

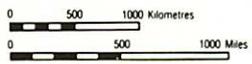
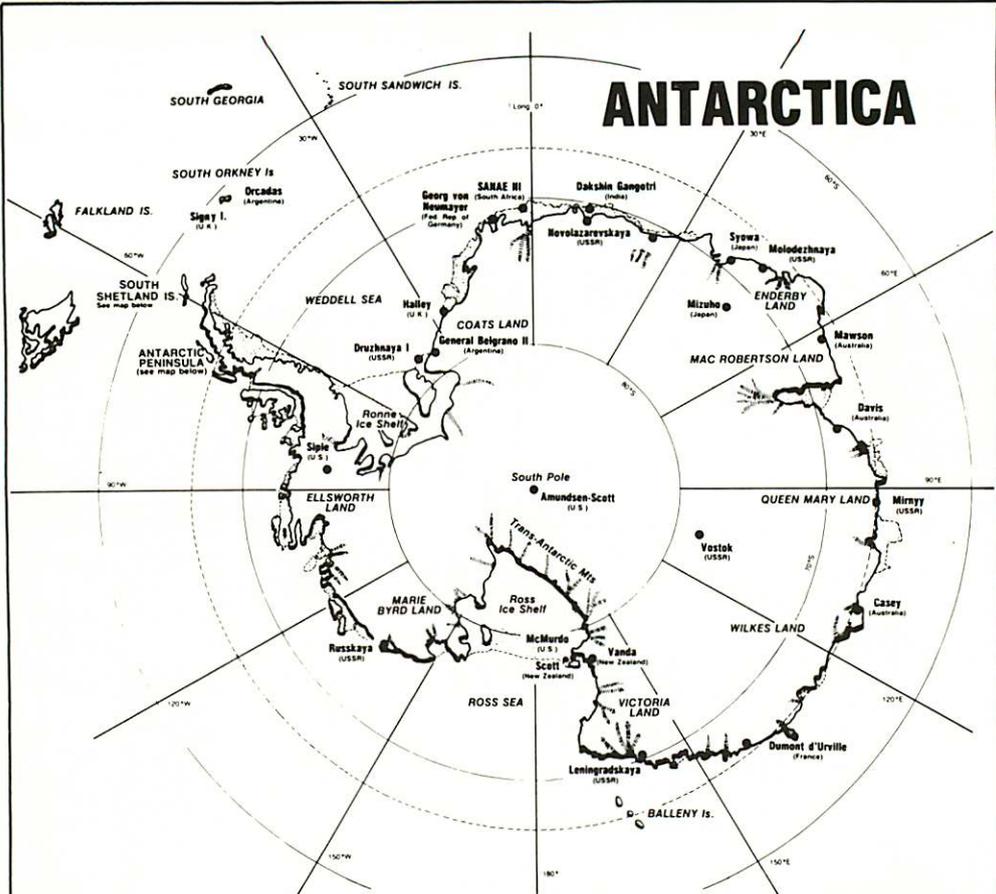
# ANTARCTIC



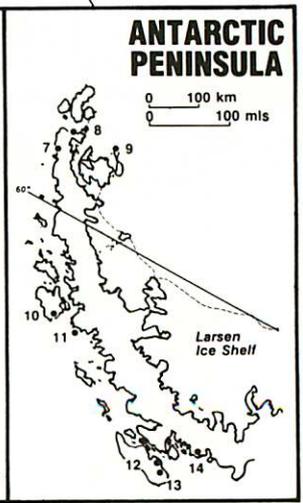
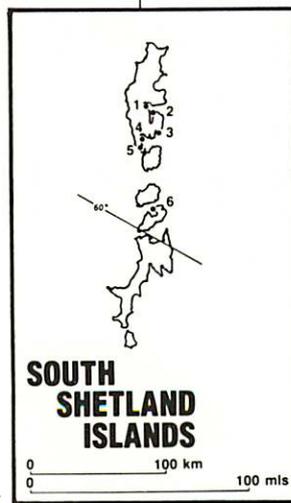
Bulletin Vol. 12 No. 6



# ANTARCTICA



- 1 Comandante Ferraz BRAZIL
- 2 Henry Arctowski POLAND
- 3 Teniente Jubany ARGENTINA
- 4 Artigas URUGUAY
- 5 Teniente Rodolfo Marsh CHILE
- 6 Bellingshausen USSR
- 7 Great Wall CHINA
- 8 Capitan Arturo Prat CHILE
  
- 7 General Bernardo O'Higgins CHILE
- 8 Esperanza ARGENTINE
- 9 Vice Comodoro Marambio ARGENTINA
- 10 Palmer USA
- 11 Faraday UK
- 12 Rothera UK
- 13 Teniente Carvajal CHILE
- 14 General San Martin ARGENTINA



# Antarctic

(successor to "Antarctic News Bulletin")

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Cover: *Scott Base from the air in  
February, 1990. Photo. Josie McNee*

## NZARP

# New Zealand and US personnel make early start on season's work

The first flights of the Antarctic summer programme at Scott Base and McMurdo left Christchurch on 1 October, 1991. Research events, for this year, are focussed on global climate issues with continued investigations of the ozone layer, studies of the chemical composition of the atmosphere and greenhouse gases and their significance in global warming, according to the acting Manager of DSIR Antarctic, Mr Dave Geddes. Research of the core samples taken from the ocean floor sediments in McMurdo Sound to trace the history of climate change back thousands of years will be undertaken. However, the total programme, including the number of scientific events and personnel is slightly smaller than in previous seasons.

From 22 and 28 August 11 VXE-6 C130 and one Air National Guard LC-140 flights left Christchurch between 2 a.m. and 4 a.m. in the mornings for McMurdo Sound. The aircraft involved included XDI, XD2, XD4 and XD6 supplemented by SKR42. On board were New Zealand and American administrative staff and others whose programmes or work commitments required their early season presence in Antarctica.

Among the New Zealanders were Dave Geddes, acting manager of DSIR Brett Fotheringham base manager for the summer who went on the first flight for four days at Scott Base. Eric Saxby Field Operations officer for DSIR, Brian McNamara a technician involved with stratospheric trace gas research and John Mak an airsampler also involved with trace gas measurements.

Two carpenters Con Faber and John Charles, who is working for the Antarctic Heritage Trust, also went south to stay while Kim Westerskov, a photographer working for the Christchurch International Airport Company was making the first of three visits this season, and Sylvia Nichol, a meteorologist involved with Ozone monitoring have projects underway.

For the New Zealanders who had wintered over it was their first real contact with the outside world since early February. However their winter isolation was reduced by the mid-winter airdrop and the mercy flight which brought the bonus of mail prior to the first of the season's flights. (See pages 190ff)

The mid-winter airdrop comprised two flights the first on June 25 and the second two days later. On the first morning one C-141B Starlifter from the 63rd Military Airlift Wing, Norton Air Force Base, California (Tail No #60128) departed Christchurch at 05.51. It flew under the call sign "Polar 91" and was resupplied with a total of 90,700lbs of fuel by a KC-10 "Extender" from March AFB, California (#40187) three times during the round trip to McMurdo and the South Pole. Each refueling took about seven minutes with the first at 0913, the second at 1038 and the third at 1121. The aircraft dropped a total of 12,156 lbs of cargo. This included 2,435 lbs for Scott Base and 6,540 lbs for the South Pole. The items included two frozen pigs, 540 eggs, watermelons and 545 litres of milk and much miscellaneous cargo. The aircraft landed at Christchurch at 2115.

The second aircraft departed at 0540 on 27

June flying under the call sign "Gucci 69". By 0912 it had completed its run over McMurdo where, of the 35,719 lbs of cargo dropped, 440 lbs was destined for Scott Base. The aircraft had returned to Christchurch by 1625 having been refuelled twice with a total of 66,000 lbs at 0912 and 1029.

The Commander of the C-130 on both days was Lt Col Ronald Varley. The tanker, which flew under the call sign of "Toga 19", was commanded by Major Laurence Molloy.

The 1991/92 New Zealand Antarctic Research Programme (full details of which will be given in our next issue) will involve 214 scientists, base support and field staff in the 52 projects being undertaken in and around Ross Island, McMurdo Sound and the Dry Valleys. Six divisions on the Department of scientific and Industrial Research will be involved in 11 separate events. Five universities are participating as well as the Antarctic Heritage Trust, Canterbury Museum, the Royal New Zealand Air Force, the Defence Environmental Medicine Unit, Christchurch International Airport Ltd., and Land Soil Consultancy Services. The Ministry of the Defence will be providing RNZAF C-130 flights between Christchurch and McMurdo as part of the joint United States logistics arrangement as well as cargo handlers, specialist crash fire tender personnel and chefs.

