



Leerburger

Adèle penguin singles out its own chick from hundreds of thousands.

Massive scientific effort

Biologists, atmospheric physicists, psychologists from many nations work through the summer 40 feet beneath the ice cap

From deafened penguins, unborn seals, a hole 8,000 feet down and balloons 50,000 feet above, American scientists, with colleagues from 11 countries, are extracting the secrets of the Antarctic.

Representatives of more than 50 colleges, universities and Government laboratories are currently working on 60 different scientific projects as part of the 1967-68 U.S. Antarctic Research Program.

These projects are all part of a \$7.7 million program of the National Science Foundation. While NSF supplies the science money, the Navy is spending \$19.8 million in logistic support. Close to 1,100 scientific and military personnel are participating in this year's Operation Deepfreeze.

Antarctica, which is more than one and a half times the size of the United

States, first became an important scene in America's scientific effort with the beginning of the International Geophysical Year in 1957. Since then, NSF has had an annual Antarctic research program.

Although the majority of the work is carried out during the summer months (October-February), close to 300 scientific and military personnel "winter over" in one or another of America's six stations on the continent. McMurdo Station, on the coast, is the largest support and research facility. Fifty scientists and 150 support personnel spent the winter at McMurdo in 1967.

Eerie, ice blue tunnels lead to the various wooden structures beneath the ice. Scientists live in small but comfortable quarters. Most men have private rooms decorated with personal

pictures. According to one psychological study of the men who spend up to a year in isolation, the first pictures to appear on the walls are pin-ups. These begin to be covered by travel posters after several months. Pictures of sun-flooded beaches and mountain scenery remain until about two or three months before the men are due to head home; then the pin-ups return.

An extremely close relationship between the men beneath the ice; a feeling of great comradeship. Although the prime interest is science, each station has a club room complete with bar. Some stations have pool tables. During the last winter season, a scientist at the South Pole station appeared with a small, gold earring in his left ear. By winter's end, nearly all the scientists had pierced left ears and a single gold ring. This symbol of esprit de corps was abandoned when the men left the station.

Each base believes its kitchen serves the finest food in Antarctica. The chef at Byrd Station explained, "Food is most important to the men here. We have a greater variety of frozen gourmet foods in our tunnels than any other base on the ice. Our menu can include trout from Denmark, Hawaiian duck, the best American steaks or New Zealand lamb. Occasionally, during the summer, a plane brings in fresh lettuce and tomatoes. We have a problem rushing the fresh foods from the sub-zero temperatures above the ice to the warmth of our refrigerator."

Although Antarctica contains the world's largest supply of fresh water, it's all frozen. At Byrd Station, the personnel are divided into seven "water crews." Each crew spends several hours a day each week chopping and sawing ice and depositing it in the station's ice melter. The melter is heated by the exhaust pipes from the fuel powered electric generators. The reward for "water duty" is the privilege of taking a weekly shower.

The inland stations include Byrd Station, Plateau Station and the Geographical South Pole. (There are two additional summer stations on the coast.) Because of brutal weather conditions, the majority of the working areas and all the living sections at the inland stations are about 40 feet beneath the continental ice cap. In August 1966, Plateau Station recorded a temperature of minus 121.4 degrees F.

At Byrd Station, a two-year supply of food is piled in one long ice tunnel. Temperature remains at about minus 20 degrees F; spoilage is no problem.

Antarctica has been one of the few areas in the world in which complete, free and open cooperation exists between the United States and the Soviet Union. During the winter of 1967, E. Everett McNamara, Arctic Institute of North America, studied soils and weathering processes at the Soviet coastal station of Molodezhnaya. The same year, Petr. G. Astakhov of the Arctic and Antarctic Institute in Leningrad conducted ionospheric studies at the U.S. South Pole Station.

