), Bernardo O'Higgins (63°19'S, 57°54'W), Pedro Aguirre Cerda (62°56'S, 60°36'W), and Gabriel González Videla (64°49'S, 62°52'W). Of these, Gabriel González Videla will temporarily be operated as a summer facility. There are two temporary bases, the Sub-base Yelcho (64°52'S, 63°34'W) and the Guesalaga Refuge Hut (67°47'S, 68°53'W). The construction of another permanent station in the Antarctic Peninsula is being considered for the 1965-66 season.

As noted in a previous issue of the Antarctic Report (June 1964, p. 19), the organizational set-up for the conduct of Chilean antarctic activities has undergone some changes with the establishment last year of the Chilean Antarctic Institute. This Institute now plans, directs, and coordinates the scientific and technical aspects of the program under the direction of a council of representatives from public and private organizations with direct interest in antarctic work. The logistic support of the Chilean Antarctic Expedition remains in the hands of the Armed Forces.

The 19th Chilean Antarctic Expedition left Valparaiso on December 12,

1964. In the party were 10 scientists who planned to carry out geological research in the South Shetland Islands, ornithological investigations on Nelson Island, and volcanic observations on Deception Island over a three-month period. Radioactivity measurements and geomagnetic observations at Pedro Aguirre Cerda Base were also included in the summer program.

The ornithological observations, a three-year project, are expected to culminate in the publication of a catalog and guide to the birds of the Antarctic Peninsula and adjacent islands.

As part of the expedition "Marchile IV" aboard the Yelcho, sounding work was to continue during January - March in the area 53°-65°S and 75°30' -85°W and was to include ten north-south oceanographic profiles with a separation of 30 miles. Oceanographic stations were to be made along three profiles every 40 miles to a depth of 3,000 meters. During each profile bathythermographic, surface temperature, and bathymetric observations were to be made.

The following winter programs were planned:

CARTOGRAPHY

Continuation by the Institute of Military Geography, of topographical triangulation work initiated in 1964, and establishment of first-order astronomical fixes at O'Higgins or Gabriel González Videla for geodetic observations.

EARTH SCIENCES

Installation of a volcanological observatory, consisting of a subsoil thermograph and a vertical short-term seismograph, at Pedro Aguirre Cerda Base.

The seismological equipment at Gabriel González Videla Base was to be dismantled for repair in Santiago. The seismological observations were to continue at General Bernardo O'Higgins Base, where new equipment is to be installed during 1966.

METEOROLOGY

Continuous surface observations at all bases, including synoptic observations every three hours.

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G. W. MARKHAM RETIRES
R. B. THOMSON BECOMES SUPERINTENDENT, DSIR ANTARCTIC DIVISION

After forty years of service with his government, "Geoff" Markham, Superintendent of the Antarctic Division, New Zealand Department of Scientific and Industrial Research, retired at the end of April. His distinguished administrative career culminated in the successful direction of the New Zealand Antarctic Research Programme for the past six years.

Mr. Markham is well known to persons in the U. S. antarctic program through his annual trips to Scott Base, Hallett Station and research areas in the Ross Sea region. His office in Wellington has been a focal point for visits by Americans passing through New Zealand and he was a familiar figure at the headquarters in Christchurch.

Mr. Markham has been succeeded as Superintendent of the Antarctic Division by Mr. Robert B. Thomson who, among other activities, served as the 1960 Hallett Station Scientific Leader and spent the 1960-61 summer at Scott Base as Public Relations Officer and Postmaster. In 1962 Mr. Thomson was leader of Wilkes Station for ANARE and led a party from that station on a 900-mile traverse to the Soviet Vostok Station and return.

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PUBLICATIONS

The following publications received at the Office of Antarctic Programs during April pertain to work supported in whole or in part by the National Science Foundation under the U.S. Antarctic Research Program:

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ANTARCTIC RESEARCH SERIES, vol. 4, Geomagnetism and aeronomy. Washington, D. C., American Geophysical Union, 1965. 236 p.

BENNETT, S. M. and T. M. NOEL, AVCO Corp. An electron bombardment theory of high-latitude sporadic E. (In: Antarctic Research Series, vol. 4, Geomagnetism and aeronomy, 1965, p. 77-99.)

