NORSK POLARINSTITUTT

ÅRBOK 1987

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The Annual Report of the Norwegian Polar Research Institute

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Annual report of the Norwegian Polar Research Institute

Norsk Polarinstitutt has roots back to 1906 with regular polar activity from 1909. It was officially established by Parliament in 1928 and is today an independent institution under the Ministry of the Environment. As Norway's central institute for the scientific research of Svalbard, Jan Mayen, the polar seas, and the dependencies in the Antarctic, it is also responsible for the mapping of the Norwegian polar land areas. Research concerning fishing and other marine-biological resources and petroleum exploration on the continental shelf are excluded from the Institute's field of responsibility.

Norsk Polarinstitutt has three main assignments:

1. It has consultative functions for and with the Norwegian authorities in polar matters. By its research and mapping, the Institute is part of the Government's execution of its sovereignty responsibilities, the management and observation of Norwegian interests in the Arctic.

2. It shall contribute to the definition of research tasks and needs for new basic knowledge about the polar areas. The Institute's own research is part of this together with the effort to stimulate other institutions to increase their effort in the polar areas.

3. The Institute should be a national centre for scientific activities in Norwegian polar areas with specific responsibility for tasks requiring continuity.

The following is a short description of some of the Institute's activities:

Biological research: Because marine and terrestrial ecosystems in the polar regions are particularly vulnerable to human activities, the Institute's biological research has been directed towards problems within wildlife management and nature conservation in Svalbard and adjacent ice-covered waters. Marine birds, botany, and marine and terrestrial mammals have been main topics of study.

Geophysical research: The geophysical work of the Institute is primarily directed towards ice and climate. Glaciers, sea ice, and the interaction between the surface of the earth, ice, and the atmosphere are major topics of study. Oceanographic investigations of the ice-covered sea regions are incorporated in the research programme.

Geological research: Geological mapping of the Norwegian polar areas is the most important aim and responsibility of the Institute's geological department. Research, which is the basis for maps and map descriptions, is carried out concurrently with the mapping activities. The Institute is responsible for the structural investigations and the charting of the sea floor in the polar sea regions.

Topographic mapping: Norsk Polarinstitutt is responsible for the terrestrial mapping of Norwegian polar regions. Priority has been given to the task of completing the main topographical map series for Svalbard to the scale of 1:100,000.

Thematic mapping: Thematic maps published by the Institute include geological maps of land masses, loose deposits and upper layers of the sea floor in the polar regions, geophysical charts of sea ice distribution, ocean currents and gravity measurements, and maps of biological resources and abundancies.

Research Station in Ny-Ålesund, Svalbard: Norsk Polarinstitutt's Research Station is one of the most northerly scientific land stations in the world, located at 78°55'N, 11°56'E. It is open to all Norwegian scientists with government-funded projects and to foreigners cooperating with Norwegian institutions.

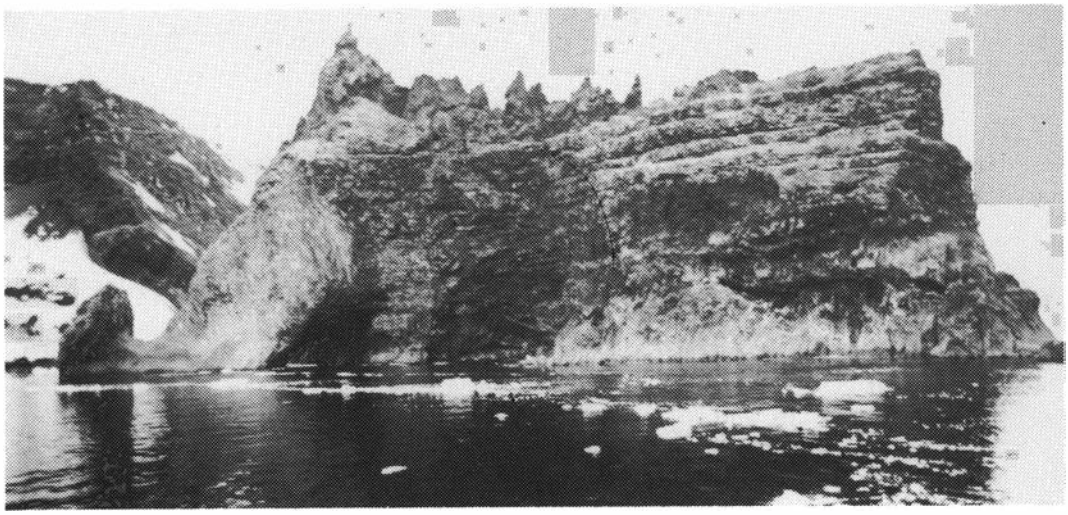
Administration of joint scientific expeditions: Norsk Polarinstitutt is responsible for the administration and implementation of Norwegian Antarctic research expeditions. The annual expedition to Svalbard also includes participants from other research institutions. In its function as central governmental body, the Institute also coordinates scientific studies in the polar regions, particularly in management-oriented investigations.

Service: The Institute runs a service office in Longyearbyen in the summer season, providing practical advice and assistance for expeditions and field parties. Norsk Polarinstitutt is also building up an equipment pool where specialized polar equipment may be borrowed against a charge for normal wear and tear.

Information: The information service handles general enquiries from Norwegian and foreign institutions and individuals about the Institute's activities in Norwegian polar areas. Several scientific publications and news bulletins are published on a regular basis and the Library has one of Europe's best collections of polar literature.

Contractual activities: As far as its capacity allows, the Institute accepts contract work on a non-profit basis within its fields of competence.

Other activities: The Institute has been responsible, since 1933, for the establishment and maintenance of a network of navigation lights and beacons for ships and air traffic on Spitsbergen.



Kapp Ingrid, Peter I Øy, Antarctica, seen from the northwest.

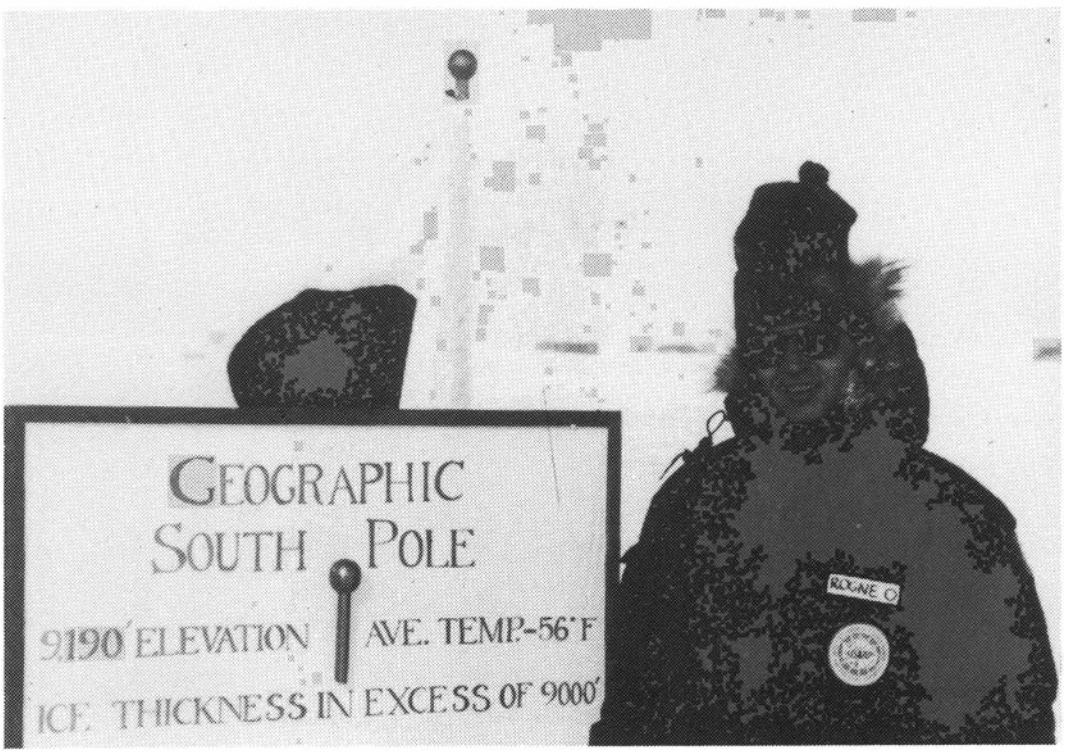
The past year

Another busy year has come to an end, starting with an expedition to Antarctica - or more precisely, to Peter I Øy. Good leadership, together with favourable ice and weather conditions, helped the expedition to complete a full programme of mapping and positioning, marine biological investigations, and a series of smaller terrestrial sampling projects. An automatic weather station was erected.

Field activity was carried out throughout the year in the Arctic reaching a maximum in the summer months. In addition to the regular institute investigations, we had an increase of external projects which surpassed all expectations, although we only undertake tasks concurrent with our main responsibilities. Most of these projects came up as a consequence of the necessity for environmental impact analyses on land and sea, but industrial needs for more knowledge about the physical environment count for a number of new field projects. With its continuously up-dated data bases, its experience, and knowledgeable staff, the Institute should be an attractive consulting agency and partner in several fields.

The planning of a new atmospheric station in Ny-Ålesund was completed in 1987. When finished in 1989, we hope it will prove to be a valuable addition to the research facilities offered by the Research Station. A proposal for the establishment of a research centre in Longyearbyen attracted much attention and is under serious consideration by several interested parties.

In February the Institute hosted the first consultative meeting of representatives from the Arctic nations on the formation of an Interna-



Odd Rogne, Director of Norsk Polarinstitutt, at the South Pole.

tional Arctic Science Committee. The positive interest and support from all countries resulted in the appointment of a working group to continue the work. This initiative may prove to be the nucleus of a very interesting organization for arctic science (see more details under "Polar Events").

Another significant event was the finalization and signing, after three years of negotiations, of the Norwegian-Soviet agreement on Arctic research cooperation. Together with similar cooperative agreements with research institutions in other countries, it should lead to a natural development of international cooperation in the Arctic. A smaller event in the same field was the arrangement of the first Svalbard Geological Field Symposium, bringing together scientists from several countries to informal discussions at the end of the field season in Svalbard.

An official committee was appointed in 1986 to work out a report on polar research in Norway. Headed by the Research Director of Norsk Polarinstitutt, the committee will evaluate the present status of Norwegian polar research, analyze its structure and organization, and define uncovered needs. When presented in the autumn of 1988, the report will hopefully accentuate the importance of having a well organized and internationally competitive Norwegian research effort in the polar regions. There are obvious needs for both basic and applied research, including monitoring and mapping.

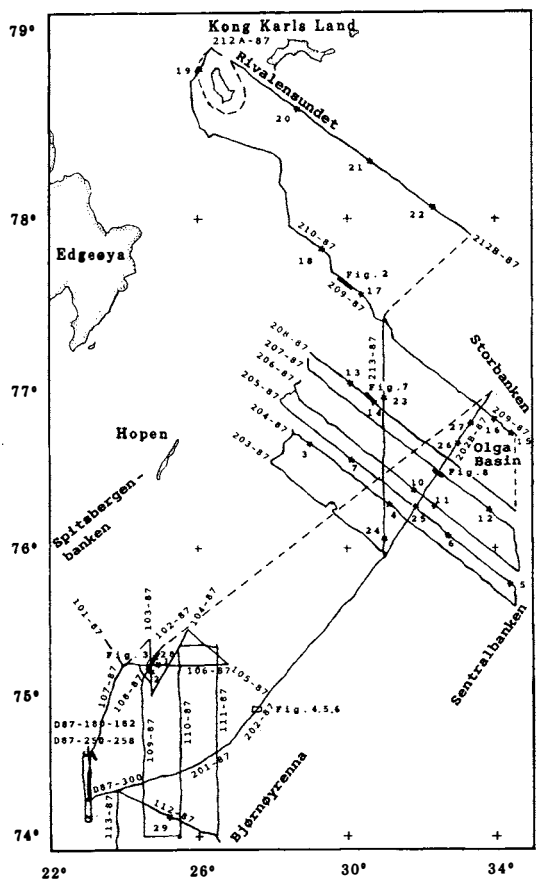
"M/V Lance" breaking through the ice.

Field activities in 1987

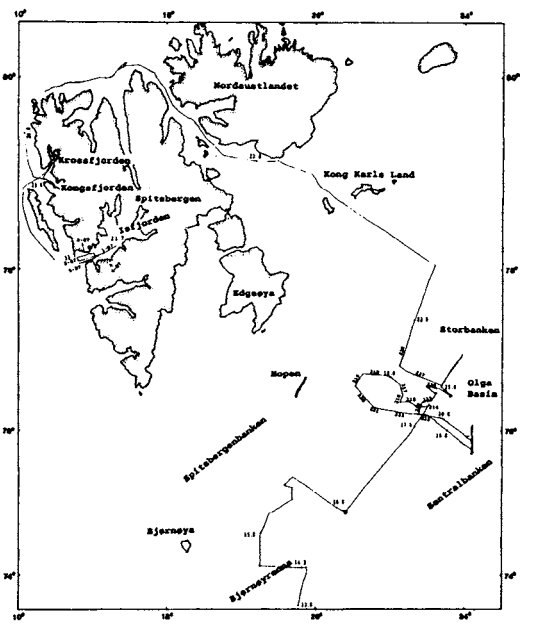
Field work started in January in 1987, and continued throughout most of the year. The main expedition activities took place in July and August when the snow cover was at a minimum and the sea-ice problems small. The regular air traffic to Longyearbyen and year-round possibilities for hiring helicopter or small aircraft transport to other parts of the archipelago at any time of the year, made it easier to do field work in off-season periods.

The Institute's summer expedition left Bodø on board "M/V Lance" on 7 July. After the terrestrial parties had been transported to their field areas, to work on different aspects of biology and geology, the vessel was used for marine-geological investigations in the Barents Sea from 21 July to 26 August. She returned to Bodø on 3 September with field parties, equipment, and samples. A helicopter stationed part of the time on board the ship, part of the time in Longyearbyen, supported the field parties logistically throughout the summer season.