### **Personnel appointed by DSIR Antarctic to Scott Base are:**

**Base Manager:** Brett Fotheringham, a naval officer aged 28 from Wellington.

**Operations manager:** Phil Robins, aged 39, a mariner from Nelson, who spent the summer of 1988-89 in Antarctica.

**Public relations officer:** Yvonne Martin, aged 25, a journalist from Auckland.

**Canteen manager:** Shaun Smith, 23 from Wellington.

**Chef:** Catherine George from Dipton in Southland is 27.

**Domestic staff:** Pam Davies, aged 43 is a caterer from Christchurch.

Pauline Thwaites aged 30, a nurse from Tuatapere.

**Carpenter:** John Charles, aged 49 is a handyman from Arthurs Pass.

John was second-in-command at Scott Base in 1976-77 and returned in 1989-90 as part of the Antarctic Heritage Trust programme to restore the historic huts. He is also working for the trust this season.

**Carpenter:** Con Faber, a carpenter by trade is 36 and comes from Wellington. He previously wintered in 1979-80 and was at Scott Base for the summers of 1984-85 and 1987-88

**Mechanic:** Sean Heaphy aged 26 from Palmerston North and has wintered in 1988/89 and spent the summer of 1990-91 in Antarctica.

**Plant operators:** Todd McLeod, aged 23 from Christchurch and David Statham aged 22 from Linton. Both are soldiers.

**Supply officer:** Keith Henley aged 40 from Christchurch.

**Stores/cargo handler:** Eve Ripo aged 22 is from Whenuapai where she is a storeperson with the RNZAF.

**Telecom supervisor:** Bella Kara, aged 27 from Christchurch where she is a clerical supervisor with Telecom.

**Telecom clerks:** Denise Phillips aged 25 from Christchurch where she is a clerk with Telecom and Cathy Horne aged 23 from Rangiora.

**Radio technician:** Mark Patton, aged 28 from Wellington where he is a technician.

**Postal/admin clerk:** Kirk Ramsay aged 23 from Christchurch where he is an assistant naval recruiter.

**Comms operators:** Eddie Matchett aged 25 from Papakura, soldier; Belinda Moffitt, aged 22 from Auckland is a naval rating and David Lee aged 22, an airman from Ohakea.

**Instructor/field training:** Jon De Vries, aged 37 is from Wellington where he is a designer/builder.

**Field leader/training:** Maryann Waters aged 32 from Christchurch who will be spending her third summer on the ice the previous seasons

being in 1989-90 and 1990-91.

**Field training:** Jo Straker aged 41 from Tokaanu where she is an outdoor educator. She was last south in 1990-91

**Field leader:** Andy Harris is a guide from Mt. Cook. He is 26 and will be supporting the combined University of Canterbury, British Antarctic Survey and BAS team working on the tectonic evolution of the South Antarctic Sector of the South Pacific Margin in Marie Byrd Land. He was also in Antarctica in 1987-88 and in 1990-91.

**Field leader:** Brian Staite, a 40 year old outdoor educator from Tokaanu will be working with a joint NZARP-Anare party in Southern Victoria Land. It will be his fourth season in the field, previous years being 1985-86, 1987-88 and 1990-91

### Vanda

Unlike previous years this station will only operate for part of the summer season. It will open on 2 November and close on 16 December.

**Leader:** Alistair Fastier is a student from Christchurch. He is 32 and wintered previously in 1987/88 and spent the summer of 1990-91 in Antarctica.

### Winter

**Base Engineer:** Brian Howat, 31 is a fitter and turner from Lower Hutt.

**Engineering supervisor:** Shane Coleman, aged 28, a mechanical technician from Auckland.

**Electrician:** Brett Whitley, aged 29 from Auckland. He wintered last in 1986-87.

**Mechanic:** Mike Collins aged 32 is from Christchurch where his usual job is mechanic.

**Telecom technician:** Paul Purves aged 36 from Hamilton is a radio technician with Telecom. He has wintered in 1985-86 and 1987-88.

**Technician:** Grant Avery, aged 31 is an electronics technician from Lower Hutt.

**Chef:** Kerry Paterson aged 29 from Auckland. Kerry wintered in 1986-87 and in 1988-89.

**Domestic staff:** Therese Dobbs, aged 27 is from Christchurch. She was previously at Scott Base in 1986-87.

**Field person/storekeeper:** Jim Henderson aged 32 from Dunedin where he is a custodian.

## Hugh Logan resigns

Mr Hugh Logan, manager of the Antarctic Division and Chief Operational executive for the New Zealand Antarctic Research programme since, 1988, has moved to the Department of Conservation. He has been appointed regional conservator for the Nelson and Marlborough land districts. His responsibility for the management and co-ordination of the New Zealand Antarctic activities ended officially in June.

In his three-year term as manager of what is now DSIR Antarctic Mr Logan had first the responsibility for the Antarctic Division's move from its central city headquarters to the new International Centre at the Christchurch Airport.

Scientists and support staff working in the field from Scot Base, Cape Bird or Vanda Station need the best possible transit on the ice. Mr Logan has been able to meet their needs and NZARP now has a fleet of modern vehicles for use in the field and local areas.

Development of joint programmes with other nations in Antarctic have been a major concern of Mr Logan as Chief Operational Executive. In his last summer with DSIR Antarctic he and his staff have completed three important projects in co-operation with the United States Antarctic Programme and the British Antarctic Survey.

A joint New Zealand-US party carried out a crustal seismic investigation across the boundary between East and West Antarctica. It completed a seismic profile 142 km long across the Transantarctic Mountain front from just south of the Nimrod Glacier.

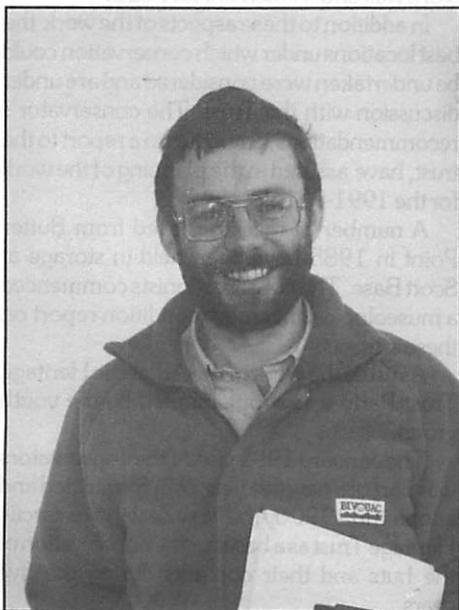
Two other parties of New Zealand, British and American geologists worked in Marie Byrd Land. A ski-equipped Hercules flew them to

their field camps, and field support was given by a BAS Twin Otter aircraft. They were concerned with the geological relationship of the Marie Byrd Land continental block to other parts of Antarctica; basement rocks more than 80 million years old and younger volcanoes now extinct in the basement.

New Zealand's Antarctic research demands continuity of purpose and professional management. In the last three years Mr Logan has maintained this continuity and there is a high level of professionalism in the execution of the whole programme.

Mr Logan, who is 37, has been associated with NZARP for about eight years. He first went south as a field leader in the 1979-80 season, and was an advisory officer with Antarctic Division from mid 1982 to early 1986. After a term with the DSIR Head office in Wellington he joined the Ministry of Civil Defence in Wellington in 1987 as deputy director.

An experienced mountaineer Mr Logan has



Hugh Logan

climbed widely in the Southern Alps and in the Andes. He is a past president of the New Zealand Alpine Club. His guidebook to Mt. Cook was published in 1982 and a second edition appeared in 1986. Last year he wrote "Great Peaks", an account of his favorite mountains. - JMC

## Antarctic Heritage Trust

Adding to the inventory of artifacts from Scott's Hut at Cape Evans and the surrounding site and reporting on their condition will be one of the tasks of the team working for the Antarctic Heritage Trust on Ross Island this coming season.

Led by John Charles, who was also responsible for the party in 1989-90, the team comprises Roger Fyfe, an archaeologist and Deputy director of Taranaki Museum in New Plymouth, David Woodings, registrar at Waikato Museum in Hamilton and Athol McCredie, Freelance registrar from Wellington. With the exception of John Charles, who has been assisting the base carpenter at Scott Base since Winfly, the team will travel to Antarctica in December for five weeks.