Astakhov, a slight, spade-bearded researcher, was a most popular figure at the Pole Station. He worked closely with the American scientific leader, Richard B. Weininger of the Institute of Telecommunication Science and Aeronomy. "Although we worked on different projects, we became quite involved in each others' work," said Weininger. "In fact, we discussed several projects we'd like to pursue to-

Research and Engineering Laboratory, Hanover, N.H., scientists will analyze the ice cores in an attempt to learn more about the history of Antarctica and the climatic changes that may have affected glacial action in the rest of the world as far back as 30,000 years ago (SN: 12/16).

In another major research project, James R. Barcus, University of Denver, is using balloon-borne instruments to detect auroral and solar electrons and solar nuclear particles during the period of maximum solar activity. The program includes 15 launches at Byrd Station and 5 at McMurdo, about 850 miles away. The balloons fly at 50,000 feet and contain automatic self-destruction mechanisms to be activated if they fall to aircraft-route altitudes.

Several other upper atmospheric physics studies will utilize the laboratories at the Geographic South Pole. An observatory at the Pole, on the

Adèlies' embryology as well as the adult penguin's ability to recognize its own offspring. Very little is known about the discrimination or learning process of penguins.

The Adèlie penguin feeds only its own offspring and rejects any foster chick. How the parent is able to recognize its own chick in a milling rookery of thousands of young penguins is the question being studied at Hallott Station by Dr. David H. Thomson of the University of Wisconsin.

In 1964, Dr. Richard L. Perry of the New York Zoological Society found that the recorded sounds of the female Adèlie penguin would attract only her own offspring. Dr. Thomson will reverse the procedure to determine if the recorded voice of a chick will evoke a parental response. He will also test visual response by deafening the parent and determining whether she can identify her chick by sight alone.



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No cold war under the ice. Soviet scientist Petr. G. Astakhov and American Richard B. Weininger.

gether. Peter and I became very good friends and I know we'll keep in touch after we return to our own countries."

Said Astakhov, "You can't live and work as closely as I've done with these American scientists without developing a close, personal friendship. We may have our political differences, but that never affected our relationship as scientists and friends. Dick has taught me a great deal of English, and I've tried to teach him a little Russian. I've invited several of my new associates to visit me and my family in Leningrad." However, as one of Astakhov's American associates said, "Sure, Peter is a great guy and I'd love to visit him in Russia, but I wonder what would happen to my security clearance if I ever did?"

One of the more dramatic scientific programs being carried out at Byrd Station this year is the drilling of an 8,000-foot hole through the continental ice sheet. Under the direction of B. Lyle Hansen, U.S. Army Cold Regions

earth's spin axis, has the advantage of being stationary relative to other points on the rotating globe, thus affording a continuous look at the same point on the celestial sphere.

With the cooperation of Soviet scientists, a major program to study the density and height of the E-layer of the earth's ionosphere is beginning. Expectations are that the E-layer, 50 to 85 miles above the earth, will provide information about concentrated influxes of solar radiation in the polar area. By using a forward scatter technique, radio signals are bounced off the ionosphere and recorded at widely separated Antarctic receiving stations. One is at the Soviet Antarctic base, Vostok, located at the Geomagnetic South Pole. Soviet scientists are using American-made equipment to record the radio signals.

Most of the biological research is taking place at the coastal stations. Scientists hope that several penguin studies will reveal more about the

Seals are under study at McMurdo Station. Robert W. Elsner, University of California, San Diego, is leading a project to investigate the Weddell seal's cardiovascular adjustments during deep dives in the frigid Antarctic waters. He hopes to determine the seals' natural diving time, the circulatory changes that occur in both fetal and maternal seals during dives, as well as the seal's heart rate and blood flow. It is hoped that these studies may shed light on the problems of human asphyxia (lack of oxygen) after birth.

Perhaps the most arduous project is the 1,200-mile traverse over the vast, windswept plateau of Queen Maud Land. This year's expedition is the third leg of a four-year 5,000-mile South Pole-Queen Maud Land Traverse. Norman W. Peddie of the U.S. Coast and Geodetic Survey is leading the party of 10 explorer-scientists. The team is taking periodic seismic, gravitational and electro-magnetic soundings.

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