Some oceanographic and ice studies were carried out by Institute geophysicists participating in expeditions on board other research vessels. The Institute's Research Station in Ny-Ålesund was in general operation throughout the year, and functioned as base for a number of field projects in the summer season.



Acoustic profiles measured in the Barents Sea during the marine geological investigations with "M/V Lance" in July/August. Stippled lines mark full speed transits with only 3.5 kHz profiling.



Route during the second part of the Barents Sea cruise with "M/V Lance". Each new day is marked with a tick-mark and date. Lines 2, 3, 4 and 5/87 in Isfjorden were run during the first part of the cruise.

22 scientists and logistic personnel from the Institute, including contracted personnel, did field work in Svalbard in 1987. Since each researcher often works on more than one project, a sum total of 115 project/persons take part in the field activities financed through the budget of Norsk Polarinstitutt. These numbers do not include the crews of the vessel and helicopter. 25 scientists from other institutions took part in cooperative projects, mostly within biology and geology. Some support, mostly logistically, was given by the Institute.

Section reports

Biology

Dr. Philos. Nils A. Øritsland was head of the Biological Division in 1987. He has worked at the Institute for eight years and spent many field seasons in Svalbard studying reindeer and polar bears. He is a Professor II at the University of Oslo.

Norsk Polarinstitutt is responsible for management-oriented biological research in the Norwegian polar areas. The Biological Division incorporates ecological mapping and population biology studies within such disciplines as marine biology (excluding the Directorate of Fisheries' area of responsibility), ornithology, botany, and land mammals.

The division has two tenured scientists: one ornithologist and one mammalogist. A research fellow studying the behaviour of the arctic fox, spent about half the year at the Research Station in Ny-Ålesund. Two contracted ornithologists continued their work under the PRO MARE and AKUP programmes (PRO MARE: Programme for Marine Ecology; AKUP: Arbeidsgruppen for konsekvensutredninger av petroleumsvirksomhet). Another eight biologists were contracted for field and desk work under the MUPS environmental impact studies on Svalbard (MUPS: Miljøundersøkelser på Svalbard).

Software modifications of the Institute's fauna data base were carried out, and a first verbal version of the MUPS system for environmental impact analyses in Svalbard presented in Norsk Polarinstitutt Report No. 39. A thematic map of animal life in Svalbard and Jan Mayen to the scale of 1:1,000,000 was prepared for printing. This is to be included in the National Atlas of Norway (published by the Geographical Survey of Norway).

Field work

The field work in 1987 focused on seabirds, seals, arctic fox, polar bears, and reindeer.

Scientific cruises - Two of the Institute's biologists participated in a cruise on board the coast guard vessel "K/V Nordkapp" in February, organized by the Norwegian research programme for marine arctic ecology (PRO MARE). Seabird feeding ecology and energetics were studied, and censuses of seabird distribution in ice filled waters conducted in the Northern Barents Sea. The research vessel, "F/F Endre Dyrøy", owned by the Oil Directorate, was hired under the AKUP programme, to do pelagic seabird registrations in the Northern Barents Sea in August and October.

Terrestrial field work - Ornithological studies with emphasis on seabird energetics were continued in the Ny-Ålesund area in the spring and summer of 1987. The field work took place at bird cliffs in Kongsfjorden, and laboratory experiments were performed at the Research Station in Ny-Ålesund. In cooperation with the Game Biology Station at Rønde in Denmark, the breeding ecology of the

Seabird studies in a bird cliff in the Barents Sea.

light-bellied Brent Goose was studied at Tusenøyane in SE Svalbard. Seabird studies at Bjørnøya were continued under the AKUP programme and additional registrations made of seabird colonies on Edgeøya and on the southern coast of Spitsbergen.

Studies of the effects of helicopter traffic on nesting seabirds were carried out in Kongsfjorden as a part of the MUPS programme. Seabird censuses in the Storfjorden area were made in connection with petroleum exploration activities at Haketangen, South Spitsbergen. Radio telemetry and behavioural studies of polar bears were performed in the area between Hornsund and Storfjorden.

Reindeer population surveys, including tagging and tracking telemetry, were conducted on Nordenskiöld Land and Brøggerhalvøya. The experimental reindeer harvesting programme was continued. Different aspects of the biology of the arctic fox were studied in the Kongsfjorden and Isfjorden areas. Preliminary studies concerning energy expenditure of free-living ringed seals were conducted in Kongsfjorden during the spring by the use of acoustic telemetry equipment.

Projects

Fauna data base (F. Mehlum) - Single observations and time series of abundance of birds and mammals are recorded in a map related (GEOPLOT) data base. Updated and reasonably realistic abundance values for seabirds are available. The records on mammals reflect single observations and not realistic distributions.

Seabird studies in the Svalbard area (F. Mehlum and G. Gabrielsen) - The project concerns population and feeding ecology as well as physiological energetics of seabirds. Field and experimental work was carried out at Hornsund and Ny-Ålesund.

Seabirds studies in the Barents Sea (V. Bakken) - This project focuses primarily on population or abundance surveys. Field work was carried out in Storfjorden, at Bjørnøya, and at the ice edge northeast of Bjørnøya.

Reindeer studies in Svalbard (N. A. Øritsland) - The work concerns primarily population monitoring and feeding ecology. Tagging and location telemetry investigations were carried out on Nordenskiöld Land and Brøggerhalvøya.

Environmental impact studies in Svalbard (MUPS) - (N.A. Øritsland and P. Prestrud) - Field work concerned with effects of air traffic on cliff-nesting seabirds was carried out at Ny-Ålesund. Observations and location telemetry on polar bears migrating through the Hornsund area were carried out and results from 1986 reported. A conceptual model for consequence analysis of industrial activities on Svalbard was presented.

Rabies and population dynamics of the arctic fox in Svalbard (P. Prestrud) - Tagging, location telemetry observations of pup produc-

tion, and body growth and composition studies were done on the arctic fox in the Adventdalen and Sassendalen areas. Field work was done in 1987 and results analysed for publication.

Behaviour and social biology of the arctic fox in Svalbard (K. Frafjord) - Tagging and ethological observations of the arctic fox were carried out at Ny-Ålesund. In addition, further ethological observations and experimental feeding of five captive foxes were carried out.

Geology

The Geology Division includes one technician and eight geologists. Two of them are occupied with older metamorphic and folded rocks, three with younger sedimentary sequences, one with Quaternary geology and two with marine geology. In addition to doing geological research, they are all working on the production of geological maps to various scales of Svalbard and the adjacent Barents Sea. All took part in field studies in different parts of Svalbard and the Barents Sea in 1987.

Work continued on the geological map series to the scale of 1:100,000. A geological map of Svalbard and Jan Mayen to the scale of 1:1,000,000 was published by Statens Kartverk for the National Atlas of Norway, and will appear with a short descriptive text in the Institute's Thematic Map series in 1988. A geological map to the scale of 1:3,000,000 of Svalbard and the Barents Sea is under construction in cooperation with the Geological Survey of Norway.

Material collected in the field was studied and the results presented in publications and lectures. Work on a geological handbook for Svalbard, to appear in 1988, was started in 1987.

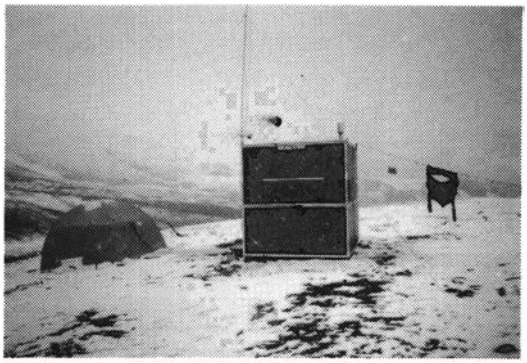
Field work

Terrestrial geology. - Mapping studies were done of older folded and metamorphic rocks in the St. Jonsfjorden areas and of younger sequences at the head of the fjord. Younger sequences were also studied in the inner part of Isfjorden. The main field work was done for the western part of the Van Keulenfjorden map sheet. A study of short duration was un-

Thore Winsnes was the leader of the geological division in 1987. Having worked at the Institute since 1948, he has spent many field seasons in Svalbard, and has participated in many Antarctic expeditions

dertaken in Nordenskiöld Land in cooperation with the University of Oslo.

Marine geology. - Studies of the Quaternary sediments and glacial history of the Barents Sea, including bottom sampling and work on a shallow seismics project, were done on a cruise with the "M/V Lance" from 21 July to 26 August. Similar work was undertaken in cooperation with Mobile Exploration Norway Inc. and the University of Bergen aboard the "M/V Mobile Search".



Geologists' camp in Chamberlindalen, south of Bellsund.

Projects.

Regional geological investigations in Svalbard (A. Hjelle, Y. Ohta, O. Salvigsen, T.S. Winsnes, H. Keilen) - Field work was finished for three issues in the Svalbard 1:100,000 series, the St. Jonsfjorden, Isfjorden, and the Kongsfjorden map sheets. Field studies on the Van Keulenfjorden map sheet in the same series were done, but poor weather prevented completion. New field data from the summer season necessitated some small changes to be made on the Billefjorden map sheet, which would otherwise have been ready for print. The Braganzavågen map sheet was printed and the descriptive text almost completed.

Data base of the Geology of Svalbard - A test programme for the establishment of a data base for the geology of Svalbard was started in 1987 for the Kongsfjorden map sheet. Work will continue to form a base for a map and a descriptive text.

Data base for geological samples from the Arctic region (H.B. Keilen) - This data base, established in 1985, involves descriptions of fossils from the Arctic region. Key words include reference lists, finding place data, stratigraphic positions and deposition of samples. The data base has been completed up to 1980.

Sedimentological and palaeological investigations of Upper Carboniferous and Lower Permian successions in central Spitsbergen (H. B. Keilen) - A study on the integrated sedimentological, palaeo-ecological and diagenetic studies of the Gipsdalen Group, Nordfjord Block, Spitsbergen, was started in 1986.

Tertiary tectonics in southern Spitsbergen (W. Dallmann and Y. Ohta) - The initial reconnaisance field work for this project was started in the Van Keulenfjorden area in the summer of 1987. The aim is to improve our knowledge about the Tertiary deformation history and structure and to establish tectonic models for the orogenic development within the area south of the Bellsund-Agardhbukta line. The first results being published in 1988, completion of the project is expected in 1992. National and international symposia will be arranged in connection with this project, the first to take place in cooperation with the Geological Department of the University of Oslo in April 1988.

Glaciation and deglaciation of Svalbard (O. Salvigsen) - Studies of the glaciation history and shoreline displacement were made in Wedel Jarlsberg Land in the summer of 1987. Sub-till sediments were found in the valley mouths and marine limits were determined between Bellsund and Torellbreen. Amino acid analysis and radiocarbon dating were extensively used in the subsequent preparation of data. This project is carried out in cooperation with the University of Bergen.

Investigations of the basal Devonian formations, northern Spitsbergen (T. Gjelsvik) - Descriptions of about half of 25-30 profiles and localities were prepared based on field data and microscopical studies of several hundred thin sections. H. Keilen assisted with the palaeontological investigations.

Correlation of older complexes (A. Hjelle, Y. Ohta and T.S. Winsnes) - The correlation includes pre-Devonian rocks in Svalbard and both radiometric dating and recently developed microfossil techniques have been applied. The results will be summarized to establish tectonothermal terrains. In this connection the project is part of the international cooperation project "Circum Atlantic Paleozoic Terrains" of UNESCO and IGU, with Y. Ohta as coordinator for Arctic areas.

Dating of older metamorphic rocks (Y. Ohta) - The main work on this project, which was started in 1985, was done in northwest Spitsbergen. U/Pb, Rb/Sr, and Ar^{40}/Ar^{39} datings have been applied in cooperation with Dr. J. J. Peucat, University of Rennes, France, for the two former methods, and Prof. R. D. Dallmeyer, University of Georgia, USA, for the latter. Professor D. G. Gee of the University of Lund, Sweden, also participated in the project.

Quaternary glaciations in the northern and central Barents Sea; timing and mechanisms (A. Elverhøi and A. Solheim) - This long term project studies the extent and chronology of the Quaternary, in particular the Late Weichselian, glaciations of the northern and central Barents Sea, and how this ice sheet is related to Svalbard and northern Europe glaciations. Two Cand. scient. theses were started on this project.

Sedimentation and sedimentary processes in modern glaciomarine environments (A. Solheim and A. Elverhøi) - Various aspects of glaciomarine deposition and processes are studied off Svalbard glaciers and the Weddell Sea ice shelf in Antarctica. In 1987, particular emphasis was placed on synthesizing several years' work outside the surging tidewater glaciers of Nordaustlandet, Svalbard.

Upper bedrock subcrop of the northern and central Barents Sea (A. Elverhøi and A. Solheim) - Based on shallow seismic data, Quaternary sediment samples and some in situ rock samples, the lithology and shallow structure of the upper bedrock (0-200 m) in the northern and central Barents Sea have been mapped to the scale of 1:1,500,000. This work was completed in 1987. Maps and an explanatory article will be printed in the Skrifter series in 1988.

Quaternary sediment mapping, northern and central Barents Sea (A. Elverhøi and A. Solheim) - Regional maps to the scale of 1:1,500,000 of sediment thickness and surface sediment distribution were completed previously. More detailed maps (1:500,000 or 1:750,000) are now being compiled from two areas on Spitsbergenbanken and Storbanken/northern Bjørnøyrenna where data density justifies this.

Glacigenic sedimentation and sedimentary processes off the west coast of Spitsbergen (A. Solheim and A. Elverhøi) - This project was started in 1987 to study the sedimentary fan/transverse trough complex off Bellsund using high resolution, multi-channel reflection seismic data.