Assessing the environmental monitoring which has been undertaken within the huts at Cape's Royds and Evans and at Hut Point is also part of their brief as is completing the butylclad lining on the inside of the outside wall on the south and east sides of the Cape Evans Hut, further clearance of ice and artifacts in the stables area and a programme of general maintenance at all the huts. This continues last season's work undertaken by the team leader Roger Cullen from Fletcher's Construction in Christchurch and Myles Feeney, a property officer with the BNZ in Wellington.

In addition to minor cleaning of the buildings and oiling of the hardware at the various historic sites the pair completed most of the recladding with Butynol of the roof of the main hut at Cape Royds, repaired and checked the

tie-downs and undertook other minor repairs. At Cape Evans they completed the clearing of ice from Bowers Annex. It had formed as a result of meltwater and in parts had spread some two feet inside the hut. They undertook further digging out of the permafrost to increase the drainage channel and fixed butynol to the inside of the lower boards of the hut before back-filling the channel with ice and scoria to divert the water from the building. Further general maintenance work was undertaken at Cape Evans as well as at Hut Point. The deformation survey was also taken a step further at both locations.

Last season a conservation survey was begun by Karel Peters, head conservator from the Auckland Institute and Museum who was assisted by Lynn Campbell, a paper conservator from the McDougall Art Gallery in Christchurch. During their stay in Antarctica the pair visited the huts at Cape Evans, Cape Royds and Discovery Hut at Hut Point. They studied the factors causing deterioration of the artifacts and installed equipment to monitor the environment with Scott's and Shackleton's Huts at Cape Evans and Cape Royds. Preliminary work only was undertaken at Hut Point. This involved daily recording of light levels with dry and wet bulb readings of a whirling hygrometer to provide data from which the daily percentage of relative humidity can be calculated. For more long term assessment of the temperature and relative humidity inside the huts a special logger was installed in each of the huts at Capes Royds and Evans. Visitors have been asked to record the date, time and duration of their visit as well as the number of people entering the hut as this affects the humidity and therefore the artifacts. The information will be correlated with the data from the loggers and provide the conservationists with some impact of the affects of visitors to the huts.

Using a system based on Robert G. Chenhall's Nomenclature for Museum Cataloging but adapted for their purposes the pair also undertook the first stage of classifying objects in the huts as part of the preparation of

an inventory and condition reports. Each item recorded was tagged and given a number from year one to five according to the estimated priority for conservation. Items selected for the inventory at Cape Royds included the galley area which contains food tins, kitchen utensils, the coal range and associated implements. The small scientific laboratory behind the coal range which contains glass beakers and also came in for attention along with all magazines, books and photographs throughout the hut. Textile articles were sampled and their condition was reported but they were not cataloged. Leather and wooden objects were inspected and a general assessment made. In all 652 objects from the hut were registered in the inventory along with their associated condition reports.

At Cape Evans the pair selected items from the galley area, the Scott bunk, the chart table and the scientific labs and examined others which were not included in the inventory. In all some 800 items were condition reported and registered. Because of time constraints no such work was undertaken at Hut Point.

In addition to these aspects of the work the best locations under which conservation could be undertaken were considered and are under discussion with the Trust. The conservator's recommendations, embodied in a report to the trust, have assisted in the planning of the work for the 1991-92 field season.

A number of relics retrieved from Butter Point in 1985 have been held in storage at Scott Base. The conservationists commenced a museological inventory condition report on these artifacts.

As usual the work of the Antarctic Heritage Trust Party was supplemented by the youth group.

The January 1991 visit of the conservators was part of a new five year plan formulated and adopted in 1990 by the New Zealand Antarctic Heritage Trust as a basis for the conservation of the huts and their contents during the five years.

The Conservation Plan replaces "A Strategy for the Preservation and Management of

Historic Sites in Ross Dependency, Antarctica written by G.A. Turner then with the Department of Lands and Survey in Wellington, New Zealand who published it in 1979. In addition it builds on the experience acquired by personnel working for the Trust in recent years.

The preparation of the new plan was initiated and coordinated by the Historic Places Trust on behalf of the Antarctic Heritage Trust which adopted it at its final meeting for 1990.

The working party for the new plan comprised Chris Cochran, a Conservation Architect from Wellington, Roger Fyfe, an archaeologist and assistant director of the Taranaki Museum in New Plymouth, David Harrowfield, research officer for DSIR Antarctic, at Christchurch Airport, Baden Norris, Antarctic curator at Canterbury Museum, Karel Peters, materials conservator at the Auckland Institute and Museum and Neville Ritchie, archaeologist at the Department of Conservation in Hamilton. They met in Wellington on August 8 and had prepared their first draft for circulation eight weeks later. The document was considered by the Conservation Plan sub-committee of the Antarctic Heritage Trust later that month, amendments incorporated and recirculated in time for the November meeting.

In section one the document details the treaty recommendations regarding historic sites and New Zealand's role in complying with them. A schedule of the sites has been included with their location and a brief history. They are grouped into four categories in accordance with their value as historic sites. Section three outlines the present condition (1990-91) of the sites and their environs and also the recent work carried out at them. The fourth section details the environmental constraints including the logistical difficulties involved in reaching and subsequently working on them. A fifth section provides an assessment of their cultural significance. The sixth defines the conservation policy to be adopted in general terms for the buildings. This is followed by recommendations outlining a general conservation policy relating to artifacts, detailing their recovery,

collection and display policy as well as covering monitoring, removal or repatriation and recommends the establishment of a reserve collection. This section also contains a recommendation for the establishment of a Ross Island Museum either at Scott Base or McMurdo to act as a repository for large obsolete equipment while also providing a site for temporary or long term displays or interpretative panels about the historic huts. Such a museum "would enable many more people to have a glimpse of the historic huts and their contents and gain an appreciation of their historic importance". It would also "take visitor pressure off the huts as tourist numbers continue to grow."..... The interests of such a museum should not be limited to the heroic era, but should extend to more recent scientific and exploration history such as was undertaken, for instance, by Admiral Byrd from 1928 and during the international Geophysical Year of 1957-58.

A further section sets out in detail the work required to the buildings and artifacts and includes further notes on their current status while section eight details a recommended programme of action with an estimate of the time funding required to achieve the objectives detailed. Last season's work met the first stage of these objectives. Further detail in the plan relates to programme management and the responsibility of DSIR Antarctic and the Antarctic Heritage Trust as well as associated bodies including the New Zealand Historic Places Trust, the Department of Conservation, Canterbury Museum and the New Zealand Antarctic Society. Section 10 provides a summary of the recommendations while appended to the document is a select bibliography of the historic sites, and a list of photographs, maps and plans, and repositories of collections in New Zealand.

## **Photographs and documents sought for "A" Hut museum**

"A" Hut, part of the original Scott Base is to become a museum. Preservation and fitting

out of the hut is being undertaken by DSIR Antarctic in conjunction with the Trans-Antarctic Association. It will be used to show recent history of New Zealand Antarctic operations. DSIR Antarctic is calling for contributions from participants in the New Zealand Antarctic Research Programme.

Scott Base was established to accommodate scientists working as part of New Zealand's contribution to the International Geophysical Year and to support the Commonwealth Trans-Antarctic Expedition led by Vivian Fuchs, (who was knighted for his efforts.)

The buildings, which made up the Base, were designed by Mr Frank Ponder, the Ministry of Works Architect based in Wellington. Structurally they were of two main types; one, made in Australia comprised of panels with an exterior skin of aluminium alloy, a filling of plastic foam insulation and an inner lining of an asbestos type mat while the other, made in New Zealand was of timber with an exterior surface of fibreglass on plywood, a core of glass-wool and a inner layer of an asbestos type material on hardwood. Those from Australia would be mainly for the living quarters while the smaller New Zealand huts would be used for scientific purposes. The insulation had been calculated to combat the temperatures of 100 degrees below freezing and the eight main buildings, each of approximately 35 feet by 20 feet covering a ground area of about 200 feet by 60 feet, were to be strong enough to withstand winds of over 100 mph. They would be painted bright orange, anchored with steel guy ropes and joined by a corrugated steel companionway.

All the buildings, which would make up the new base had been prefabricated and trialled on the old exhibition site at Rongotai Airport in Wellington by the team who would be responsible for construction of the base in the Antarctic. They were then repacked and labelled for the voyage south, and loaded in a convenient sequence for base assembly on the American vessel the John R. Towle and the

HMNZS Endeavour. The code-labelling explained each hut's designation.