CRADDOCK, CAMPBELL, T. W. BASTIEN, R. H. RUTFORD, and J. J. ANDERSON, Univ. of Minnesota. Glossopteris discovered in West Antarctica. (Science, Apr. 30, 1965. vol. 148, no. 3670, p. 634-37.)

CRARY, A. P., National Science Foundation. Antarctic biology: introduction. (BioScience, Apr. 1965. vol. 15, no. 4, p. 251-52.)

DEWITT, H. H., Univ. of So. California. Antarctic ichthyology. (BioScience, Apr. 1965. vol. 15, no. 4, p. 290-93.)

EPSTEIN, SAMUEL and R. P. SHARP, California Institute of Technology, and A. J. GOW, U.S.A. CRREL. Six-year record of oxygen and hydrogen isotope variations in South Pole firn. (J. of geophysical research, Apr. 15, 1965. vol. 70, no. 8, p. 1809-14.)

FLOWERS, EDWIN C. and H. J. VIEBROCK, U. S. Weather Bureau. Solar radiation: an anomalous decrease of direct solar radiation. (Science, Apr. 23, 1965. vol. 148, no. 3669, p. 493-94.)

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GRESSITT, J. L., Bernice P. Bishop Museum. Entomological field research in Antarctica. (BioScience, Apr. 1965. vol. 15, no. 4, p. 271-74.)

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LLANO, G. A., National Science Foundation. United States Antarctic Research Program in biology. (BioScience, Apr. 1965. vol. 15, no. 4, p. 254-58.)

PATTON, D. E., V. L. PETERSON, G. H. STONEHOCKER, and J. W. WRIGHT, National Bureau of Standards. Characteristic variations in the antarctic ionosphere. (In: Antarctic Research Series, vol. 4, Geomagnetism and aeronomy, 1965, p. 47-75.)

PENNDORF, RUDOLF, AVCO Corp. The average ionospheric conditions over the Antarctic. (In: Antarctic Research Series, vol. 4, Geomagnetism and aeronomy, 1965, p. 1-45.)

PENNEY, R. L., Johns Hopkins Univ. Some practical aspects of penguin navigation-orientation studies. (BioScience, Apr. 1965. vol. 15, no. 4, p. 268-70.)

PRYOR, MADISON E., Ohio State Univ. Biological research at Mirnyy Observatory, Antarctica. (BioScience, Apr. 1965. vol. 15, no. 4, p. 280-82.)

RAY, CARLETON, New York Zoological Society. Physiological ecology of marine mammals. (BioScience, Apr. 1965. vol. 15, no. 4, p. 274-77.)

RAY, CARLETON, and W. E. SCHEVILL, New York Zoological Society. The noisy underwater world of the Weddell seal, Part I. (Animal Kingdom, Mar.-Apr. 1965. vol. LXVIII, no. 2, p. 35-39.)

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4, Geomagnetism and aeronomy, 1965, p. 173-187.)

SLADEN, W. J. L., Johns Hopkins Univ. Ornithological research in Antarctica. (BioScience, Apr. 1965. vol. 15, no. 4, p. 264-68.)

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WOHLSCHLAG, D. E., Stanford Univ. U. S. biological facilities in Antarctica. (BioScience, Apr. 1965. vol. 15, no. 4, p. 261-63.)

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FIELD REPORT NO. 76 - APRIL 1965

NOTE: In general, material included in the Field Report is summarized from regular reports by personnel of Federal agencies, universities and institutions carrying out scientific research in the Antarctic under National Science Foundation grants and with logistic support by the U.S. Navy. In order to ensure that the work of the individual scientists and their institutions is clearly understood, it is requested that prior to using any of this material for public dissemination, such use be discussed with the Office of Antarctic Programs in the National Science Foundation or with the originators of the research as named.

GENERAL

Byrd Station: The departure of the sun brought summertime work to a close although April was unusually warm and, except for the lack of light, quite suitable for outdoor activities. Installation of the foundation for the new recreation building was nearly completed at the end of the month. Both USARP and Navy personnel have been working on the resupply requirements for next year.