Glacial history and Cenozoic sediments of the eastern Weddell Sea shelf, Antarctica (A. Elverhøi and A. Solheim) - This project involves regional studies of Cenozoic glacigenic sediments and their underlying bedrock. Special emphasis is given to studies of the Late Weichselian glaciation and changes in the palaeo-current regime.

Iceberg scouring in the northern Barents Sea and on the Antarctic continental shelf (A. Solheim and A. Elverhøi) - Distribution, dimensions, structure and mechanisms are studied

in these two quite different glaciomarine settings. While we find relatively small icebergs calved off from tidewater glaciers in the Barents Sea, large, tabular icebergs broken off from floating ice shelves are typical for the Antarctic.

Svalbard coastal mapping (A. Elverhøi and O. Salvigsen) - Mapping of the coastal types of Svalbard, by means of photography and video recording with special reference to the oil pollution aspects is being done under this project. The Geographical Institute of the University of Oslo is cooperative partner. Thematic Map No. 6, Forlandet, was printed in 1987. Field studies for a map of the Bellsund area were completed.

Regional investigations in Dronning Maud Land, Antarctica (Y. Ohta) - In cooperation with Dr. B. Tørudbakken of Saga Petroleum, various rocks were dated and a good isochrone obtained for charnockite. In cooperation with the Japanese Polar Research Institute, fifty mineral analyses were made for the calculation of metamorphic temperature pressure. Based on these petrological and isotope-chemistry data a draft manuscript was prepared with detailed geological descriptions.

Geophysics

Five geophysicists are employed by the Institute: one specializes in meteorology, two in glaciology, one in oceanography, and one in sea ice research. One of the glaciologists is responsible for the Antarctic glaciological programmes as well as for the organization of national expeditions to Antarctica. The other four have done field work in Svalbard during the summer season or on cruises in the sea ice around the Archipelago at various times of the year. The main objective of the geophysical division is long-term studies of different aspects of climatic conditions, with special emphasis on ice research.

Torgny Vinje (right), the leader of the geophysical division is a sea-ice researcher and has been working at the Institute since 1956. He spent three years in the Antarctic from 1956 to 1960 on an expedition under the International Geophysical Year, and has long experience as expedition leader in Svalbard and adjacent waters as well as in the Antarctic. Jan Jansen, captain on board the "M/V Lance", to the left.

The collection of meteorological observations from the automatic weather station in Svalbard, on Bouvetøya, and Peter I Øy continued in 1987, and so did the preparation of tables for the main radiation components in Ny-Ålesund. The registration systems in Ny-Ålesund have been inspected and the radiation instruments calibrated once every year.

Sea ice investigations based on satellite imagery, automatic ice drift buoys and measurements conducted from ships at various times of the year continued. The sea ice projects have increased in number during the last years, particularly in connection with oil exploration in the Barents Sea and consequent need for analyses of potential absorption of oil spills in ice-covered waters.

Landsat TM and SPOT satellite imagery was used to study features of some of the main glacial outlets in Dronning Maud Land. A study on the volution of the under-water sides of ice shelves and icebergs was published.

The data from field investigations were worked out and published as maps, reports or publications. The geophysicists have cooperated with national and foreign scientific organizations and taken part in a number of international projects.

Field activities

Maritime ship-based investigations were carried out on four cruises in 1987: Mooring work was done on Spitsbergenbanken from the "K/V Nordkapp" between 27 January and 3 March. Hydrographical investigations were conducted in the Greenland Sea on board the "R/V Valdivia" between 11 March and 5 April, in the Greenland Sea and the Fram Strait on board the "R/V Polarstern" between 3 June and 5 July, and mooring work and hydrographical investigations in the Barents Sea onboard the "K/V Senja" between 13 and 26 October.

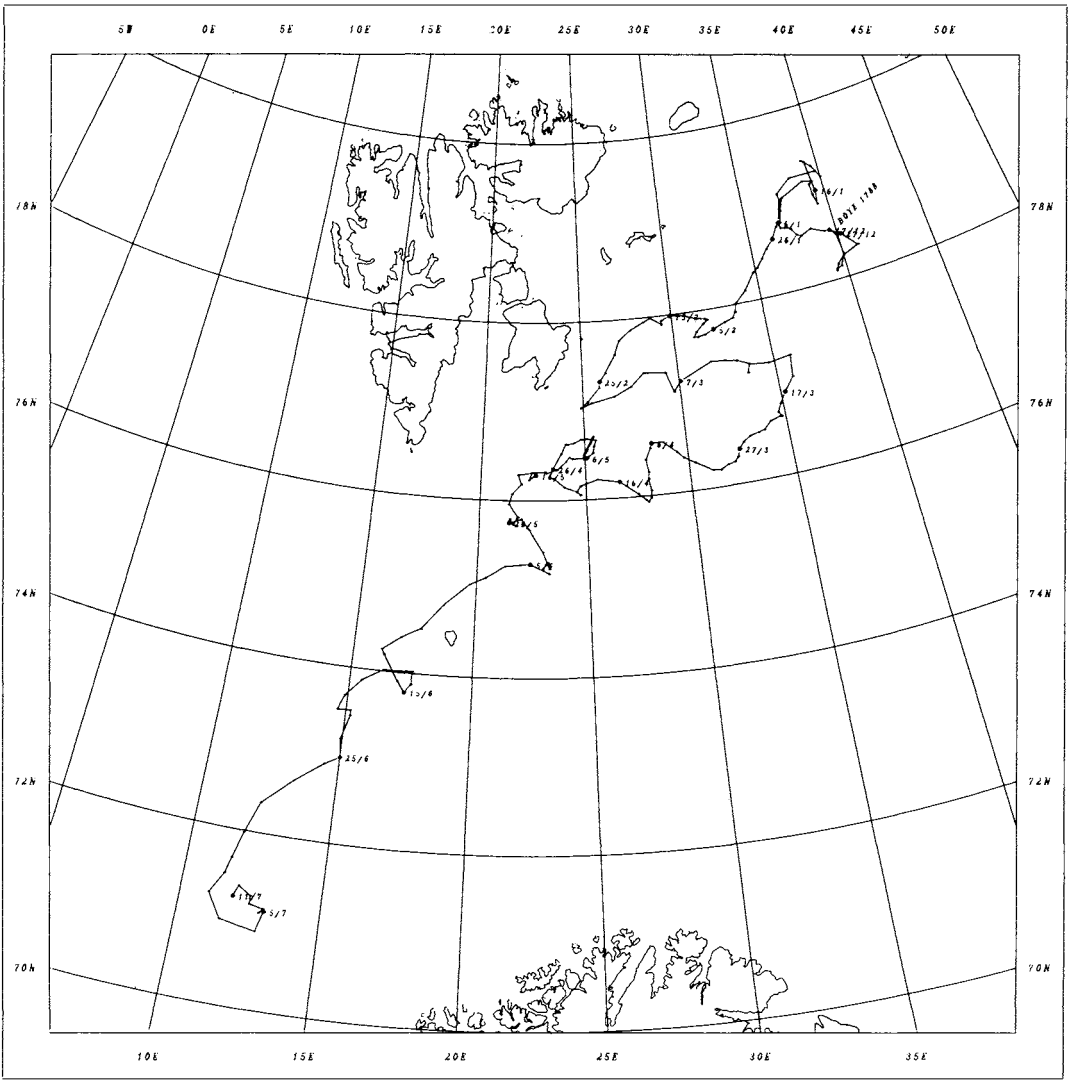
Terrestrial investigations were carried out at Storbreen, Norway, in May, and at Brøggerbreen and Lovénbreen, Ny-Ålesund, in July. The radiation instruments in Ny-Ålesund were calibrated in June-July.

Projects

Sea ice - AKUP (T. Vinje and Å.S. Johnsen) - Special sea ice investigations have been made for the Ministry for Oil and Energy for the assessment of the consequences of oil exploration in the Barents Sea. A scanning sonar for the mapping of sub-surface topography was used for the estimation of the pooling capacity of oil under ice. Stereo-photography was used for the estimation of the relationship between top and bottom features. The drift of oil infested ice is estimated from data from the ice drift buoys parachuted on to the ice by the Air Force. Applying the drift relationships observed in this way, we can later estimate the climatic probability drift distribution from a stochastic ice drift model. Altogether twenty ice floes of various ages and extensions were measured in 1987 and four ice drift buoys were dropped on to the ice along 40°E. One geophysicist is contracted on this project.

Ice distribution statistics (T. Vinje) - The area-digitizing of a twenty-year long revised data base for ice distribution and surface temperatures in the Atlantic sector of the Arctic continued under a project for oil companies having operative responsibility north of 62°N. The new series evolves from a comparison of Norwegian, American, English, and Icelandic ice maps, as well as information collected at the Institute from ships and aircraft. Three geophysicists are contracted on this project.

Arctic Ocean Buoy Programme (T. Vinje) - The cooperation with the Norwegian Meteorological Institute and the Polar Science Center at the University of Washington continued. This programme was established to stu-



Drift track for ICEXAIR buoy No. 1788 from 16 December 1986 to 11 July 1987. During the first part of the drift it was on an ice floe, but was floating freely in the sea from 4 June.

dy the interaction between ice drift, wind and ocean currents in the Transpolar Ice Drift Stream emerging through the Fram Strait. Altogether five stations were dropped on to the ice by the Norwegian Air Force in the region between the North Pole and the Siberian coast.

Greenland Sea project (T. Vinje) - This is a comprehensive long-term international project with emphasis on climatic aspects. The longterm transport of ice from the Arctic Ocean into the Greenland Sea will be estimated by means of upward-looking sonars (ULS) in the Fram Strait and farther south. One sonar was deployed in June 1987. The purchase of another two is secured by contribution from NAVF and Norsk Polarinstitutt.

Sea ice climatic variables (T. Vinje) - ICECLIMA is a remote sensing programme

which will use microwave data from the ERS-1 satellite to be launched in 1990. The exchange of ice between the Arctic Ocean and the Barents and Greenland Seas will be determined, icebergs in the Barents Sea detected, and the possibilities of tracking an oil spill absorbed in an ice field will be tested. The programme is approved by ESA. The statistical evaluation of image processing derivatives continues.

Water mass transformations and the exchanges between the Polar Ocean and the North Atlantic (B. Rudels) - The work concentrates on water transformations, convection and the ventilation of the deep and bottom waters in the Arctic Mediterranean. The exchanges through and the mixing and recirculation in the Fram Strait are also studied. The work, while initiated earlier, is coordinated with the international Greenland Sea project and combines field observations with theoretical studies. Close cooperation has been established with the Institut für Meereskunde, Universität Hamburg.

Mixing processes in the northern Barents Sea (B. Rudels) - Freezing, brine release and the formation of dense, saline bottom water, together with internal processes such as double-diffusive convection, entrainment and intrusive mixing, are studied. The programme consists primarily of CTD observations complemented with current measurements and studies of chemical tracers. The work is connected with the Norwegian PRO MARE programme and has been carried out in cooperation with Oceanografiska Institutionen and Institutionen för Analytisk och Marin Kemi, Göteborgs Universitet, and Institut für Meereskunde, Universität Hamburg.

Solar altitude diagrams (V. Hisdal and T. Berge) - A series of diagrams with instructions for determining solar altitudes and duration of different phases of daylight for high northern latitudes was made ready for publication.

Radiation data for Ny-Ålesund (V. Hisdal) - The main radiation components are recorded continuously. The preparation of tables of these data for the last years has been seriously delayed, however, because of insufficient capacity of the computer section.

Automatic weather stations (V. Hisdal) - Data from the automatic stations were collected on tape as part of a long-term project of studying the climate of Norwegian polar regions.

Mass balance studies of glaciers in Svalbard (J. O. Hagen) - The glaciological work was concentrated on mass balance studies of the Austre Brøggerbreen and Midre Lovénbreen glaciers near Ny-Ålesund, Svalbard. The mean thinning, since the measurements started in 1966, over the whole surface of the former is about ten metres which is more than 10 per cent of the total volume of the glacier. The measurements made in 1985 and 1986 were prepared for publication. Mass balance studies of the Kongsvegen glacier were started in the inner part of Kongsfjorden in 1987, while Finsterwalderbreen in Van Keulenfjorden was measured on a smaller scale.

Surge investigations in Svalbard (J.O. Hagen) - 90 per cent of the glaciers in Svalbard are subpolar and most of them seem to be of a surging type (i.e. with periodic rapid advances). The surge process is complex and investigations include velocity, profile, and vol-

Alation stakes for glacier mass balance measurements are drilled down on the Lovénbreen glacier in May 1987.

ume change registrations as well as measure ments of the temperature regime of some selected glaciers in Svalbard.

Polar hydrology (J.O. Hagen) - Preliminary studies of some drainage areas were made in 1987 in order to establish some hydrological research stations in Svalbard. This is a joint project with Norges Vassdrags og Energiverk (NVE), Norges Hydrotekniske Laboratorium (NHL), and Det Norske Meteorologiske Institutt (DNMI). Polar hydrology - that is studies of hydrological processes and data collection in areas with permafrost - has been given high priority by the Norwegian Hydrological Committee and new projects are planned.

Mass balance studies of the Storbreen and Hardangerjøkulen glaciers (J.O. Hagen) - Mass balance measurements of the Storbreen and Hardangerjøkulen glaciers in mainland Norway were continued. This is part of a long-term project which for Storbreen involves the second longest series of investigations of its kind.

Length measurements of glaciers in Norway (J.O. Hagen) - Glacier front fluctuations have been regularly registered in Norway since 1900. The measurements give an approximate estimate of the average mass balance over a long period of time, and may be useful in modelling glacier response to climatic changes. A total of ten glaciers are measured each year. They all retreated in 1987, from nearly zero to up to twenty metres.

Studies of tabular icebergs in Antarctica (O. Orheim) - The processing of iceberg data from Antarctic waters collected through an international programme led by the Institute was continued. Information has now been collected on more than 100,000 icebergs.