Originally the base was to be built at Butter Point close to the Ferrar Glacier giving access to the polar plateau. After further reconnaissance (and considerable discussion) the site was abandoned mainly for logistical reasons and Pram Point on Ross Island Point was selected instead. It was by now January 9 and on the following day bulldozing of the site was undertaken and then construction began in earnest "with the precise laying out of all the buildings and the leveling of the foundation sites. By 14 January the first milestone was passed with the complete erection of Hut A (kitchen dining hall, and radio room). This was indeed great credit to Heke as building foreman and his seven assistants Mitchell (architectural liaison), Edwards, Price, Sinclair, Voisin, Boyd and Becconsall" wrote Helm and Miller in Antarctica the official account of the New Zealand section of the expedition. "Not a thing was missing and everything fitted neatly into place. The rehearsals of the erection at Rongotai, Wellington, now proved their worth. Before the walls of any hut could be closed in all of the heavy materials for the particular hut had to be transported to and put roughly in place. Thus, a into Hut A had gone the mammoth President range, the snow melter and water tank, and also the three large radio transmitters." Behind a heater unit was the office and bedroom designated Sir Edmund Hillary's for the period of the Trans-Antarctic crossing.

By January 16 the construction party were adding the finishing touches to the interior of the hut. Outside during the afternoon of Sunday 20 January 1957 the New Zealand flag was formally raised (on a flagpole used by Scott at Hut Point from 1902-04) by the Able Seaman Ramon Tito, the youngest member of the crew of the Endeavour. The short, but impressive ceremony, had been arranged by Captain Harold Ruegg, Administrator of the Ross Dependency and attended by many American personalities including Admiral Dufek. Captain Kirkwood represented the Royal New Zea-

land Navy. According to the official account, the beer and cheese party which followed in Hut A was noteworthy for the fact, that it was considerably colder inside than out for no heating apparatus had yet been installed. It was indeed a credit to the insulation! By February 1, five of the six main living huts had been erected and the foundations of the last were being laid. Construction continued apace for accommodation had to be secure for the 22 men of the TAE expedition and IGY before the onset of winter and beginning of the scientific programme.

Originally the base was intended to last about three years and during subsequent occupation this first hut to be completed became known as the TAE Hut and more recently as A Hut serving for a time as a mess/galley unit but subsequently as a temporary sleeping area and also as a laboratory.

Work on the construction of the new base began in 1976 and as it developed it became increasingly difficult to clear snow from around the old building and so, it was decided that it should be relocated. Sites in New Zealand were considered first but when negotiations failed the then Antarctic Division of DSIR decided that it should be moved to another location in the new Scott Base complex. The position chosen does not affect the airflows under the new base buildings which are elevated to provide an escape route for any blown snow.

Stripping the building was impossible as the panels and other fittings would have been damaged. It was decided that it would be sledged to its new site some 40 metres further towards the sea and four feet lower than where it was first assembled in Antarctica.

Using three Herman Nelson heaters, ice which had accumulated under the building during the preceding 32 years was melted. Twenty four hydraulic jacks were slid under the building to lift it so that heavy beams which could be used to form a sledge could be posi-

tioned. The slope to the new location was blasted and filled and the unit winched and hauled into position by D5 and D3 crawler tractors. A D8 provided anchorage to stop it slipping further than required.

Once at the new site the old building was again jacked up on piles made of the original rail sleepers so that meltwaters would not damage the insulation. The Army Engineers, who, in conjunction with Garth Varcoe of DSIR Antarctic were responsible for the move, then installed a shallow gabled overlay over the existing roof before returning to New Zealand. During January members of the Antarctic Heritage Trust team reinstated the walls in accordance with the original layout.

DSIR Antarctic is now looking for any photographs, preferably with negatives or slides of such events, which occurred in the years A hut was occupied. The collection of Winter-over group photographs at Scott Base starts in 1966/67; earlier photographs would be appreciated. The Division hopes to set up a series of protected albums within the hut showing three or four photographs of memorable events from each season; it is anticipated that such a collection will provide a summary of New Zealand's Antarctic History. All care will be taken and negatives or originals returned to the sender. Relevant documents or copies of them would also be appreciated.

**Please mark the envelopes containing photos or information:**  
**TAE Museum**  
**C/o Garth Varcoe,**  
**DSIR Antarctic,**  
**P.O. Box 14091,**  
**CHRISTCHURCH AIRPORT**

*Ref: "Antarctica" by A.S. Helm and J.H. Miller, Government Printer, Wellington, New Zealand 1964, pages 156-159.*

## ANARE

# Further increase in funding for Australian programme

The Australian Government is supporting the 1991-92 Antarctic programme with a \$68.2 million allocation to the Antarctic Division. This represents an increase of \$5.4 million from the previous year. One hundred and thirty-six research projects are to be undertaken. They cover atmospheric, ecological and environmental issues with a strong emphasis on global environment change, ozone depletion, the history of climate change, long-term climatic trends and Antarctic and sub-Antarctic wildlife.

Although full details have not yet been released major research programmes will include studies of the iceforms and rocks of the northern Prince Charles Mountains and deep ice core drilling at Law Dome, inland from Casey. These cores will provide records of past climatic conditions. A six week marine science cruise will be undertaken to allow scientists to examine the distribution and abundance of fish stocks around Heard Island and study the oceanography of Prydz Bay.

Australia's contribution to the international World Ocean Circulation Experiment (WOCE) will begin with a hydrographic transect between Tasmania and Antarctica. The first full-year scientific programme at Heard Island since 1954-55 is also to be undertaken.

Much of the work being scheduled will focus on maintaining and improving environmental management. The first stage of a station fuel bunding program will be implemented with construction of containment facilities at Casey Station. This follows a number of spills and leakages at the Australian stations. Bulk storage tanks, valves and pipework will be upgraded and containment basins built around the tanks to prevent fuel escaping into the environment should spills occur in future. Fur-

ther rubbish will be removed from the disused tip at Mawson and a start will be made on the removal of the old Casey Station buildings.

Funding has also been allocated to the building programme. The science laboratory at Casey and the upper atmosphere physics building at Davis will be completed over the summer. During the next three years a meteorological centre is to be built at Davis and a new transmitter building is to be constructed at Casey. The new operations building at Davis will be fitted out and a similar building will be assembled at Mawson.

Icebird and Aurora Australis will provide logistic support for this season's programme and seven helicopters will be used in ship to shore operations and field work.

Aurora Australis was scheduled to leave Hobart on 25 September on the first of eight voyages which will be made during the season. She relieved the station at Macquarie Island and was to undertake marine science cruise before returning to Hobart a month later. However the cruise was delayed because of a fault in a winch, crucial to the marine survey between Tasmania and Antarctica and the ship returned to Hobart after deploying the expeditioners and supplies at Macquarie and before beginning the survey. On her next voyage she will relieve and resupply Mawson and Davis while Icebird goes to Casey. In late November they will repeat the voyages with Icebird calling in at Macquarie Island.

Early in the New Year Aurora Australis will again return to the bases on a cruise that will include marine science and, depending on weather and sea conditions, a brief call may be made at Heard Island to deliver the advance wintering group and minimal stores. In the

meantime Icebird will go to Davis, Mawson and also call in at Heard Island with the rest of the party, their stores and equipment. She will also undertake hydrographic work at Mawson before making her last voyage of the season to Casey and Macquarie. Aurora Australis is scheduled to complete her support for the 1991-92 Australian programme on the 29 March while Icebird will conclude on 2 April.

## Cooperative research centre announced

A cooperative research centre for the Antarctic and Southern Ocean Environment is to be established at Hobart by the Federal Government under a new \$100 million a year science programme. The major partners in the Centre will be the University of Tasmania, the Antarctic Division of the Department of Arts, Sport, the Environment, Tourism and Territories, CSIRO and the Bureau of Mineral Resources.

The centre will be one of the first 15 of 50 such centres in the programme for which funding will increase to \$30 million a year by 1992-93 with a total of \$190 million over the seven years of initial establishment and development. Participants must at least match the contribution but their commitment is expected to be well above this level.