Eights Station: Loose boxes and timbers tossed about by a record windstorm on the 16th caused some damage to outdoor equipment. Some pieces were found several miles from the station after the storm. Reception on the amateur radio was consistently poor, with most of the traffic taking place in the 14 Mc./s. band.

USNS Eltanin: At the beginning of April, the Eltanin was near 63°S., 135°W. on Cruise 17. During the month, work was continued south to 68°S., 135°W., then southeast to 69°S., 95°W. before turning north. On April 30th, the ship was near 55°S., 95°W. Icebergs and growlers were numerous during the first half of the month.

McMurdo Station: Many housekeeping tasks were completed: the capital and general equipment was inventoried, the Jamesway field huts were repaired, sorted, and inventoried, the 12 x 24-foot green fish house was refurbished, and all diving gear was moved from Building J-19 into the USARP warehouse.

Palmer Station: The weather was much improved over last month, and was generally milder. There were some large pressure fluctuations and four days with fog. On the 29th, there was some rain and sleet. The icecap Jamesway is now completely buried.

South Pole Station: Operations normal.

BIOLOGY

McMurdo Station

Fish Metabolism and Growth, Stanford University: Studies were continued of the tissue metabolism of Trematomus fishes at a variety of temperatures, some below the environmental temperature. Metabolic pathway studies which involved carbohydrate metabolism were carried out also. Freezing point and chloride determinations were made on 25 T. bernacchii. Three fish houses were set out on the 24-inch thick ice in the Hut Point area and good catches of Trematomus were obtained. The Nodwell vehicles, which gross 14,000 pounds, were successfully used for fishing operations on the sea ice.

Palmer Station

Entomology, Bernice P. Bishop Museum: The arthropod distribution studies continued with emphasis on the comparison of samples from various field localities. The studies indicate the history of temperature variations, humidity tolerance and food preference. Studies on several species of mites and Collembola indicate that the differences are related more to growth form and compactness of moss than to the moss species. Most of the arthropod species, which are widely distributed in a variety of habitats, show some vertical stratification within the habitat. The arthropods have been essentially inactive since the onset of cold weather when the soil and moss temperatures went below 0°C. There was one warm spell from April 16 through April 22 during which the moss temperature reached +1°C. (April 19). No Collembola activity has been observed in the field since the onset of the cold weather. Two mite species were still present on the lower surface of stones and showed immediate movement when the stones were overturned.

No Belgica larvae have been observed living in the water, although they are common under Prasiola and other damp-to-wet terrestrial situations. They are most often found some distance from the nearest free water.

Weddell seals are now scarce in the area, but there are a number of elephant seals resident at Norsel Point. Skuas and Wilson's petrels, as well as the Adélie penguins, have left the area. There were still large concentrations of blue-eyed cormorants and gentoo penguins in the area at the end of April.

GLACIOLOGY

Palmer Station

Ohio State University: All accumulation stakes were re-measured. There were significant variations in the snow accumulation in various parts of the icecap, viz.:

Highest part of icecap	March 2	- April 14	185 cm.
Low area around Ferrier Bay	Feb. 16	- April 14	130 cm.
Area near Lapayer Bay	Feb. 16	- April 15	200 cm.

The ice movement survey is now in progress.

METEOROLOGY

Byrd Station

U.S. Weather Bureau: The average temperature was 2.9°C. above the April average, and the average wind velocity, 3.2 mph. above.

Four ozonesondes reached an average height of 25,067 m. The level of maximum ozone concentration moved upward from the usual position around 100 mb. to 55 mb. The partial ozone pressure at this elevation was 332 nanobars, the highest concentration at this height in many months. There was a steady increase in the absolute ozone: on the 24th, the Regener showed a maximum content of 2.98 pphmv and the Mast, 2.947 pphmv. The average net snow accumulation on 50 snow stakes was +5.6 cm. (2.2 in.).

Eights Station

U.S. Weather Bureau: On the 14th a record high April temperature of -6.1°C. (+21°F.) was reached and on the 24th, a new low, -46.7°C. (-52°F.).