Geodesy/topography

Norsk Polarinstitutt is responsible for the mapping and the production of maps of Norwegian polar land areas. Three topographers and one geodesist are employed in this work.

Triangulations and tide and magnetic measurements made on the expedition to Peter I Øy in Antarctica were calculated. - The magnetic measurements from Svalbard were preliminary calculated. Together with the Norwegian Mapping Authority, the division started calculation of Global Positioning System (GPS) observations made on the expeditions to Svalbard in 1985 and 1986. Aerotriangulation of a block of 240 aerial photographs from the northeastern part of Spitsbergen was completed with the help of the Norwegian Mapping Authority.

The division edited two maps of the Dronning Maud Land 1:250,000 series, one map of Peter I Øy 1:50,000, and three maps of the Svalbard 1:100,000 series.

The following maps were compiled and published as whiteprints:

Peter I Øy 1:50,000	
Svalbard 1:100,000:	E5 Gustav Adolf Land
	E7 Kapp Payer

The following maps were published:

Svalbard 1:500,000:	4 Nordaustlandet (new edition)
Svalbard 1:100,000:	C13 Sørkapp (new edition)
	A6 Krossfjorden

A data base of the coastline digitized from the Svalbard 1:100,000 map series was established. A complete topographic data base of Bjørnøya is now available.

Sigurd Helle was head of the topographical division until he retired in October 1987. He has been with the Institute for 38 years and has participated in several expeditions to Svalbard and Jan Mayen. He was the leader of the Norwegian Antarctic Expedition 1956-60 to Dronning Maud Land, arranged in connection with the International Geophysical Year, 1957-58.

Field work

Topographer Knut Svendsen (leader), geodesist Trond Eiken, and their two assistants took part in an expedition to Peter I Øy, Antarctica, from 22 January to 2 February. They observed three doppler points, measured a small trigonometric network, shot a series of oblique air photographs , and conducted magnetic and tide observations. (See article at the end of this annual report.)

Topographer Bjørn Lytskjold and one assistant did magnetic measurements in Spitsbergen and completed the magnetic survey programme started in 1985. The tide gauges in Longyearbyen and Ny-Ålesund received their necessary annual check.

Cartography

The cartographical division's main responsibilities are the technical preparation and production of the Institute's topographic and thematic maps, and the administration of the final preparation for the map printing work which is done outside the Institute. Three cartographers and one illustrator are occupied with this as well as with illustrating work for the Institute's publications.

The following maps were published in 1987:

S500	4 Nordaustlandet - new, revised edition (topographical)
S100	A6 Krossfjorden - new (topographical)
	C13 Sørkapp, new - revised edition (topographical)
	C10G Braganzavågen - new map (geological)
Svalbard	1:200,000 A3 Forlandsundet - new coastal/thematic map in cooperation with Department of Geography, Univ./Oslo
Svalbard	1:10,000 - Kvadehuksletta - new geomorphological/Quaternary map in cooperation with Department of Geography, Univ./Oslo

The division was also occupied with the preparation or revision of seven topographical, one biological, and eight geological maps. Some work has been done on another ten maps. The division has been represented in the place-name committee and has continued its transferring of place-names to a computer data base.

Information/documentation

An information officer, a publications editor, a librarian, a translator and a part-time assistant cover the multitude of documentation tasks resulting from the Institute's responsibility for the scientific research in the Norwegian polar areas. The continued interest in polar matters made 1987 a very busy year for the division.

In addition to answering day-to-day questions on polar matters of a historic or more current significance, the Information Service seeks to give as extensive information as possible. Several press releases, news and information bulletins, in addition to the annual report of the Institute, were sent out in 1987. Some press conferences were also arranged with good media participation. Two new issues of *Polarinform,* introduced at the end of 1986, were distributed to 300 interested subscribers, and were frequently quoted in the press.

The publication of scientific literature is an important part of the Institute's documentation service. Two issues of the journal *Polar Research,* one of *Skrifter,* and seven reports appeared in 1987 and were exchanged and sold to scientists all over the world. The services of the Institute also include sale of aerial photographs and topographic and thematic maps. The sale and subscription routines for Institute publications are handled by the Documentation Division as of the beginning of 1987.

The Institute library has one of the best collections of polar literature in Europe and is open to the public during office hours. 1987 saw another 196 titles registered, including 88 new purchases, 36 old titles, 15 reprints, 15 titles from exchange partners, and 42 gifts. The reprint collection totals 6600 titles. 549 loans were registered, including loans to other libraries.

The translator is mainly occupied with the translation from Russian to English of scientific literature. A list of the translations carried out this year may be obtained at the Institute.

Logistics

The increased expedition activity throughout the year made 1987 a very busy year for the Logistics Division. In addition to giving logistic support to the Institute's ordinary summer expeditions, a total of 90 scientists from other institutions were given logistic support of some kind in Svalbard. All equipment is being registered on to a data base, which will probably be completed in 1988.

Norsk Polarinstitutt has the practical responsibility for establishing and maintaining a network of navigation lights and beacons for ships and aircraft on Spitsbergen. Personnel from the logistics division are responsible for their annual inspection and service. In addition to general maintenance work, two new navigation lights for aircraft were set up at Kapp Borthen and in Moselbukta.

The division has five permanent posts and a number of part-time helpers, but the personnel situation was still unstable in 1987 owing to illness and leave. Through the use of a rota system, the division always has an on-the-spot representative in charge of the equipment at the research station in Ny-Ålesund.

Norsk Polarinstitutt's Svalbard office

The Institute has had a base for its Svalbard expeditions in Longyearbyen since 1977. The logistics division is responsible for the service function of this office, both for the Institute's own people and for other visiting scientists. The office was manned during the main field season on land which stretched from 1 March to 1 September in 1987.

Norsk Polarinstitutt's Research Station, Ny-Ålesund

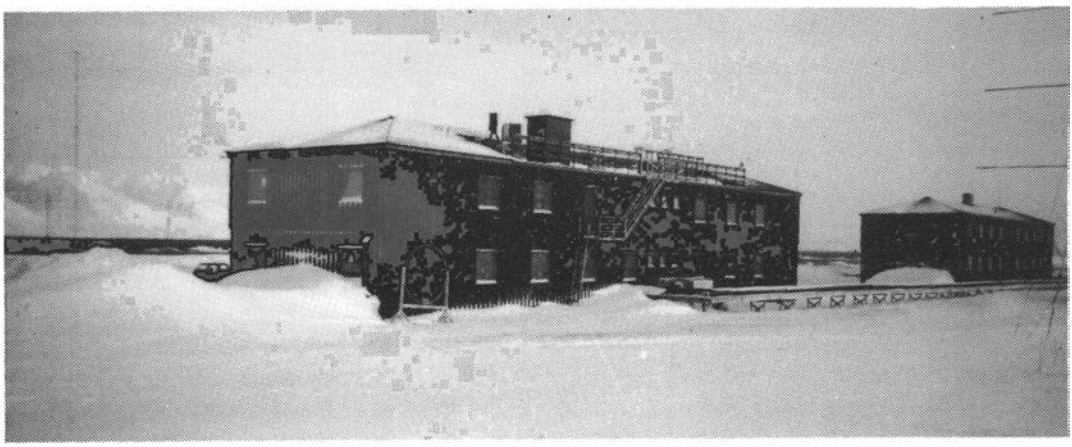
The Research Station in Ny-Ålesund was established in 1968 and is one of the most northerly land stations in the world. It serves as an observatory, a laboratory and a field base and is available all year round for Norwegian scientists and others working with arctic problems in cooperation with Norwegian scientific institutions. The most important part of the activity takes part in connection with the station's observatory functions, which involve a considerable recording of mainly geophysical data.

The permanent scientific registration programmes of the Research Station in Ny-Ålesund were in operation throughout 1987. Some of them involve cooperation with scientists from other countries. The following phenomena are recorded continually or observed during longer periods of the year:

Components of the radiation energy budget	– Norsk Polarinstitutt
Tide measurement	– Norsk Polarinstitutt
Mass balance of glaciers	– Norsk Polarinstitutt
Atmospheric pollution	– Norsk Institutt for Luftforskning
Meteorological conditions	– Det norske meteorologiske institutt
Seismic disturbances	– University of Bergen
The Earth's magnetic field	– Universities of Tromsø and Oslo
Ionospheric activity, including aurora	– Universities of Tromsø and Oslo

During the course of 1987, 77 visiting scientists stayed at the station for a total of 1400 visitor days. Not included in this number are more randomly visiting researchers, stopping over in Ny-Ålesund on their way to field work elsewhere in Svalbard. Visits are unfortunately not evenly spread throughout the year. More than 60 per cent of all visits to Ny-Ålesund take place in the period 15 June to 15 August. During the remaining ten months of the year, there is ample room for visitors, particularly in October-November. July is the busiest month. About 70 per cent of all visits are concerned with biological projects, 20 per cent with geophysics, and 10 per cent with geological work.

Last year's research fellow studied the behavioural ecology of the arctic fox in Svalbard, sharing his time between the Research Station and the office at Norsk Polarinstitutt.



Norsk Polarinstitutt's Research Station in Ny-Ålesund.

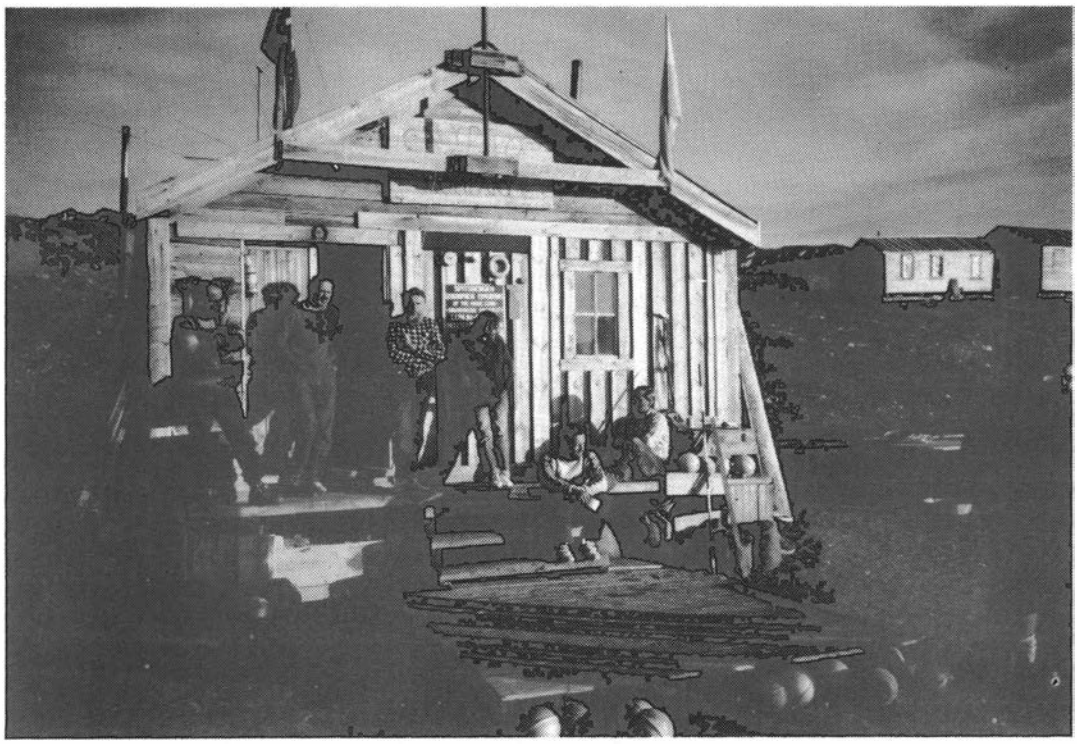
Polar events

International Arctic Science Committee

Scientists working in Antarctica and familiar with the Scientific Committee on Antarctic Research (SCAR) often ask why there is no similar organization for the Arctic. One reason is to be found in the differing political situations for the two polar areas. Although the need for and advantages of such an international organization are unquestionable, a scientific cooperation in the Arctic may get a different form from that in Antarctica.

The idea of establishing an international scientific organization for the Arctic has been discussed from time to time, but with no real results up until recently. Delegates from countries active in Arctic research discussed this question again at an informal session of the XIX SCAR Meeting in San Diego in 1986. They decided that a new initiative should be tried. As the success of such an organization is closely dependent upon politics, delegates recommended that the first preliminary consultations should take place between representatives from the Arctic countries. Norsk Polarinstitutt volunteered to host the first meeting on behalf of the Norwegian National Committee on Polar Research.

The meeting in Oslo was held in February 1987, attended by representatives from countries with territories north of the Arctic Circle. Those attending concluded that some important



Meeting between Norwegian and Polish scientists in Calypsobyen, Bellsund.

needs for international cooperation and communication within Arctic research were not met by the international arctic science bodies already in existence. A working group consisting of Roots (Canada), Rogne (Norway), and Taagholt (Denmark/Greenland) was asked to prepare a proposal document, elaborating the ideas brought forward at the meeting.

The group produced a rather extensive document, which was finished and circulated at the end of the year. It gives an outline of the present situation, presents the needs and suggests how to meet them, and ends up by proposing to establish a non-governmental scientific committee provisionally called the International Arctic Science Committee (IASC). The suggested organization structure is very similar to that of the existing regional international multi-disciplinary scientific coordination committees of the International Council of Scientific Unions (ICSU). As proposed, the IASC should consist of a Board to run its affairs, a council of national representatives from all participating countries, working groups to be concerned with research in selected subject areas of international importance, and a Secretariate.

The report of the working group was circulated to all participants asking them to consult with the national scientific bodies as well as political authorities of their countries. The next planning meeting is scheduled for late March 1988.

Export of Norwegian polar equipment and technology

Norwegian whalers, sealers, and great explorers like Fridtjof Nansen and Roald Amundsen, have contributed much to the discovery and mapping of new southern and northern polar land areas. This, in addition to her location north of the Arctic Circle, has made Norway internationally known as a polar nation. The cold climate has made it necessary to develop clothing and various equipment to be used under extreme polar conditions, and Norwegian producers have been suppliers in this special market for more than a hundred years.