Benefits from the centre will include the significant backing of Australia's initiative to maintain Antarctica as a natural reserve and a land of science. It will also fill a number of gaps in the programme by establishing:

- An oceanographic programme in the Southern Ocean based on the expertise of the CSIRO Division of Oceanography and the facilities on the new Antarctic research vessel, Aurora Australis, which will complement and support the Antarctic Division's marine biology and sea ice programmes in the region.

- An enhanced programme on past climate change based on the Division's existing ice core studies programme but with additional funding from the centre. The programme will

also be complemented with new palaeo-environmental studies.

- An enhanced programme of Antarctic meteorology research; and

- a remote sensing programme to provide broadscale oceanographic, glaciological, meteorological mapping and biological data on the region to support and enhance existing ground-based scientific programmes.

Establishment of the centre will also involve the 14 staff of Division's Glaciology Section in a move from Melbourne to Hobart.

Like other such organisations to be established the Cooperative Centre for the Antarctic and Southern Ocean Environment will, according to the Minister of Science and Technology Mr Simon Crean who announced the first round of the centres, "draw together outstanding research groups in the universities, CSIRO and other government research institutions linking them to researchers and users in industry and other sectors of the community".

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## Speculation mounts for French base in continental interior

In spite of funding difficulties (Antarctic Vol 12. No. 5 pages 144-147) French plans for a base at Dome C are thought to be advancing. With the projected completion of the airstrip at Du monde d'Urville early this coming season and the first flight scheduled (as from August 1990) for January 1991 the French Antarctic authorities are thought to be focussing on logistic support and the development and building of a base in the continental interior for a scientific programme with a new emphasis.

Current speculation indicates that the programme is likely to concentrate on ice-atmos-

phere studies, earth sciences, astronomy, the outer atmosphere, human biology and medicine. Situated at 124deg10'E/10'74deg40'S Dome C, or Dome Concorde, as it may be called, is away from the ocean and outside influences are removed.

This makes the atmosphere ideal for physical and chemical studies, the thin air making measurements easier. The site is ideal for glaciological programmes as precipitation is low and the maximum time length for climatic reconstitution corresponds to given-length coring. Also the ice is stable and stationery making it particularly suitable for drilling.

The earth scientists can expand their observational network and the astronomers can take advantage of the rarefied atmosphere and reduced water mass. By being close to the South Pole peak observation periods are also extended. The magnetosphere is less corrupted by other demands and the location therefore appears to physicists. Those studying human biology would welcome a site 100 kilometers from Dumont d'Urville for the difficulties in traveling under winter conditions.

If the new base goes ahead the future of Dumont d'Urville remains in doubt. The base, named after the French explorer Jules Sebastien Cesar Dumont d'Urville, was established in 1956 in preparation for the French contribution to the International Geophysical Year in 1957. (d'Urville made two trips to the Antarctic the first in 1839 and the second in 1840 in a search for the South Magnetic Pole.)

Conflicting shipping schedules do not enhance the credibility of the suggested base programming; materials were apparently due to arrive at Dumont d'Urville from September 1991 and be driven overland to the site in preparation for construction in 1992-93 and operation from 1994. Only one new vehicle was delivered last season and now the first of the five voyages for the L'Astrolabe from Hobart to Dumont d'Urville is already late leaving Le Havre.

L'Astrolabe is scheduled to make five visits

to Dumont d'Urville this season, and was originally to depart from Le Havre on 12 October arriving at Hobart on the 25 November and leaving the following day. She was then to arrive at the station five days later on 3 December where she would stay for a further five days before returning to Hobart making return visits to the station on 24 December, 11 January, 6 February and 28 February finally departing on 1 March and returning to Le Havre by 21 April via Hobart. According to the agents in Hobart the programme is not unusual and with an air link progress towards the new base could still be made from Dumont d'Urville.

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## Poland

The XV Polish Antarctic Expedition which has been at Arctowski Station since 1990 should conclude in March 1992. It has been a two part expedition, the first comprising a summer group of scientists including three biologists and a geographer who were to be accompanied by exchange scientists from the Netherlands. The second, a winter group, comprised five scientists, a geographer, two biologists and a geophysicist. The programme was part of a Polish National Project broadly entitled "Studies on living resources, lithosphere and environment of polar regions." It is administered by the Polish Academy of Sciences and includes scientists from the Institute of Ecology and Institute of Geophysics as well as Poznan University and the Bialystok branch of Warsaw University.

Polands Academy of Sciences, is also responsible for the station, which lies at latitude 62 deg 09'45'S and longitude 58 deg, 27'45'W and is in Admiralty Bay at Point Thomas on King George Island. in the South Shetland Group. Leader of the expedition is Prezemyslaw Gonera and deputy leader with responsibility for the technical side is Leon Babelek.

Biological studies predominate in the programme. They include population dynamics  
*continued on page 189*

*BAS news*

# New base at Halley and airstrip at Rothera to be ready for 1991-92 season

The move into the new Halley station, the fifth, closure of the fourth, use of the compacted runway at Rothera and marine research and supply of other bases by the new vessel RRS James Clark Ross are likely features of the coming season of British Antarctic Survey activities. A new aircraft will complement the existing fleet in the field as BAS organises its programme to include new waste management procedures from its headquarters at Cambridge which are still being developed. The last field season was completed in spite of unusually heavy ice in the Weddell Sea and trouble with the RRS John Biscoe.

Last year the four permanent scientific stations, Signy (60 43 S/45 36 W), Faraday (65 15 S/64 16 W), Rothera (67 34 S/68 08 W) and Halley (75 36 S/68 08 W) and one field research station, Bird Island (54 00 S/38 03 W), were manned. In 1990, 70 personnel wintered over with 13 at Signy, ten at Faraday, 14 at Rothera and 30 (including construction personnel) at Halley. Three stayed on Bird Island. The air transit station Damoy (64 49 S/63 31 W), the air/land transit station Fossil Bluff (71 20 S 63 31 W) and a number of field huts were also in use during the summer. At Halley Research Station, the third phase of the station rebuild was partially completed.

The two Royal Research Ships, John Biscoe and Bransfield were in operation during the 1990-91 season, though RRS Bransfield's engine problems necessitated an early return to UK. The RRS John Biscoe undertook an extended end of season run to the Antarctic Peninsula in place of RRS Bransfield, in addition to normal station relief and a marine biological programme. RRS Bransfield undertook the main relief and resupply of Halley, as well as deploying and supporting the construction team and material for the Halley rebuild. HMS Endurance assisted in the movement of

personnel and supplies. All four Twin Otter aircraft were in use during the field season,

## SHIP OPERATIONS

RRS John Biscoe sailed from Grimsby on 19 September 1990, a day later than scheduled due to bad weather, and conducted scientific equipment trials on passage to Funchal, Madeira, before heading for Montevideo to collect fresh provisions and water. The ship arrived at Stanley, Falkland Islands on 19 October, where she refuelled and embarked personnel and cargo, before heading for Bird Island Field Station, South Georgia. Bad weather delayed the relief of the Station and the installation of a BAS field party at Husvik. After completion of the duties on 30 October the vessel sailed again for Stanley, where personnel for Rothera Research Station and cargo, which had been delayed at Ascension Island, were taken on board.

The vessel arrived at Faraday Research Station on 11 November, landing fresh provisions and mail. Bad weather had prevented the landing of a geological party on Livingston Island, in the South Shetlands, on passage. On returning north, the vessel discharged-

personnel and cargo at Damoy, the Survey's forward air facility on Wiencke Island for onward flight to Rothera Research Station. On her way to Stanley, the vessel made a brief stop at King George Island in the South Shetlands to establish a two man geological field party.

Personnel for Signy, Faraday and Rothera (via Damoy) Research Stations were embarked along with cargo, and after refuelling the vessel sailed from Stanley on 21 November. On passage to Signy Research Station in the South Orkney Islands, deep-water sea-level sensors were recovered and redeployed by personnel from the NERC Proudman Oceanographic Laboratory. They also repaired the tide gauge system and satellite data link on Signy Island. Good weather at Signy Island enabled the relief to be completed in two days and the vessel sailed for Faraday Research Station, collecting on route, the two man geological field party from King George Island and discharging cargo and personnel at Damoy. Heavy pack ice around Faraday delayed operations and it was late on 3 December before the relief and supply of 95 tons of bulk fuel was completed. The ship then headed again for Stanley.