The highest peak gust ever recorded at this station, 71 knots, occurred on the 16th during a storm which produced a new minimum sea level pressure for April of 960.8 mb. Eight days later, a new maximum sea level pressure of 1020.051 mb. was recorded.

The average change on 49 snow stakes was +117.1 cm. (46.1 in.) and the greatest snowfall in 24 hours, 5.6 cm. (2.2 in.) on the 19th and 20th. The sastrugi size was quite variable, with a generally N-S orientation. Walking conditions were extremely good on the hard-packed snow.

There were no significant increases in surface ozone. The concentration varied from 1.7 pphmv to 2.60 pphmv with slight increases during storms with southerly winds.

The atmospheric electricity measurements again showed high potential gradients during storm periods. Some difficulty was experienced with the probe caps which become plugged with snow when the wind speed approaches 45 knots.

South Pole Station

U.S. Weather Bureau: All programs operated routinely. An all-time high temperature for April of -31.7°C. (-25°F.) was recorded.

STATION SEISMOLOGY

Byrd Station

U.S. Coast & Geodetic Survey: The equipment worked well.

South Pole Station

U.S. Coast & Geodetic Survey: All equipment functioned well, and a minimum of adjustment or maintenance was required. There is much less drift of the recorder traces.

UPPER ATMOSPHERE PHYSICS

Byrd Station

Aurora and Airglow, Arctic Institute of North America: Aurora was visible on every clear night. The patrol spectrograph has been running well since the beginning of the month when the K-100 release lever was repaired to correct a sticking problem. The same trouble was found, and corrected, on all three cameras. All of the film has been developed.

No useable data were obtained from the split-beam photometer due to high-noise level and external interference. A larger fan and a desiccant have been added to the input air system in order to raise the dome temperature, but the SCAR ASC dome still frosts internally when the outside temperature is below -40°C.

Forward Scatter, National Bureau of Standards: The Byrd-Pole link worked well, but a series of malfunctions caused erratic operation of the Byrd-McMurdo link and considerable time was spent in maintenance work. There were two periods of heavy frost which resulted in poor antenna efficiency. The spare antenna is now stored inside the building.

Geomagnetism, U.S. Coast & Geodetic Survey: The chronometer rate became very erratic at the beginning of the month and for the first six days the program was timed by the ionosphere program

clock. A new rate has been established, which remained under 2/10 sec./day for the balance of the month. Ten sets of absolutes were taken with the following averages:

declination	70°27.1'
horizontal field	16,314 g.
vertical field	57,773 g.

Four additional sets of horizontal measurements that were made are not included in the averages.

The largest magnetic storm of the season began on the 18th and lasted through the 20th with the major activity being between 0200 and 1200 GMT. on the 18th. The storm resulted in a 64% increase in the vertical field and a 68% decrease in the horizontal field for the daily sum. There were Sudden Storm Commencements at 050338, 09050, 100321, 160338, 190155, and 200236 GMT.

Ionospheric Absorption and Micropulsations, National Bureau of Standards: The micropulsation and VLF equipment recorded an unusually high level of activity with almost daily occurrences of hiss accompanied by micropulsation and Riometer absorption events.

A magnetic event during the 18th-20th resulted in large amplitude micropulsations and extremely high absorption.

Ionospheric Soundings, National Bureau of Standards: The expected decrease of foF2 values was detected as the sun went below the horizon. The maximum median foF2 was 5.3 Mc./s. unqualified at 1700 local time and the minimum median, 2.6 Mc./s. qualified at 0607.

The spread echo condition was about the same as last month, but there was an increase in blanketing and sporadic E.

The antenna is still causing some concern, but most of the equipment down-time could be attributed to intermittent wire separation which caused severe power supply failure.

The critical scaling was up-to-date at the end of the month, but general scaling was lagging due to excess maintenance time requirements. The resupply list was completed.

VLF and ELF, Stanford University and Pacific Naval Laboratory: All activity increased and the whistler activity markedly during daytime. By the end of the month, an increased number of high latitude traces were being heard and the auroral hiss was showing more discrete structure than expected.