The last few years have seen steadily increasing international activity both in the Arctic and the Antarctic. Realizing that we might have something to offer in an international polar market, Norsk Polarinstitutt initiated a project in 1987 to organize Norwegian suppliers of polar equipment, services, and technology in a joint presentation abroad. After a very positive test inquiry among possible exporters, the Norwegian Export Council became involved and will carry through the project in 1988. In a world-wide presentation of polar products and services in Hobart, Australia, in September 1988, it is hoped that Norwegian products and services, based on our long polar traditions, will make a favourable and competitive impression.

International workshop on the late Cenozoic palaeoenvironments and geology of the Arctic

Aiming at an integration of existing knowledge on various aspects of the late Cenozoic palaeoenvironment in the Eastern Arctic, Norsk Polarinstitutt, together with NAVF (the Norwegian Research Council for Science and the Humanities), invited to an International Workshop at Spidsbergseter Fjellstue in April 1987. Some seventy scientists from ten nations participated and more than thirty papers were presented.

The majority of the contributions focused on the Weichselian glaciations of Svalbard and surrounding marine areas. Recent studies seem to indicate that the late Weichselian ice sheet at its maximum extended almost to the present western coast line of Svalbard, leaving the outer shore and islands ice free. The withdrawal started as early as at 13,000-12,000 years before the present, corresponding to isotope stage 1A. Presentations from Arctic Canada and the Labrador Sea, Baffin Bay and the Norwegian Sea contributed to thorough and comprehensive discussions.

Also discussed were the more long-term palaeoclimatic evolution of the Arctic, based on data from the eastern Arctic Basin and results from the Ocean Drilling Program (ODP) Leg 104 on the Vøring Plateau. While earlier calculations suggested that sea ice formed in the Arctic Ocean about 5 million years ago, a reinterpretation of the palaeomagnetic data indicates an ice cover formation only 2 million years ago. This concept is also more in agreement with terrestrial data from northern Greenland. According to the ODP data, the first major expansion of the Scandinavian ice-sheet took place about 2.6 million years ago, which is also in agreement with data from other regions.

A special session at Spidsbergseter discussed future Arctic drilling programmes. The technology for the development of such programmes is available, but the costs involved are too high to be covered by any scientific institutions. It was suggested at the meeting that a joint effort in this field might be realized in connection with the centennial celebrations of the Nansen Fram Drift.

Three oil companies, Total Marine, Elf Aquitaine and Mobil Norway, supported the workshop meeting financially. Papers presented were published as extended abstracts in a special issue of *Polar Research,* Volume 5 No. 3.

Svalbard Geological Field Symposium 1987

To visit Svalbard is like leafing through an illustrated geological textbook. All the main geological systems are represented, and the sparsity or complete lack of vegetation facilitates the study of detailed geological layers and faults. Geologists from all over the world have been visiting Svalbard every summer for many years, some for pure scientific reasons, others, in recent years, hoping to find oil-bearing layers in the Archipelago or adjacent sea areas.

Most of the geologists working in Svalbard have visited Norsk Polarinstitutt in Oslo, but there has been very little regular contact between them otherwise. To make such contact possible, it was decided to arrange a contact meeting in Longyearbyen at the end of the summer field season in 1987.

The first "Svalbard Geological Field Symposium" was held in Longyearbyen on 26-27 August 1987, organized by Norsk Polarinstitutt and Store Norske Spitsbergen Kulkompani. The fundamental idea of the meeting was to bring Svalbard geologists together for scientific discussions and exchange of information on topics of mutual interest. After an introductory session, the participants were divided into three specialist groups - Devonian, Devonian to Tertiary, and Quaternary.

This was the first such meeting arranged in Svalbard, and was regarded by the organizers as a kind of test project. When asked about the need for future symposia, the participants agreed that meetings arranged every second year would be of great value. Some suggested that excursions should be included as a part of future symposia. The Institute has published an informal report from the meeting.

Mass dying of Common Guillemots on Bjørnøya

Large bird cliffs at Bjørnøya, swarming with common guillemots in 1986, were almost empty the next summer. Population counts made by Norsk Polarinstitutt in 1986 and 1987 showed that 90 per cent of the birds, a total of 200,000 hatching pairs, had disappeared from this largest bird colony in the Barents Sea from one year to another.

At the same time many observations were made along the northern coast of mainland Norway of emaciated, dead common guillemots. A number of them had been marked at Bjørnøya in 1986. The birds have probably starved to death due to the scarcity of capelin in the Barents Sea.

The common guillemot is a fastidious bird, with a strong preference for capelin. According to the Maritime Research Intitute in Bergen, the capelin population in the Barents Sea has suffered a total breakdown, probably due to over-fishing. A full stop in capelin fisheries was effectuated in 1987, and according to the experts, such fisheries should not be resumed until sometime in the 1990s to allow the population to regain its strength. Only time will show whether the common guillemots on Bjørnøya will be saved.

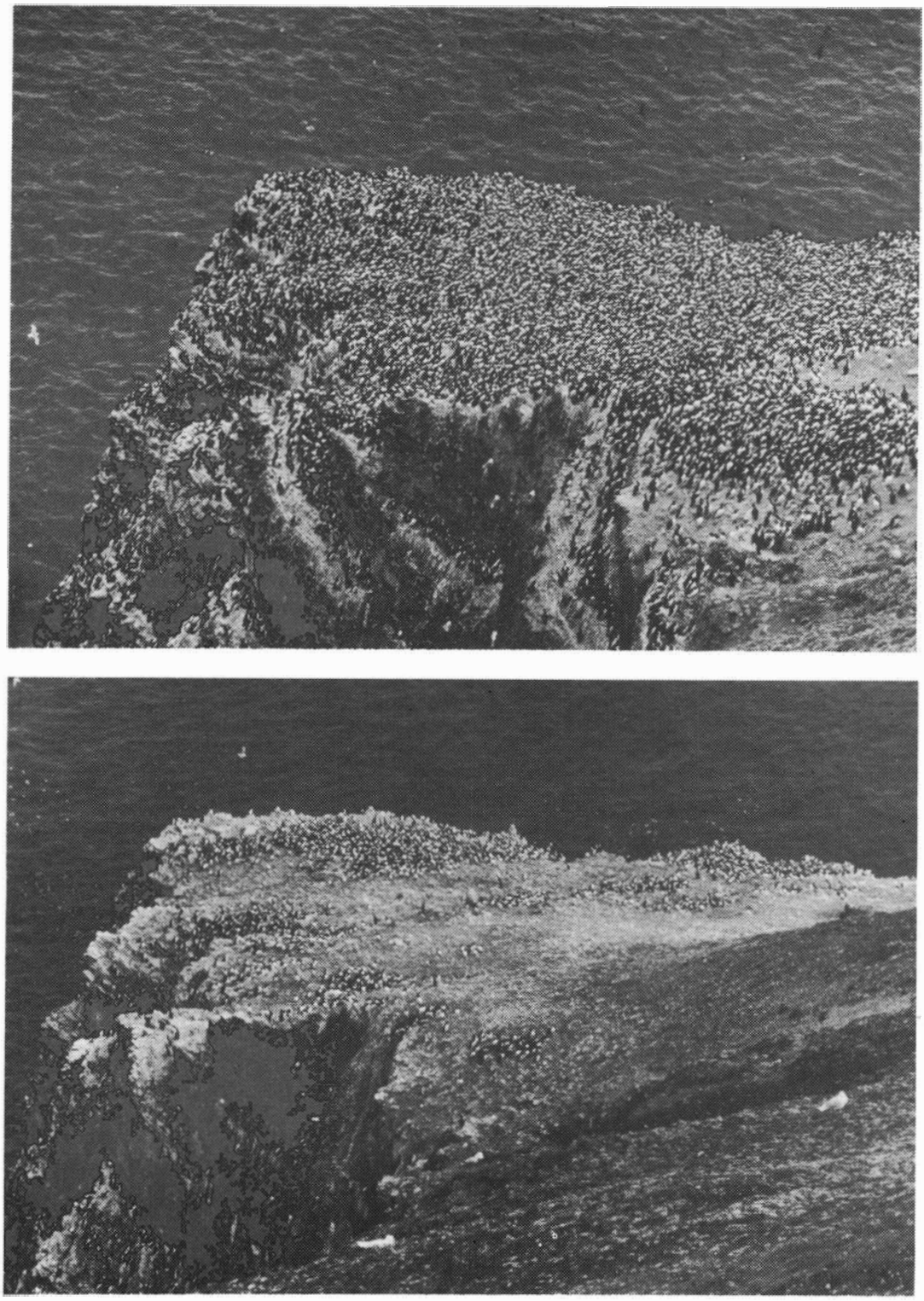
Common guillemots breeding on Bjørnøya in the summer spend the winter along the coast of Northern Norway. It is most unlikely that they should have been staying at the wintering sites or moving to other summer breeding places. Earlier information has indicated a corresponding reduction of the common guillemot populations along the coast of mainland Norway. The most probable explanation for the empty bird rocks at Bjørnøya, therefore, is that the birds have starved to death. The common guillemot colony on Bjørnøya is the largest one in the Barents Sea.

Digital sea ice data base for the European Arctic

Sea ice data from the European Arctic are more easily available, after an edited ice chart series for the 1966-1986 period was digitized and plotted into a data base.

Satellites in polar orbit enable us to watch the polar areas for research and operational purposes. As early as 1966, Norsk Polarinstitutt started to publish sea ice extension maps for the Barents Sea and the waters around Svalbard. The Norwegian Meteorological Institute took over in 1970. More than 1600 ice charts have been published since the start·more than twenty years ago. Published weekly, they cover today the Barents Sea with Svalbard, the Greenland and Norwegian Seas, and show ice coverage and surface temperatures in the ice free sea areas.

The maps are mainly based on satellite imagery, but aerial, marine and weather station observations are also of importance. The Norwegian series has been cross-checked against American and British ice charts and observations.



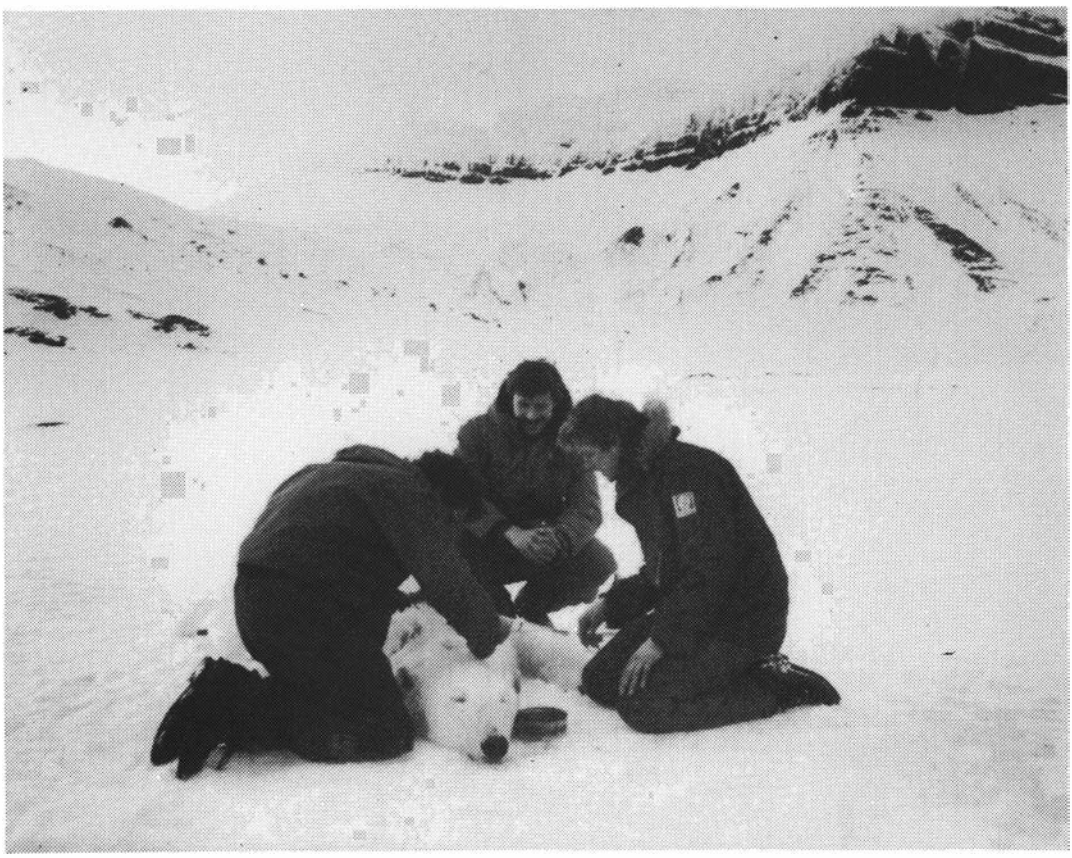
Common guillemot bird cliff on Bjørnøya in 1986 (above) and in 1987 (below).

The digitalization of the edited ice map series has been done at Norsk Polarinstitutt and is financed completely by Esso Norge. The Norwegian Meteorological Institute is responsible for the further completion of the data base.

New analysis system for environment impact investigations in Svalbard

The report on a new analysis system for environment impact investigations in Svalbard was recently published (in Norwegian) at Norsk Polarinstitutt. Containing a list of the most important environmental problems we are likely to meet when starting industrial activities in the Arctic, it may be a useful tool for the environmental authorities in their planning for the kind of research necessary before such industrial activities can be started.