After refuelling, exchanging some officers and crew, and embarking members of the James Ross Island combined geological and biological project, the vessel proceeded to Montevideo arriving 15 December. Fresh provisions and further fuel were taken on board. After a further exchange of officers the vessel sailed for James Ross Island on 19 December, stopping on the way to spend Christmas in King George Bay, King George Island. Approaching James Ross Island she encountered very heavy pack ice, and was forced to abandon attempts to reach the island and set sail instead for Signy Research Station arriving 29 December. After an exchange of personnel and the supply of 140 tons of bulk fuel, the vessel headed again for James Ross Island. With no improvement in sea ice conditions, the James Ross Island party were forced to move their project to an alternative site on Byers

Peninsula, Livingstone Island, which was accomplished by 5 January 1991. RRS John Biscoe returned to Stanley on 7 January, having established a two man field party at Brown Bluff Bay on the way.

The vessel embarked 22 scientists for a 36 day biological cruise around South Georgia to investigate biogeochemistry, zooplankton, krill, fish and squid ecology, and sailed on 11 January. Equipment trials were carried out during the voyage. A mid-cruise break was taken at Leith on 5 February and the vessel returned to Stanley on 17 February, enjoying good weather for the majority of the cruise.

A "Farewell Dance", organised by the Master and crew of the RRS John Biscoe, was held in the town hall on 20 February to mark what was to have been the vessel's last visit, before retiring from BAS service. However, when the vessel's itinerary was changed to include the relief of research stations normally carried by RRS Bransfield she subsequently returned. Consequently, after the exchange of cargo with the RRS Bransfield, the Biscoe sailed on 23 February for Livingstone Island to collect the field party deployed earlier in the season. On passage, three personnel were embarked at the Chilean Research Station, Teniente Rudolfo Marsh on King George Island. On 28 February the vessel sailed from Livingstone Island for Faraday Research Station, calling at Deception Island on the way. Good weather at Faraday Research Station enabled the relief to be completed in two days. It included the transfer of a further 44 tons of fuel. The vessel sailed for Signy Research Station and arrived 6 March, where high winds delayed operations for 24 hours. However, refuelling and cargo and personnel exchange was completed by 8 March, and the vessel proceeded to South Georgia. Before completing the relief of Bird Island Field Station in difficult conditions, brief stops were made at Grytviken to load a BAS diving recompression chamber, for repairs in the UK, and at Husvik to embark a field party. The vessel sailed again for Stanley arriving 16 March.

Personnel from the BAS Headquarters in

Cambridge joined the vessel for the final leg of her extended Antarctic season and the ship departed for Faraday Research Station on 22 March. After a brief stop to drop mail and cargo, she proceeded to Rothera Research Station to become the first ship to use the new berthing facility which was then nearing completion and was subsequently named 'Biscoe Wharf' by Captain C R Elliott. Good weather enabled the operation to be completed in three days and the vessel sailed for Stanley on 29 March, stopping on passage briefly at Faraday Research Station and Deception Island. With UK cargo loaded and refuelled the ship made its final departure on 6 April to an 11 gun salute, arriving in the UK 8 May via a brief stop at Montevideo after a voyage lasting 33 weeks.

To commemorate the vessel's last and 35th consecutive annual voyage to Antarctica, and the retirement of Captain EMS Phelps, a civic reception was held on arrival, accompanied by Commander in Chief Fleet's Royal Marine band and attended by a large number of BAS staff and relatives. The Director, Dr DJ Drewry gave the welcoming address to the ship's officers and men.

A major task of RRS Bransfield during the 1990-91 season was the supply of materials and construction team for the third consecutive year of the rebuild of Halley Research Station on the Brunt Ice Shelf; and to remain in support during the construction period. The ship sailed from Grimsby on 17 October and called at Rio de Janeiro, to embark additional members of the construction team and fresh provisions for the ship and Halley Research Station. On passage to South Georgia, two Toga Buoys were deployed on behalf of the US National Data Buoy Centre. These buoys, tracked by satellite, measure atmospheric pressure, air and sea temperature, and are part of a continuous global ocean monitoring programme to which BAS contributes. A brief call was made at Husvik and Bird Island, South Georgia, to exchange cargo and personnel, and Grytviken, to afford the ship's complement a short period of rest and relaxation, before departing for the

Weddell Sea.

The vessel was able to make good progress until the 26 November, when she encountered heavy pack ice. While working through it on 1 December, a fault developed in the main propulsion motor, which resulted in the isolation of the after armature of the motor and the vessel was forced to continue on half power. Arrangements were made for repairs to be carried out in Cape Town, South Africa early in February 1991. Dense pack and reduced power delayed the vessel's arrival at an embayment in the ice shelf near Halley Research Station, until 22 December. Discharge of cargo and fresh provisions began immediately and personnel worked in a continuous series of 12-hour shifts until 29 December, when all reverted to working a single 12 hour day, completing discharge by 31 December. Outgoing cargo and vehicles started to be loaded from 7 January. This process was interrupted on 19 January when she left the embayment because a large iceberg threatened to block the entrance. She was able to reberth the next day and shortly afterwards, the German research ship, Polarstern came along side to bunker 170 tonnes of bulk fuel, sailing on completion. RRS Bransfield then sailed for Cape Town on the 27 January, after loading all returning cargo and personnel, including Dr D J Drewry, BAS Director, J Bawden, Head of Administration and F G Curry, Head of Administration Designate, who had flown in from Rothera Research Station.

Heavy pack again retarded progress. Ice reports from other vessels in the area, Polarstern and the Argentinean ice breaker *Almirante Irizar*, confirmed the wide extent of the pack. After a rendezvous with the *Polarstern*, which was still in the area, the ship returned to N9, an alternative off-loading site on a section of low ice shelf approximately 50 Km from the Halley embayment, arriving 5 February. The Director Dr D J Drewry, J. Bawden and other HQ personnel disembarked and flew to Rothera Research Station via Halley 4 aboard one of the BAS aircraft. When delays forced abandon-

ment of the Cape Town option, the vessel then set sail for Stanley. A change in wind direction formed a shore lead, she was able to use to effect a release from the pack ice. Cargo and personnel transfers were carried out at Signy Research Station on passage and the vessel arrived at Stanley on 21 February, after an anxious period north of Signy, when the remaining motor stopped in heavy seas. After some eight hours of repair work, under the leadership of Chief Engineer A Alison, the ship resumed her passage northwards. Cargo was discharged for transfer to the RRS John Biscoe and for storage at Stanley. During the stop-over in Stanley, the ship was visited by Mr Baker-Bates, High Commissioner for British Antarctic Territory. The vessel refuelled and departed 1 March arriving in the UK on 7 April, after a brief stop at Montevideo on the way; the voyage had lasted over 24 weeks.

### Air and Field Operations

The four BAS Twin Otter aircraft departed the UK on 1 October on their annual ferry flight to Rothera via Greenland, and the Americas. A hydraulic fault lowered the ski on VP-FBB while in flight between Chile and Rothera Research Station on 17 October and forced the plane to press on in deteriorating weather conditions. Planes VP-FAZ, VP-FBC VP-FBL turned back. They eventually reached Rothera on 25 October.

Poor weather between mid October and mid-November severely hampered pre-season crew training and depot laying schedules, although a short weather window did allow the field support facility at Fossil Bluff to be opened on 26 October.

VP-FBC departed Rothera 18 November for a 1600km flight across Antarctica to Marie Byrd Land to support a collaborative British/USA/NZ geological project, operating from fuel caches placed by United States C130 aircraft. The plane returned to Rothera on 9 January.

During the latter half of November, the other three Twin Otters transported summer

field staff from Damoy, where they had disembarked from the RRS John Biscoe, to Rothera Research Station for the start of their field season. Late November and early December brought very good weather enabling the major field inputs to be accomplished by 13 December. Central and northern Alexander Island were targeted for geological parties and both these groups were deployed as self sufficient units by 12 December. A two person field unit was airlifted into the Batterbee Mountains adjacent to the Dyer Plateau, to undertake an extension of a glaciological stake scheme. They also organised the raising and removal back to Rothera of 49 boxes of ice cores which had been drilled the previous season.

The first half of December also saw six persons and approx 10,000 kgs of equipment and supplies put into to deep field locations on the Ronne Ice Shelf. Two of the group continued on by air to the southern Ronne Ice Shelf to undertake a 800km glaciological survey traverse back to the original input site where the others were carrying out successful hot water drilling activities through the ice shelf.