The solid-state VLF instrumentation was installed and is operating

well. A new amplifier was built for the monitor and the old Sanborn recorder was fitted with a new gear to conform with the speed of the new Sanborn recorder.

The NBS phase data appear to have improved after increasing the time constant of the phase circuit. This modification also improved the operation of the Varian recorder since the phase signals are now less erratic. A vertical antenna was placed in operation with the NBS phase equipment and a ground plane was laid out to improve reception. The new antenna successfully withstood a 50-knot wind. The changes have increased the sferic level, but the system has no trouble locking onto the signal.

Eights Station

Aurora and Airglow, Arctic Institute of North America: There were auroral events on the 9th, 17th, and 18th, the latter one being outstanding and well correlated with other ionospheric events. The all-sky camera and patrol spectrograph operated normally and film development was up-to-date at the end of the month. Moonlight and poor weather prevented operation of the photometer during most of the month.

An extra heater and a defroster fan were installed in the visual observation dome, but fogging still remains a problem.

Geomagnetism, U.S. Coast & Geodetic Survey: Some equipment reorientation on April 2 resulted in base line changes which made it necessary to readjust all normal traces and relevel the recorder drums and time-mark mirrors. The magnetic storm on the 18th was intense enough to render the normal gram unreadable for a period of 6 hours. Both the rapid-run vertical and horizontal record traces were extended beyond the recorder limits. Fourteen sets of absolutes were taken with the following results:

declination	$32^{\circ}40.7'$
horizontal field	21,046 g.
vertical field	48,263 g.

Ionospheric Absorption, National Bureau of Standards: The largest and most complex absorption event ever recorded at this station commenced with the disturbance on the 18th. The magnitude of the event grew to 12.0 db. and the disturbed conditions existed for the remainder of the month. The equipment operated well on the 9th when there was a power failure.

Ionospheric Soundings, National Bureau of Standards: Spread echo and sporadic E were in evidence throughout the month and some absorption was noted during days of aurora. The value of foF2

showed a gradual decrease as darkness approached and echoes were received down to 0.5 Mc./s., the minimum frequency of the sounder. Several hours of data were lost during the storm of the 16th when flying boxes damaged the transmitting antenna.

Micropulsations, National Bureau of Standards: The equipment operated normally except on the 24th when the new preamplifier was removed for repair. Activity was centered around the 9th and 18th. Strong pearl, hiss and periodic activity occurred during the last half of the month.

VLF and ELF, Stanford University and Pacific Naval Laboratory: All programs were operational during a month of remarkable activity. Among the phenomena recorded were gigantic ELF and ULF coruscations, multi-phase emissions, chorus, whistler and hiss interactions, long-echo trains, sudden VLF absorption, and whistler echoes which triggered emissions. The dates of maximum activity were 9, 10, 12, 18, 19 and 22.

The synoptic tape speed was increased to 15 in./sec. and all OGO schedules were met. A new whistler manual is being prepared.

McMurdo Station

Cosmic Rays, Bartol Research Foundation: The super neutron monitor and meson telescope operated normally. The renovation of the small three-tube neutron monitor was completed and it is ready for use as a correlation instrument for the super monitor. A fire alarm system was installed in the Cosmic Ray building.

Forward Scatter, National Bureau of Standards (Bartol Research Foundation Observer): The receiver for the Byrd-McMurdo link and the transmitter for the McMurdo-Vostok link operated well.

Ionospheric Absorption, Douglas Aircraft Company: Equipment failure caused the loss of six days of data on the 50 Mc./s. Riometer. The unit was rebuilt and placed in operation again.

Geodetic Satellite Observations, New Mexico State University: Satellite passes monitored totalled 734. A marked deterioration of VLF and HF signal reception was noted as the month progressed.

South Pole Station

Aurora and Airglow, Arctic Institute of North America: The first aurora was seen on the 10th and was observed daily from the 17th. Film processing was up-to-date at the end of the month.

The patrol spectrograph was on a program of 108-11-1 minute exposure

from the 21st and the all-sky camera was on a schedule of 20-5-20 sec. exposure from the 13th. The special events program was activated.