The analysis system is composed of a set of valued ecological components - VEC - (in Norwegian VØK - verdsatte økologiske komponenter), i. e. components in the ecosystem which should be given priority, for instance polar bears. A total of fourteen VECs were selected. A conceptional diagram was made for each VEC, showing the impact of industrial activity. So-called impact hypotheses are made based on each diagram. Such a hypothesis is a statement about how a VEC may be influenced by nature disturbances. A selection of impact hypotheses



Researchers are fitting a radio collar on an immobilized polar bear, to be able to trace its wandering. The bear will wake up after a couple of hours. These polar bear investigations are financed by Statoil under the environmental impact investigations programme.

are made based on existing knowledge and after careful consideration. When necessary knowledge is lacking, we have a reason for suggesting initiation of a research project.

Norsk Polarinstitutt has been assigned the task of making an environment impact programme for Svalbard. The development of an analysis system was added as a subproject to be prepared by an Expert Group and a Working Group with representatives from research and industry and established in line with the Canadian BEMP project (Beaufort Environmental Monitoring Project).

Statoil, British Petroleum, and Store Norske/Hydro financed the development of this analysis system. It is not meant to be a final plan for environmental investigations to be carried out in Svalbard in connection with industrial activities, but shall and must be adjusted as we go along and as we see fit.

Official report on Norwegian polar research

The Research Director of Norsk Polarinstitutt, Dr. Jan Holtet, was appointed chairman of an official Norwegian committee which will work out a report on polar research in Norway. The appointment was made by the Government on 6 November 1987. The committee will map the scientific work being done in the polar areas today and will size up the need for research within the natural, technological and humanities/political sciences.

The first meeting was held in December, and the Committee will have its report ready by 1 November 1988. The committee consists of twelve members representing different institutions and disciplines of research. Secretarial tasks have been assigned Norsk Polarinstitutt.

Published in 1987

Several series are published by the Institute. The journal *Polar Research* contains original scientific papers in English and appears in two-three issues per year. The *Skrifter* series is for monographs in English, French or German, while *Meddelelser* is a series for articles of a more popular character. *Polarhåndbok* has so far appeared in two issues, on the flora and geography of Svalbard. *Årbok* has been published annually since 1960. The *Temakart* series (Thematic maps) was started in 1985, three new issues appearing in 1987.

Norsk Polarinstitutt's publications may be ordered from bookstores or directly from the Institute.

Publications

Polar Research

This journal, started in 1982, is now well established. It has attracted many subscribers and is exchanged with the scientific literature of about 250 institutions around the world. Three issues, Vol. 5 n.s. Nos. 1, 2 and 3, appeared in 1987.

Norsk Polarinstitutt Skrifter

No. 188 - Rudels, B.: On the mass balance of the Polar Ocean, with special emphasis on the Fram Strait.

Årbok 1986

In addition to being the annual report of the Norwegian Polar Research Institute, this yearbook contains an article on the reindeer in the Ny-Ålesund area. It is distributed free of charge.

Norsk Polarinstitutt Temakart

The following thematic maps were published in 1987:

Temakart No. 4 – Braganzavågen (geological) 1:100,000.
Temakart No. 6 – Forlandsundet (coastal landscape, published in cooperation with the Department of Geography, University of Oslo)
Temakart No. 8 – Kvadehuksletta (geomorphological/Quaternary, published in cooperation with the Department of Geography, University of Oslo)

Research in Svalbard 1987

This yearly bulletin gives information on the scientific work planned to take place in Svalbard during the coming season. Based on data collected by Norsk Polarinstitutt it is distributed to all contributors before the beginning of the field season each year.

Norsk Polarinstitutt Report Series

The following seven papers appeared in the Report Series in 1987. The reports are published for limited distribution. Some are for sale at the Institute, while others may be obtained from the authors.

No. 34 - Prestrud, P. & Øritsland, N.A.: Miljøundersøkelser i tilknytning til seismisk virksomhet på Svalbard 1986. Et ledd i konsekvensutredning av petroleumsvirksomhet på Svalbard. NOK 35.-

No. 35 - Mehlum, F. & Fjeld, P. E.: Catalogue of seabird colonies. NOK 35.-

No. 36 - Solheim, A. & Larsson, F. R.: Seismic indications of shallow gas in the Northern Barents Sea. NOK 35.-

No. 37 - Elverhøi, A. & Solheim, A.: Shallow geology and geophysics of the Barents Sea. NOK 35.-

No. 38 - Barr, S. (Ed.): Smeerenburg Seminar - report from a symposium presenting results from research into seventeenth century whaling in Spitsbergen. NOK 35.-

No. 39 - Hansson, R., Prestrud, P. & Øritsland, N.A.: Analysesystem for miljø og næringsvirksomhet på Svalbard. NOK 35.-

No. 40 - Hisdal, V. & Berge, T.: Solhøydediagrammer for området fra 70°N til 82°N. NOK 50.-

Polarinform

This information bulletin gives short notes on general news topics from the polar areas, and is meant to be published two to four times a year. It appeared for the first time in November 1986 and will be distributed free of charge to those interested. Two issues appeared in 1987.

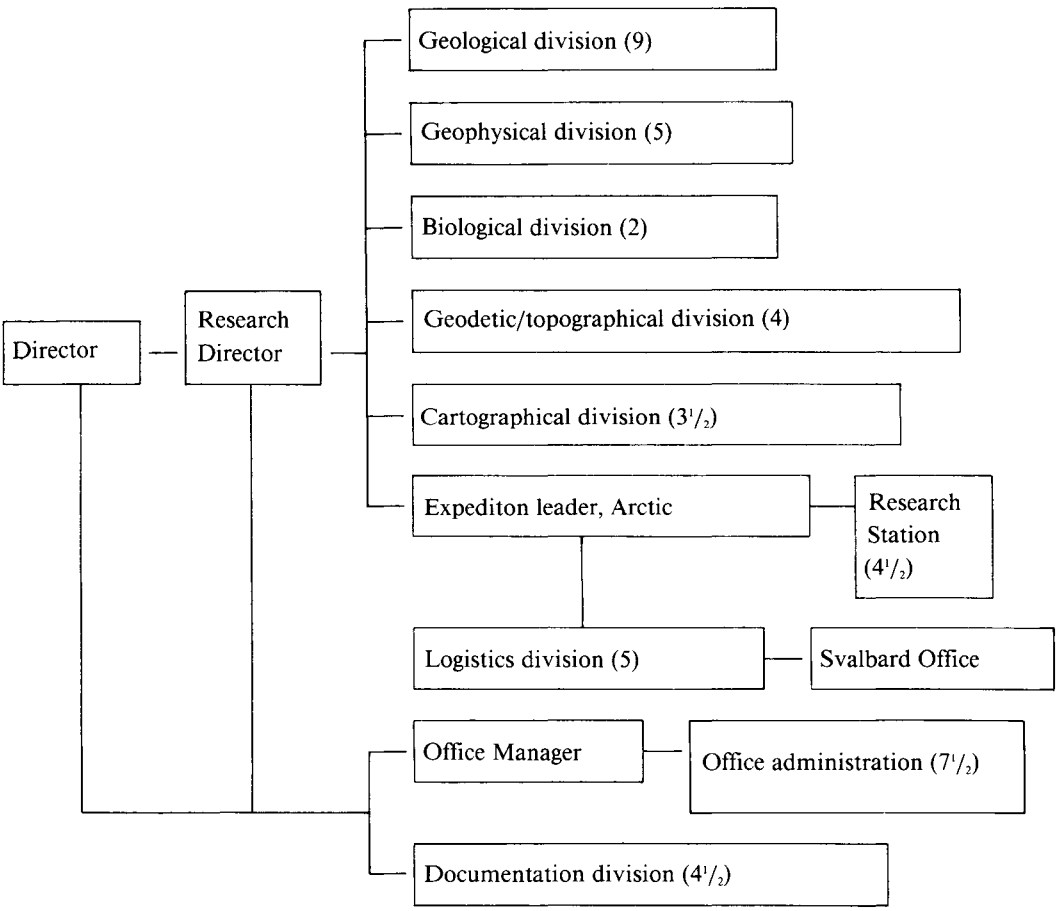
Maps and charts

Antarctica:	Peter I Øy 1:50,000 (whiteprint)
Svalbard:	E5 Gustav Adolf Land 1:100,000 (whiteprint)
	E7 Kapp Payer 1:100,000 (whiteprint)
	4 Nordaustlandet 1:500,000
	C13 Sørkapp 1:100,000
	A6 Krossfjorden 1:100,000

Institute staff

The Institute had 42½ permanent and 4½ temporary positions in 1987, a total of 47. A number of persons were contracted on specified projects for shorter or longer periods of time.

Organization (number of permanent positions in parentheses)



Administration:	
Director	Odd Rogne
Research Director	Jan A. Holtet
Office administration:	
Office Manager	Otto Gerhard Vaagen
Accounts	Bjørg Grimsrud
	Aud Christiansen (on leave)
Telephonist/Receptionist	Nora Lisen Bugge (part time)
	Mary Caspersen (part time)
Director's Office	Marit Wiik (part time)
	Hildur Skaalmo (part time)
Secretarial	Jorunn Myklebust (until 15.6.)
	Rigmor Hiorth (part time - from 1.12)
Correspondence archive	Ingeborg Christiansen
Computer services:	
Leader	Øivind Finnekåsa
	Torstein Berge
Remote sensing	Jostein Amlien (from 1.12.)
Documentation division:	
Leader, information officer	Annemor Brekke
	Susan Barr (on leave)
Editorial assistant	Knut Arnesen
Russian translator	Peter Hagevold
Librarian	Reidunn Lund
Documentation assistant	Inge Marie Mølmen (part time)
Cartographical division:	
Leader	Bjørn Arnesen
	Reidar Mandt
	Arild Myhrvold
	Donald Tumasonis (part-time)
	Espen Kopperud (on leave)
Expedition Leader, Arctic, and leader of Logistics division and Research Station, Ny-Ålesund:	Thor Siggerud
Logistics division:	
	Kåre M. Bratlien
	Jan Mikalsen
	Odvar Lund (until 30.4)
	Eilif Frantzen
	Georg Johnsrud
	Jarl G. Pedersen (from 17.11)
Temporary	Knut Hovrud

Research Station, Ny-Ålesund
(temporary posts):

Station leader, shared with KBKC	Jomar Barlaup
Engineer	Harald Ottesen (until 19.7)
Engineer	John Søgaard (until 6.7)
Engineer	Bjørn Willy Fjeld (from 27.5.)
Engineer	Trond Jensen (from 1.7.)
Research fellow	Karl Frafjord

Biological division:

Leader	Nils Are Øritsland
	Thor Larsen (until 31.5)
	Fridtjof Mehlum (from 1.6.)
Contracted	Geir Wing Gabrielsen
"	Ian Gjertz
"	Christian Lydersen
"	Pål Prestrud
"	Vidar Bakken
"	Per Magne Jensen
"	Per Espen Fjeld
"	Rasmus Hansson
"	Lars Øyvind Knudsen
"	Egil Soglo (technician)

Geophysical division:

Leader, Sea ice studies	Torgny Vinje
Meteorologist	Vidar Hisdal
Antarctic, Glaciologist	Olav Orheim
Oceanographer	Bert Rudels
Glaciologist	Jon Ove Hagen
Contracted	Ånund Sigurd Johnsen
"	Geir Kjærnli (part time)
"	Bengt Larsen

Geological division:

Leader	Thore S. Winsnes
	Audun Hjelle
	Yoshihide Ohta
	Otto Salvigsen
	Hilde B. Keilen
	Winfried K. Dallmann
Marine geology	Anders Elverhøi
	Anders Solheim
Technician	Jon Erik Møller
Temporary	Alf Arne Vullstad
Temporary	Frank Larsson
Temporary	Pål Haremo

Geodetic/topographical division:

Leader, topographer	Sigurd Helle (until 31.10)
Leader, topographer	Knut Svendsen (from 1.11)
Geodesist	Trond Eiken
Topographer	Bjørn Lytskjold

Post retirement positions:

Geology	Tore Gjelsvik

The following left the Institute in 1987:
Susan Barr
Sigurd Helle
Thor Larsen
Odvar Lund
Jorunn Myklebust
Hildur Skaalmo

On leave:
Aud Christiansen
Espen Kopperud (from 1.4)

Published by the Institute staff

Dallmann, W. K., 1987: Tectonostratigraphy and structure of the Kjukkelen area, Børgefjellet, north-central Norway. *Geol. Førh. 109,* 211-220.

Dallmann, W. K., 1987: Sedimentary environment and synsedimentary tectonics in the Hattfjelldal Nappe, North-central Norway. *Norges Geologiske undersøkelse 410,* 25-54.

Elverhøi, A. & Solheim, A., 1987: Shallow geology and geophysics of the Barents Sea, with special reference to the existence and detection of submarine permafrost. *Norsk Polarinstitutt Rapport Nr. 37.*

Gabrielsen, G. W., 1987: Reaksjoner på menneskelige forstyrrelser hos ærfugl, Svalbard-rype og krykkje. *Vår Fuglefauna 3, 152-158.*

Gabrielsen, G.W., 1987: The passive defence response and the sudden infant death syndrome. *Int. Symposium in medicine. Heart and Brain, Tromsø, June 1987.* (Abstract)

Gabrielsen, G. W., Mehlum, F. & Nagy, J., 1987: Daily energy expenditure and energy utilization of free ranging black-legged kittiwakes *(Rissa tridactyla). Condor 89,* 126-132.

Gabrielsen, G.W. & Steen, J.B., 1987: Når dyrene trykker. *Villmarksliv 8,* 46-48.

Hagen, J. O., 1987: Glacier surge at Usherbreen, Svalbard. *Polar Research 5(2).*

Hagen, J. O. & Liestøl, O., 1987: Mass balance investigations in 1985 and 1986. *Polar Research 5(2).*

Hansson, R., Prestrud, P. & Øritsland, N.A., 1987: Analysesystem for miljø- og næringsvirksomhet på Svalbard. *Norsk Polarinstitutt Rapport Nr. 39.*

Hisdal, V., 1987: Solhøydediagrammer for området fra 70°N til 82°N. *Norsk Polarinstitutt Rapport Nr. 40.*

Hisdal, V., 1987: Spectral distribution of global and diffuse solar radiation in Ny-Ålesund, Spitsbergen. *Polar Research 5(1).*

Hisdal, V., 1987: Svalbard and Jan Mayen. Pp. 472-483 in Varjo & Tietze (eds): *Norden. Man and environment.* Gebr. Borntraeger, Berlin.