Around mid-season there was a number of flights between Rothera and Halley Research Stations to accomplish personnel and cargo moves, sea ice observations for ships, deployment of an automatic weather station inland of Halley and to deploy a snow chemistry field team in Coats Land. Personnel movements also dictated a number of flights to the Teniente Rudolfo Marsh (Chilean) Station on King George Island, at the northern tip of the Antarctic Peninsula to connect with incoming/outgoing flights. Primarily these comprised Pelly construction staff at the beginning of the season, and BAS personnel for onward passage to UK in late season. Advanced deployment of aviation fuel and general supplies to deep field locations continued throughout the season, in order to facilitate future programmes.

At various times VP-FAZ was fitted with the Zeiss air camera to work areas local to Adelaide Island, Alexander Island and the Arrowsmith Peninsula for geological mapping. VP-FBL

flew over 200 hours of aeromagnetic survey over the Marguerite Bay and ocean areas to the west in December, January and early February.

Due to uncertainties of BAS shipping, following the mechanical problems onboard RRS Bransfield, the field party uplifts were completed earlier than scheduled and accomplished by 22 February. VP-FAZ departed Rothera Research Station on 19 February while the other aircraft departed on 2 March on their northbound ferry flight to the UK.

### **De Havilland DHC-7**

*A search for a reasonably new De Havilland ADHC-7 began early in 1990 and by April 1990 Negotiations for the purchase of Serial 111 G-BOAX from London City Airways (Airlines of Britain) had begun. By the end of July it belonged to BAS and was flown to Field Aviation Company Inc in Toronto, Canada, in October for conversion to BAS field requirements. This involves upgrading to Series 150 (increased gross weight and fuel capacity), improved avionics (GPS/IRS), cargo door, auxiliary power unit and wheel-ski fit. Plans for the fitting of scientific sensors are being formulated.*

*Work at Fields began in February 1991 at Fields. The detailed design, manufacture and installation of the skis is expected to be completed by August or September 1991. The flight test programme will take some three to four months, and it is anticipated that proving flights into Rothera can be undertaken at the end of the 1992-93 summer season.*

### **Other Aircraft and Ships**

All the BAS Research Stations were visited by aircraft, helicopters and ships of other nations during the Field Season. Two West German Dornier aircraft visited Rothera and Halley Research Stations early in the season, routing across Antarctica to McMurdo Station. Poor weather delayed them at both Rothera and

Halley. Their season closed at the end of January, with one returning through Rothera homebound. The second Dornier had been damaged during a field landing on the Ross Sea side of the continent, and had to return home by ship.

Other aircraft visiting Rothera Research Station included Chilean Airforce and Ken Borek Twin Otters in December, both on charter to a private operator, delivering Canadian construction workers for the runway project. The project was supported through late December to late April with regular flights by a Beechcraft King Air aircraft operated by the construction company. Another Ken Borek Twin Otter, on charter to the United States Antarctic Programme, having completed its scientific task, visited Rothera Research Station northbound in late January on passage to Punta Arenas.

HMS-Endurance and her two Lynx helicopters visited Faraday, Rothera and Signy Research Stations during the season, providing assistance in moving staff, mail and cargo. She surveyed sea areas in Bismark Strait (South Anvers Island) and the Antarctic Sound (north east tip of the Antarctic Peninsula). The vessel and helicopters also gave logistic and air photography support to the BAS geological and biological field parties, established on Livingston and King George Islands. HMS Endurance also deployed and uplifted the Joint Services climbing expedition on Smith Island. Other Royal Navy and Royal Fleet Auxiliary ships were used to move BAS staff into and around South Georgia and to carry mail and supplies to and from Bird Island Field Station.

The yacht Damien II, operating on charter with BAS biologists, undertook a seal census around South Georgia.

Vessels Erebus and Polar Duke visited Rothera and Faraday Research Stations respectively while operating for the United States Antarctic Programme. (Faraday maintains a close radio link with the nearby US Palmer Station and this provided a first opportunity to put faces to familiar voices.)

MV Gondwana, carrying Greenpeace

members and the Press, visited both Signy and Faraday Research Stations late in the season. Signy Research Station also had three calls from the tourist ship *Society Explorer* and one from the new tour ship *Polarsirkel*. Tourists are not allowed ashore on Signy Island, but Station personnel go onboard to give a short presentation of their work and to act as guides for the Shingle Cove area of Coronation Island. Faraday also received two visits from *Society Explorer*, one from *Polarsirkel* and one from the tourist ship *Illiria*.

The Chilean tourist ship *Pomare* called unexpectedly at Rothera Research Station with technical problems that developed during a February cruise to deploy fuel at the Jones Ice Shelf for the private operator, Adventure Network.

Personnel from the Argentinean ice breaker *Almirante Irizar* made helicopter visits to Halley Research Station in February and Rothera Research Station in March.

Ten private yachts were recorded in the Antarctic Peninsula region last season. Three had single crew, and two of these had overwintered. The yachts paid a total of 13 visits to BAS Stations. The BAS field party at Husvik, South Georgia, were also visited by yachts and the tourist ship *Polarsirkel*, which also deployed and later uplifted a party of Swedish biologists.

## ACTIVITIES AT THE BAS STATIONS

### Halley Research Station

Much work had been accomplished in the fitting out of the Accommodation Platform (ACB) of Halley 5 during winter. Halley done to reduce the problem of continued distortion of the structure, caused by the burial of the station by normal snow accumulation. The accumulation also required the normal on-going site maintenance and raising of surface mounted equipment and facilities. Preparations, prior to the arrival of RRS Bransfield,

included the re-commissioning of the temporary accommodation for the rebuild team, which had been shut down for the winter. The main objectives for the summer were the completion of the Halley 5 Phase 3 construction work, and the movement of the polar Anglo-American Conjugate Experiment (PACE) facility from the old to the new station site. In addition, a glaciological field party was to be deployed in Coats Land and associated work done on the Brunt Ice Shelf. Despite the late arrival of the RRS Bransfield, these objectives were largely achieved.

### 5th Halley rebuild nears completion

*The new Halley research complex is the 5th rebuild since the station was established on the floating ice of the 150 thick Brunt Ice shelf by the Royal Society in 1957 for the IGY. Snow accumulation of about 1 metre annually had buried and crushed earlier buildings. The new design aims to overcome this environmental problem by constructing the station on jackable platforms maintained at a height of about 4 metres above the snow on extendable legs.*

*Phase one comprised the construction of three jackable platforms, and was completed in the 1989-90 season. Phase 2, the main accommodation platform (ACB) was completed in 1989-90, except for the final mechanical and electrical installations, flooring, furnishings and fittings which were completed over the 1990 winter. The shell for the laboratories on the Ice and Climate Science platform (ICB), and service tunnels with access shafts between the three platforms were also completed during that year.*

*Major work planned for Phase 3 in the 1990-91 field season consisted of fitting extensions to all legs and raising the three platforms, fitting out services to the ICB laboratories, constructing and fitting out laboratories on the Upper Atmospheric Sciences (SSB) platform, and transferring*

*the scientific experiment PACE from the Halley 4 Research Station. The schedule called for 84 days of single 12-hour shifts per day to bring the construction of the Research Station to a state which would allow the transfer of all research facilities from the old Research Station Halley 4 and allow it to be closed in 1991-92.*

*The very bad ice in the Weddel Sea and the trouble culminating in the failure of one of the RRS Bransfield's two propulsion motors meant that programme had to be revised to allow repair time in Cape Town and only 37 days could be made available for both resupply of the Halley Research Stations and the building programme. A major revision of the building schedule was carried out by the Building Team Co-ordinator and Technical Officers and with the building team organised into two 12-hour shifts per day most of the tasks of the original plan were accomplished. A plumber and an electrician volunteered to augment the wintering team to ensure completion of the fitting out of the science laboratories. Consequently, the new Research Station should be ready for commissioning, and the full science move, during the next field season.*

#### **Faraday Research Station**

Several significant enhancements to the fabric of the station have been achieved. Rewiring of the main corridor, together with associated reconstruction of the ceiling, was completed during winter. A 'dry' laboratory and the base darkroom were also refitted. All these activities were carried out with minimal disturbance to scientific programmes. Summer external work included 'chipping' and painting the two bulk fuel tanks, the construction of a boat stowage platform, a large cargo/general platform, as well as walkway widening. More work, mainly internal, was also carried out on Wordie House, the old base occupied from 1947-54.

#### **Rothera Research Station**

The rebuild era at Rothera drew to a close this

year with the runway and wharf at the end of the season; the emphasis now switches to base maintenance. The fastest ever relief at Rothera, took only two and a half days, with movement of cargo and fuel from RRS John Biscoe secured alongside the new wharf. Nine of the ten fuel pillow tanks were drained and removed in a smooth changeover to the new bulk fuel farm. The containerisation of all outside store dumps provided much needed protection.