Some trouble is being experienced with cross-bar vibration under the visual dome. Turning off the blower stops the vibration, but dome frost forms within minutes.

Cosmic Rays, Bartol Research Foundation: The meson ratios were unstable, but all other operations and data appeared normal. Data processing is up to date.

Forward Scatter, National Bureau of Standards: The receiver for the Byrd-Pole link operated normally, but the transmitter for the Pole-Halley Bay link was out of operation due to component failure and output instability.

Geomagnetism, U.S. Coast & Geodetic Survey: With the exception of a malfunction of the Brown recorder, which was repaired by replacing components, all equipment operated satisfactorily. The averages of the absolutes were:

declination	27°25.9'
horizontal field	15,867 g.
vertical field	56,516 g.

The most extensive magnetic activity of the year occurred on the 18th from 0630 to 1200 GMT.

Ionospheric Sounding, National Bureau of Standards: The month was noteworthy for its lack of equipment problems. Nearly every day featured a period with no F region echos around 1400 GMT., probably due to sporadic E blanketing or absorption near Fmin.

Ionospheric Absorption, National Bureau of Standards: Several absorption events occurred which corresponded well with increased auroral activity.

VLF, Stanford University: Work continued on the preamplifier system, which was still not operating at the end of the month.

FOREIGN SCIENTISTS AT U. S. STATIONS

McMurdo Station

Weekly sea ice growth measurements began on April 5. On April 13, water temperature and salinity studies were begun from a fish house established on 55 cm. thick sea ice. The measurements of ice thickness and temperature profiles were continued in the hill lakes.

U.S. SCIENTISTS AT FOREIGN STATIONS

Mirnyy Station

George H. Meyer, the U. S. Exchange Scientist with the Soviet Antarctic Expedition, returned to Mirnyy in mid-March following a seven-week collecting trip to Molodezhnaya and Novolazarevskaya. In April, Meyer reported much snow and stormy weather but seasonal temperatures.

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SUMMARY OF METEOROLOGICAL OBSERVATIONS - APRIL 1965

	Byrd	Eights	McMurdo	So. Pole	Palmer
Temperature, °C.					
Average	-27.3	-30.7	-19.2	-57.3	-2.2
Highest	-11.7/1&11#	- 6.1/14#	- 7.3/25#	-31.7/14#	5.5/16#
Lowest	-45.6/30#	-46.7/24#	-32.2/03#	-68.9/09#	- 9.8/15#
Station Pressure (Inches)					
Average	23.745	27.946	29.122	20.035	- - -
Highest	24.38/28#	30.124*/24#	30.028*/29#	20.465/24#	29.864/2
Lowest	23.14/06#	28.372*/16#	28.504*/03#	19.590/06#	28.408/3
Precipitation (Inches)	0.3	0.39	0.2	Trace	- - -
Snowfall (Inches)	0.9	8.0	2.0	Trace	- - -
Wind					
Prevailing Direction	N	S	ENE	N**	NNE
Average speed (Knots)	21.7	10.6	6.6	13.0	- - -
Fastest mile (MPH)	56/N/12#	77/NNE/16#	- - -	29/E/16#	- - -
Peak gust (Knots)	- - -	71/NNE/16#	69/SE/21#	- - -	40/ /29#
Average Sky Cover	6.5	7.6	6.6	20	- - -
No. clear days	3	3	2	20	5
No. partly cloudy	16	6	10	4	13
No. cloudy days	11	21	18	6	12
No. days with visibility less than 1/4 mile	9	6	1	2	- - -
No. Radiosondes	29	- - -	27	- - -	- - -
Avg. height of Radiosondes (m)	23,115	- - -	24,172	- - -	- - -
No. Ozonesondes	4	- - -	- - -	4	- - -
Avg. height of Ozonesondes (m)	25,067	- - -	- - -	17,711	- - -
No. Radiometersondes	25	- - -	- - -	24	- - -
Avg. height of Radiometersondes (m)	22,803	- - -	- - -	19,262	- - -

All figures above have been taken from radio messages and are unconfirmed

* Sea-level pressure

** North defined along 0° Greenwich # Date of occurrence