Hisdal, V., 1987: Fra kulderekorder på Spitsbergen til "effektiv temperatur". *Været 11(1).*

Holtet, J. A., 1987: Data acquisition in arctic research. *Proceedings from Svalbard Seminar, NTH, Trondheim,* 42-59.

Hov, Ø. & *Holtet, J. A.,* 1987: Prosjektering av atmosfærekjemisk forskningsstasjon i Ny-Ålesund på Svalbard. *NILU Report NILU OR 67/87.*

Lydersen, Chr. & Gjertz, I., 1987: Population parameters of ringed seals *(Phoca hispida)* Schreber, 1775 in the Svalbard area. *Can. J. Zool. 65,* 1021-1027.

Mehlum, F., Rahn, H., Bech, C. & Haftorn, S., 1987: Interrelationships between egg dimensions, pore numbers, incubation time, and adult body mass in Procellariiformes with special reference to the Antarctic Petrel *Thalassoica antarctica. Polar Research 5,* 53-58.

Mehlum, F., Bech, C. & Haftorn, S., 1987: Breeding ecology of Antarctic Petrel *Thalassoica antarctica* in Mühlig-Hofmannfjella, Dronning Maud Land. *Proc. NIPR Symp. Polar Biol.1,* 161-165.

Mehlum, F. & Fjeld, P.-E., 1987: Catalogue of seabird colonies in Svalbard. *Norsk Polarinstitutt Rapport Nr. 35.*

Hjort, C., Edelstam, C. & *Mehlum, F.,* 1987: Fågel- och däggdjurtaxeringar i Polarhavet. *Expeditionen YMER-80. En slutrapport.* 151-156.

Ohta, Y., 1987: Polyphase evolution of Svalbard Caledonides. *XIV Symposium Polarne,* 27-28.

Orheim, O. & Lucchitta, B. K., 1987: Snow and ice studies by Thematic Mapper and Multispectral Scanner Landsat images. *Annals of Glaciology 9,* 109-118.

Orheim, O., 1987: Evolution of under-water sides of ice shelves and icebergs. *Annals of Glaciology 9,* 176-182.

Orheim, O., 1987: Icebergs in the Southern Ocean (Abstract). *Annals of Glaciology 9,* 241-242.

Prestrud, P. & Øritsland, N.A., 1987: Miljøundersøkelser i tilknytning til seismisk virksomhet på Svalbard 1986. *Norsk Polarinstitutt Rapport Nr. 34.*

Rogne, O., 1986: *Hvorfor nordisk samarbeid?* NORDINFO-nytt 1986. 9(4):4-5.

Roots, E.F., *Rogne, O.* & Taagholt, J., 1987: *International communication and coordination in Arctic science.* Ottawa/Oslo/Copenhagen. 24 pp.

Rudels, B., 1986 : The e-s structure of the Northern Seas: implications for deep circulation. *Polar Research 4, 133-159.*

Rudels, B., 1986: The outflow of Polar Water through the Arctic Archipelago and the oceanographic conditions in Baffin Bay. *Polar Research 4,* 1161-180.

Rudels, B., 1987: On the mass balance of the Polar Ocean, with special emphasis on the Fram Strait. *Norsk Polarinst. Skr. 188,* 53 pp.

Rudels, B., 1987: *On the exchange of water masses between the Polar Ocean and the North Atlantic.* Ph. d. thesis. Gothenburg University, 9 pp + appendices.

Rudels, B., 1987: Mixing processes in the northern Barents Sea. ICES *Symposium 1987/No. 38.* 14 pp.

Landvik, J. Y., Mangerud, J. & *Salvigsen, O.,* 1987: The Late Weichselian and Holocene shoreline displacement on the west-central coast of Svalbard. *Polar Research 5,* 29-44.

Mangerud, J., Bolstad, M., Elgersma, A., Helliksen, D., Landvik, J., Lycke, A. K., Lønne, I., *Salvigsen, O.,* Sandahl, T. & Svendsen, J. I., 1986: Sen Weichsel bremaksimum i området Isfjorden - Van Mijenfjorden, Svalbard. *Norsk Geol. Forening Medlemsblad nr. 21,* 39.

Vinje, T., 1987: Morphology and dynamics of the Barents Sea ice fields. *In: Conference proceedings Port and Ocean Engineering under Arctic Conditions.* POAC-87, University of Alaska, Fairbanks.

Johnsen, Å. S. & *Vinje, T.,* 1987: Havisundersøkelser i Barentshavet. *Rapport til OEDs Arbeidsgruppe for Konsekvensutredninger ved Petroleumsvirksomhet (i Barentshavet Syd).* AKUP.

Griffiths, D. J., *Øritsland, N. A.* & Øritsland, T., 1987: Marine mammals and petroleum activities in Norwegian waters. *Fisken og Havet, serie B, No. 1.*

Meetings, courses and teaching

Institute staff members attended meetings and short courses in Norway, Canada, the Federal Republic of Germany, the Netherlands, Poland, Spain, and Sweden.

The following have held regular University lectures and tuition:

Eiken, Trond: Surveying - University of Oslo
Elverhøi, Anders: Geology - Universities of Oslo and Bergen
Hagen, Jon Ove: Glaciology - University of Oslo
Orheim, Olav: Glaciology - University of Bergen
Øritsland, Nils: Biology - University of Oslo

Lectures and conference contributions

Dallmann, Winfried K.: *Discussion of Tertiary tectonic development of the post-Caledonian rocks of the Van Keulenfjorden area.* Geological field symposium. Longyearbyen, 26-27 August.

Elverhøi, A.: Lecture: *Arktisk miljø.* Kvartærgeologisk etterutdanningskurs, Trondheim, January.
- *Regional kartlegging av øvre berggrunn i det nordlige Barentshav.* Geo-Arktisk Symposium, Tromsø, June.

Elverhøi, A. & Solheim, A.: *Sedimenttransport fra bredekkede områder - en kvantitativ vurdering.* Norsk Geologisk Vintermøte, Trondheim, 16-18 January.

Antonsen, P., Flood, B., Elverhøi, A., Solheim, A., Vullstad, A.-A. & Dypvik, M.: *Regional kartlegging av øvre berggrunn i nordlige Barentshav, basert på lettseismiske registreringer og løsmasseprøver.* Norsk Geologisk Vintermøte, Trondheim, 16-18 January.

Andersen, A., Strand, K., Dypvik, H., Nagy, J., Eikeland, T. A., Haremo, P., Nesteby, H. & Elverhøi, A.: *Mesozoisk kontra tertiær tektonisk aktivitet langs Billefjord-lineamentet syd for Isfjorden, Spitsbergen.* Norsk geologisk Vintermøte, Trondheim, 16-18 January.

Gabrielsen, G.W.: *Fear in birds and mammals.* Oxford University, January.
- *The Pro Mare project.* Cambridge University, January.
- *Seabird energetics.* Birmingham University, January.
- *On the use of telemetry systems in studies of free ranging birds.* Workshop, Marinbiologisk stasjon, Univ. Tromsø, January.
- *Frykt hos fugler og pattedyr.* Regionsykehuset i Tromsø, May.
- *Sjøfugl-økologi.* Svalbardkurset, Ny-Ålesund, July.
- *Effekt av menneskelige forstyrrelser på fugler og pattedyr.* Svalbardkurset, Ny-Ålesund, July.
- *Telemetry systems in biological studies of seabirds.* Texel, Netherlands, October.
- *Næringsøkologi hos sjøfugler i isfylte farvann.* Pro Mare Workshop, Oslo, November.
- *Sjøfuglenergetikk.* Pro Mare Workshop, Oslo, November.
- *Sjøfuglenergetikk.* Inst. for generell fysiologi, Univ. i Oslo, November.

Holtet, Jan A.: *Data acquisition in Arctic research.* Nord-Data 1987, June.

Johnsen, Å. S.: *Pooling capacity of oil in ice.* Arctic and Marine Oilspill Programme, AMOP, Edmondton, Canada, 9-11 June.

Keilen, H. B.: *Gipshukenformasjonen, karbon/perm på Nordfjordblokken, Spitsbergen.* Norsk Geolgoisk Vintermøte, Trondheim, 16-18 January.
- *Svalbards geologi,* KOMMIT-course in Svalbard studies, Ny-Ålesund 21 July.

Mehlum, Fridtjof: *Seabird ecology.* Pro Mare meeting, Bergen, January.
- *Seabird energetics.* Seabird meeting, University of Tromsø, March.
- *Sea bird conservation in Svalbard.* University of Amsterdam, October.
- *Seabird research in Svalbard.* University of Groningen, October.
- *Seabirds, modelling of population dynamics and energy consumption.* Pro Mare Workshop, Oslo, November.

Ohta, Y.: *Polyphase orogeny of Svalbard Caledonides.* Norsk Geologisk Vintermøte, Trondheim, 16-18 January.
- *Basement development of Svalbard.* Statoil, Stavanger, February.
- *Recent data of radiometric ages from Svalbard.* Polar Colloquium, Norsk Polarinstitutt, 17 March.
- *Bathymetric features of glaciomorphology.* Quaternary Symposium, Spidsbergseter, April.
- *Polyphase evolution of Svalbard Caledonides and bathymetric evidence of glaciomorphology.* Polar Symposium, Polish Academy of Sciences, Krakow, May.
- *Bathymetry and tectonics in Hornsund, Wijdefjorden.* Polish Academy of Sciences, Warsaw, May.
- *High-P metamorphism of Motalafjella Complex.* Geological Institute, University of Oslo, September.
- *Some examples of growth of porphyroblasts under differential glide movement.* Tectonic Structural Geological Study Group, Trondheim, November.

Orheim, Olav: 1. *Numerical analysis of Landsat Thematic Mapper images of Antarctica: Surface temperatures and physical properties. 2. Antarctic icebergs - distribution and disintegration.* Fourth International Symposium on Antarctic glaciology, Bremerhaven, 6-11 September.

Salvigsen, Otto: *Relative sea level data and their consequences for the glacial history of the Svalbard area. A discussion.* Paleoenvironment of the Arctic Symposium, Spitsbergseter, 26-30 April.

Rogne, Odd: *Hvorfor polarforskning. Hvilke motiver ligger bak?* Den norske ambassade i Stockholm, 22. April.
- *Norsk Polarinstitutt - kartlegging, forskning og annen virksomhet.* Svalbardkurset, July.
- *Norsk forskning i Arktis. Foreløpige resultater av en kartleggingsstudie.* Svalbardkurset, July.
- *Norsk Polarinstitutt og forskning i Ny-Ålesund.* NTNF's bekledningsseminar i Ny-Ålesund, August.
- *Forskning i Ny-Ålesund.* Nordisk glasiologikurs, Ny-Ålesund, August.
- *Forskning i Ny-Ålesund.* NIF/SINTEF Studieseminar Nord-87. Ny- Ålesund, August.
- *Fremtidige forskningsbehov på Svalbard.* NIF/SINTEF Studieseminar Nord-87, Ny-Ålesund, August.

- *Introduction* and *Closing remarks* at the Svalbard geological contact meeting, Longyearbyen, August.
- *Forskningssenter i Longyearbyen?* VG-ting, Longyearbyen, 26 September.

Rudels, Bert: *Mixing processes in the Northern Barents Sea.* ICES symposium on the Arctic and Subarctic seas, ICES statuary meeting, meeting of the GSP steering group, Santander 28 September - 2 October.
- *On the outflow of Polar Water through the Arctic Archipelago and Baffin Bay,* Institut für Meereskunde, Hamburg.
- *Diffusion and convection at a diffusive interface.* Alfred Wegener Institut, Bremerhaven.
- *The formation of Polar Surface Water, the ice export and the exchanges through the Fram Strait.* Meteorologische Institut, Hamburg.
- *Estimating the deep water formation from molecular effects.* Institut für Meereskunde, Kiel.

Vinje, Torgny: 1. *Betingelse for det polare klima. Stråling og varmebalanse.* 2. *Polarområdenes rolle i det globale sirkulasjons- system. Fundamentale prosesser for varmeutveklsing.* 3. *Noen spesielle trekk ved forholdene i Svalbardområdet.* 4. *Prosesser i isfeltene og vekselvirkning med hav og atmosfære.* Polarstudium ved Univeresitetet i Trondheim, 12-16 January.
- *Bruk av sveipende sonar for måling av drivisens bunntopografi.* Nordisk samarbeidsmøte i akustikk, Ustaoset, 1-4 February.
- *Governmental sea ice programmes in the Barents Sea.* SINTEF/ Norges Tekniske Høyskole, 11 September.

Accounts for 1987

Chap.1412. Debit items	*Budgeted*	*Expenditure*
01. Salaries, wages, etc.	11,839,000.-	11,595,000.-
11. Goods and services	10,930,000.-	10,859,000.-
21. Special expenses:		
Ordinary	4,211,000.-	4,281,000.-
Contracts	6,000,000.-	6,000,000.-
45. Large new purchases	585,000.-	525,000.-
70. Scholarships	300,000.-	300,000.-
	33,865,000.-	33,560,000.-
Chap.18. Beacons and radio beacons in Svalbard	1,679,000.-	1,701,000.-

Chap.4412. Credit items	*Budgeted*	*Received*
01. Sale income	500,000.-	429,000.-
03. Income from various services	5,500,000.-	6,000,000.-
04. Reimbursment from Svalbard budget	1,950,000.-	1,950,000.-
	7,950,000.-	8,379,000.-

Grants and financial assistance for research projects

Norsk Polarinstitutt gives financial support to polar research at the Norwegian universities and research institutions in the form of fellowships and project grants. Fellowships are granted to individuals, mainly students, to support and stimulate new scientific projects in Svalbard. More extensive management-oriented projects will be supported under the Programme for Biological Research and Investigations in the Arctic.

Fellowships in 1987

Amundsen, Hans Erik Foss: Composition and development of the continental lithosphere of Svalbard.

Breistein, June: Effect of manure on different vegetation types worn by tractors, etc. in Svalbard.

Hobæk, Anders: Genetic variability within and between the local populations of Daphnia sp. in Svalbard.

Hodin, Lars: Vegetation along manuring gradients of two bird cliffs in Ny-Ålesund.

Jacobsen, Bjørn: Large-scale auroral dynamics in relation to solar wind-magnetosphere interaction.

Johnson, Ellen Espolin: Transplantation of plants within and between arctic and alpine heath communities.

Lindemann, Franz Josef: Anatomical study of the Triassic Stegocephalians from Svalbard and their sedimentological occurrence.

Lybekk, Bjørn: Dayside auroral dynamics studied by all sky camera.

Manum, Svein B.: Detailed field work in Svalbard's Lower Cretaceous flora.

Martinussen, Inger Birgitte: Nitrate reductase activity in different bird cliff plant species grown experimentally in Ny-Ålesund.

Nilsen, Jarle Halvard: Light-climatological investigations of Arctic species.

Odasz, Ann Marie: Frost resistance of Dryadion Community species on limestone ridges near Ny-Ålesund.

Pierce, Elin Pilar: Reproductive energetics of the purple sandpiper in Svalbard.

Ryg, Morten: Growth and energetics of ringed seals in Svalbard.

Slagsvold, Guri Johanne: Temperature regulation in Arctic tern chicks.

Sollid, Johan L.: Quaternary mapping in the Kongsfjorden area by means of SPOT imagery.

Svendsen, John Inge: Quaternary geology studies in Svalbard.

Sørbel, Leif: Geomorphological studies of rock glaciers in the Ny-Ålesund area.

Zachariassen, Karl Erik: Physiological adaptations to high arctic conditions in poikilothermic animals.

Ødegård, Rune: Geomorphological studies in the coastal zone of Svalbard.

Aarvik, Frode J. (+ Morten Ekker og Bjørn M. Jenssen): Thermo-regulatory and energetic adaptations in chicks of Brünnich's guillemots and Fulmars.

Project grants in 1987

Elvebakk, Arve: Investigation of the possibility of classifying vegetation and surface temperature regimes in the Ny-Ålesund area.

Sollid, Johan L., Elverhøi, Anders and Salvigsen, Otto: Geomorphological and biological mapping of the coastal zones in Svalbard.

Hansson, Rasmus: Polar bear telemetry studies
Haugen, Ivar and Hansen, John R.: Marine macroalgae vegetation in Svalbard.
Mehlum, Fridtjof: Seabird ecology in Svalbard.
Mehlum, Fridtjof: Ecology of *Branta bernicla hrota* in Svalbard.
Prestrud, Pål: Studies of the polar fox in Svalbard with emphasis on factors influencing the outgrowth and dispersal of rabies.
Klokk, Terje and Sveum, Per: Natural revegetation processes in disturbed areas.
Øritsland, Nils Are: Reindeer studies in Svalbard.
Amlien, Jostein: Remote sensing.

Peter I Øy, Antarctica, seen from the southwest.

Knut Svendsen & Trond Eiken:

Expedition to Peter I Øy

- a small Norwegian dependency in the Antarctic -

Almost sixty years have passed since an expedition sent out by whaling ship-owner Lars Christensen formally occupied a small island in the Antarctic, Peter I Øy, in the name of his Majesty King Haakon VII, King of Norway. Two years later, in 1931, it was formally annexed to Norway as a dependency.

Peter I Øy, first discovered in 1821 by the Russian Bellingshausen expedition, is an extremely beautiful, but also a very inhospitable little island. Most of the year it is surrounded by ice, and even in the summer only a few places along its rugged coast are accessible by boat. Most of the the coastline consists of steep rocks or glacier fronts rising more than 40 metres above sea level. Up until 1987, no Norwegian expedition had seen the island since the Brategg Expedition visited in 1948.

At the end of 1986, the Norwegian Polar Research Institute was given the welcome opportunity of using the "M/S Aurora" on a small expedition to Peter I Øy. In spite of the short time for planning and shipping of goods and equipment to New Zealand, the seven members of the expedition managed to go on board in Christchurch and set out for Peter I Øy on 10 January 1987.

Topographer Knut Svendsen (leader) and geodesist Trond Eiken from the Institute, together with their assistants Erik Svendsen and Kristin Tveit, were responsible for the main objective of the expedition - to measure the exact position of the island and to do the surveying necessary to construct an accurate map. One biologist from the University of Oslo, Svein Fevolden, was to continue his krill investigations started several years ago. The expedition should also collect geologic and biologic samples. Two radio amateurs, Einar Enderud and Kåre Pedersen, planning to erect a radio station on the island, participated in the expedition as paying guests.

Magnetic measurements performed by Knut Svendsen and his assistant on Radiosletta.

Trond Eiken performing geodetic observations on Michajlovodden.

After fifteen days in calm sea, the snow covered top of Peter I Øy could be spotted in the early morning of 22 January. Shortly afterwards the tail and rotors of the helicopter, which had been dismounted for protection reasons in case of bad weather, were put together and the helicopter made ready for a first, short flight around the island.

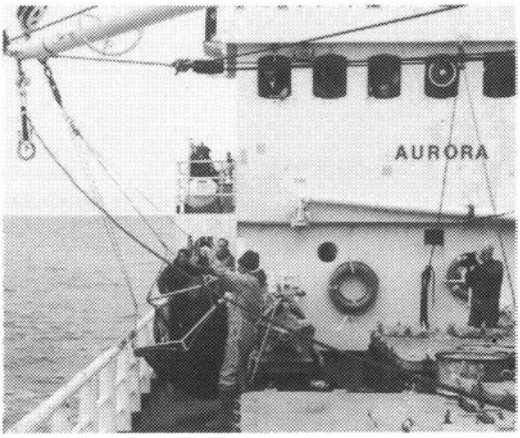
None of the existing maps could be used as a basis for detailed planning of the survey. It was clear after the first flight that the glacier plateau on the northern end of the island was the only possible place to put up a camp. Only hours after the first arrival it was safely established. One of the two satellite positioning receivers, which should give a reference frame for the survey of the island, was also erected there.

The plans included determining with the TRANSIT satellite system, two or three points as far apart as possible, to serve as main reference points. Oblique photographs for this purpose were to be taken with a Hasselblad MK70 camera, with the optical axis dipped approximately 20° below the horizon. This compilation method calls for only a few stereoscopic models, and is therefore considered advantageous for the mapping of a small island. Another benefit is the fact that only a few points are needed for a good result, as the same points may be used in several models. We also hoped that the weather would allow us to measure some geodetic points by traditional methods.

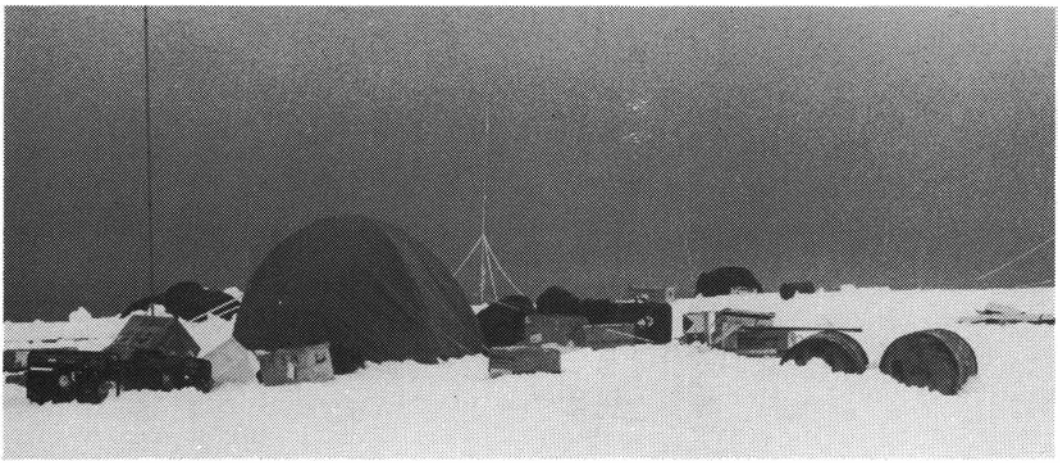
Fog prevented use of the helicopter for the next two days. But the fourth day came with a high, clear sky and excellent working conditions. The second satellite receiver was erected on Kapp Ingrid, and later on moved to Michajlovodden on the southeastern side of the island. A geodetic survey around the island, connecting the three points, was also successfully completed.

Penguin colony on Framnesodden. Kapp Ingrid northwards in the background.

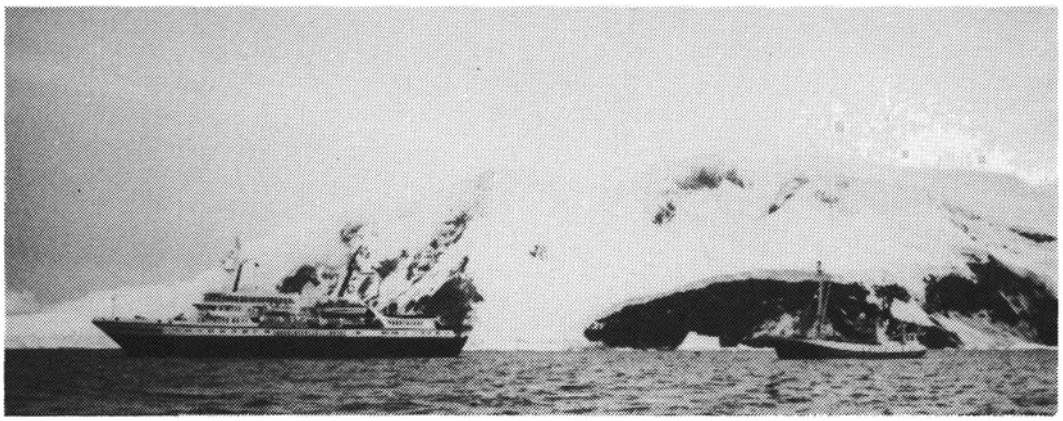
Reflector for distance measurements on Framnesodden, guarded by a reprensentative of the local population.



Krill investigations off Peter I Øy.



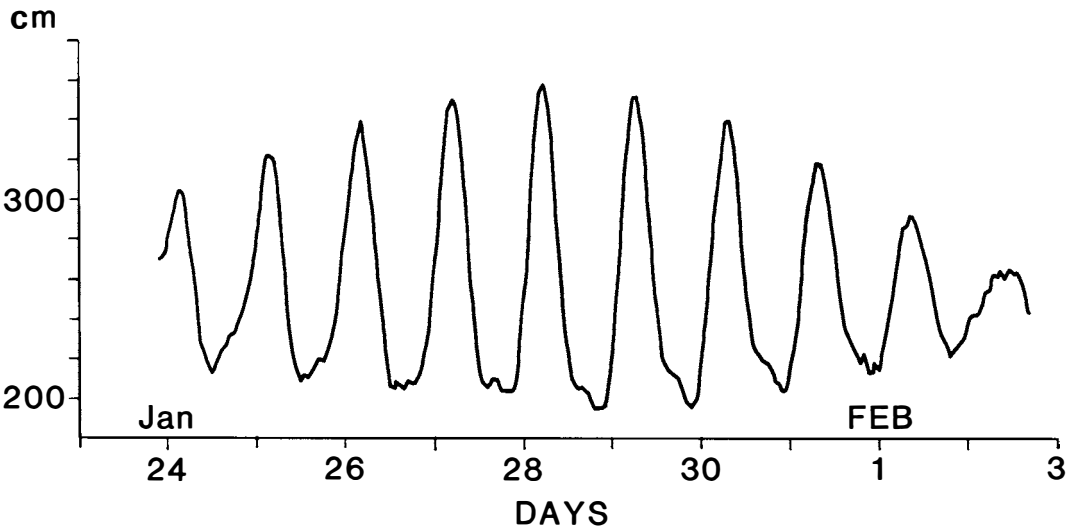
The radio Camp on Radiosletta.



Meeting between tourism and research in Norvegiabukta off Peter I Øy. Right: "M/S Aurora". Left: "M/V World Discoverer".

More than 300 photographs in colour and black and white were taken from the helicopter, covering the island to various scales. Most were shot from an altitude of about 1500 metres, but some close-ups were taken of cliffs with nesting birds to serve as background material for population counts.

A recording tide gauge in operation for ten days together with some readings on a tide pole gave us a mean sea level with acceptable accuracy. The high tide lasted six hours and the low tide eighteen hours, at the time of our visit. The tide is of a semi-daily type, but with a large diurnal inequality, due to the relative position of the sun and the moon. The difference between high and low water was approximately one metre. A plot of the tide is shown below.



A considerable number of icebergs were scattered around the island, the largest ones more than five square kilometres in size. An automatic weather station was erected on Tvistein, a narrow, fifty metre high rock off the northern end of the island. This station, which is in fact a small buoy, will probably transmit temperature and air pressure data via the Argos satellite system for a period of three years.

After ten days of hard work, and under exceptionally good weather conditions, the expedition could report back to Norway that everything planned had been successfully carried out. All surveying necessary for the compilation of a topographic map of Peter I Øy had been done, the birds and animal life registered, and vegetational and geological samples collected. The marine biological programme was carried out as planned, and the two radio amateurs were happy with the more than 15,000 new radio contacts they had established to different parts of the world.

"M/S Aurora" and the expedition left Peter I Øy on the first day of February, to arrive in Ushuaia, Argentina, a week later. Another Antarctic expedition sent out by Norsk Polarinstitutt had been brought to a successful end.