#### **Rothera Air Facilities**

Following a specific and detailed bathymetric survey of the site of the proposed wharf element in the new Rothera facilities it became clear that a new design was required. It now incorporates sheet pile retaining walls, backfilled with crushed rock, with a steel supporting structures bolted to bedrock. The design was chosen from various proposals submitted by I D Systems Ltd, the consulting engineers for the project. Their contract was amended to include the new wharf design and won by the runway contractor, Pelly Construction Ltd, in September 1990.

An advance party of contractors' personnel were flown in to Rothera to clear the runway of snow and open their camp in mid-December 1990, with the remainder arriving, also by air, at the end of December. The MV Polarsirkil, chartered by Pelly to carry materials for the new wharf, arrived at Rothera on 8 January 1991. Work progressed well in all areas throughout the season with little delay, the hangar being completed by 28 February and the fuel tank farm by 13 March. RRS John Biscoe was able to lay alongside and work cargo from the uncompleted wharf on 27 March. By 31 March the work on the wharf and final grading and surface compaction of the runway was completed. The facilities were then inspected and accepted on behalf of BAS and by the 19 April the contracting staff had left.

#### **Signy Research Station**

Further improvements were made to the waste management system at Signy, with the introduction of a waste sorting and crushing

room, and a covered area, where drums, full of waste, are sealed before shipment to the Falkland Islands for disposal. Much attention was given to the exterior paintwork on the wooden buildings, and to the fibreglass sealing of the joints on the plastic building. Extensive repairs were made to the slipway using sheet steel. The 26 foot launch "POMONA" has proved to be a very seaworthy and functional inshore marine research vessel.

A new satellite communications transmitter/receiver was installed. Two wind powered generators were erected to power two aerobiological samplers in the field. In addition to the number of visitors to Signy Station during the season, as well as relief from RRS John Biscoe and RRS Bransfield. HMS Endurance lying off some 20 nautical miles from the island recovered cargo and personnel from the Station, using Lynx helicopters.

### **Bird Island Field Research Station**

A major task has been the consolidation of fuel and logistic dumps and exporting surplus material on BAS ships. A new addition to the complex has been a field laboratory for observation work on fur seals. The laboratory has easy access to a power source being situated near the generator building. It is 5m x 3m in area and is divided into two rooms, one of which is also used for housing respirometry equipment for measuring metabolic rates of penguins, albatrosses and fur seals. The other room is also a store for chemicals and scientific consumables.

### **South Georgia**

The manager's house of the derelict whaling station Husvik on South Georgia, was occupied by BAS biologists from September to March. In January and February the BAS scientists were joined by a group of 13 Swedish biologists. They undertook preliminary studies for the development of BAS - SWEDARP (Swedish Antarctic Research Programme) collaborative projects.

### **Cambridge Headquarters**

The fourth phase of the BAS HQ building works saw the refurbishment of the existing Geology laboratories, together with the construction of new Rock Powder Preparation Laboratories. Also included were the refurbishment of other offices in Science Building 1, to accommodate the Ice and Climate Division. In July 1990 work started on a covered link between Science Buildings 1 and 2 to improve access between the two buildings and to provide a reception room for the Directorate. Work on Phase 4 was completed by July 1990. A Phase 5 extension programme will provide a state of the art cold/sterile room for glacio chemistry, together with additional laboratories, seminar rooms and offices. The work was completed in July 1991.

### **Other news:**

#### **Waste Management**

During the year BAS appointed an Environmental Officer, a major part of the responsibilities being the organisation and coordination of waste management for all Antarctic operations. This year has seen further implementation of the Survey's long term policy that all waste, other than human and kitchen waste, should be removed from Antarctica.

Crushing equipment was supplied to Bird Island Field Station and Signy Research Station. All toxic and radio-active wastes were removed from the BAS Research Stations to the UK, and virtually all non-toxic garbage to the Falkland Islands. The contract with the Property Services Agency (PSA), Port Stanley, was extended to deal with ship-produced wastes. Strenuous attempts were made to retrieve material from Halley Research Station, but logistic difficulties greatly hampered operations. New shipping regulations have made the packaging and labelling of all waste materials a much more onerous and time consuming responsibility for Station personnel. Pelly Construction Ltd were required to remove all of their wastes from the Antarctic.

As part of the years work the environmental officer, Dr Shears, completed the first annual waste management plan for BAS operations, which included an inventory of past activities and an audit of all wastes produced by BAS vessels, research stations and field camps in 1989-90. He visited Rechem in the UK to inspect the high temperature incineration plant for toxic wastes, and inspected the disposal facilities run by PSA in the Falkland Islands. BAS now require both Rechem and PSA to provide annual certification of the place and method of disposal for all wastes consigned to them. He also examined the design and practicality of sewage digestion equipment for remote Stations.

A review of old BAS research stations, disused depots and fuel dumps has been started in preparation for their disposal. An inspection checklist was devised and used in surveys of the stations at Port Lockroy and Stonnington Island. Old field huts on Signy Island were demolished and removed. A two man team spent part of the summer collecting wastes around the old British station at Deception Island for removal in 1991-92.

### **Instrumentation and systems group**

The Instrumentation and systems group has continued to provide engineering support (computing, electronic and mechanical) to science across the whole range of BAS field activities.

An agreement defining the interface between BAS (ISG) and NERC Computer Services (NCS) was formalised to provide the optimum use of scarce resources in a difficult field. Two members of the group installed and commissioned a Local Area Network (LAN) at Halley 5 Research Station in January 1990. This employs fibre optic cable to link the two science platforms back to the main accommodation and communications platform. Some work remains to be done due to the curtailed Halley work programme, but a basic service is being provided. A MicroVAX

system, which includes a Wide Area Network (WAN) link back to UK, was also installed at Halley V. This link uses state-of-the-art dial-up modems. Much preparatory work was done on these systems in the UK; the Antarctic link being simulated by conducting tests using the Indian Ocean satellite and land links to Norway.

Another staff member has provided systems management support on ISG VAX/VMS systems. He has been involved with NCS Central Support on the installation of centrally provided software packages on the RRS James Clark Ross VAX computer system. He is currently working on an auto-dial facility for the Antarctic network and on the use of document scanners for passing high quality images such as Medical X-rays for diagnostic purposes. A J Gledhill has been working on the next generation of message handling software. A number of second user Micro-VAX systems have been purchased, which will allow the network to be extended to RRS Bransfield, and the Signy and Rothera Research Stations during the 1991-92 season.

Also completed during the year was the installation of scientific equipment and data logging systems on the new BAS Twin Otter aircraft. It included an equipment environment monitoring and control system.

Another new system developed in a collaborative project is a bio/physical logger for the RRS John Biscoe devised in collaboration with staff from the Marine Live Science Division.

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*Continued from page 180*

and behaviour studies of the bird and mammal species in the area during the summer and winter, and an estimation of the mineral and organic matter attribute to birds circulating in the Admiralty Bay ecosystem, as well as analysis of the invertebrate species in the shallow basins and streams and a seasonal collection of ichiofauna and zooplankton in Admiralty Bay.

USAP

# Mercy flight to rescue ill New Zealander

A United States Hercules ski equipped aircraft made a mercy flight into Antarctic midwinter darkness on June 4 to pick up a seriously ill New Zealander from Scott Base and bring him back to Christchurch for hospital treatment.

The New Zealander was the base engineer 30 year old Peter Harding, (Otaki) who had been suffering a bowel infection which failed to respond to treatment for nearly a month and was potentially life threatening

After consulting New Zealand specialists, the Antarctic Division decided to bring Mr Harding back rather than wait for the first scheduled landings towards the end of August. An official request for assistance was made to the US National Science Foundation which is responsible for the American Antarctic programme.

Planning the first mid winter landing on the ice shelf since 1964 took four days. The operation was completed in 18 hours and Mr Harding who spent 90 minutes in a heated ambulance at Williams Field about 10 km from Scott Base was in Christchurch Hospital soon after 11.15 p.m.

Flown by an augmented crew from the US Navy's VXE-6 Squadron the Hercules left Christchurch airport at 5.45 am. It landed at Williams field at 1.28 p.m. took off again at 2.58 p.m. and touched down at 11.15 pm.

An hour after the New Zealand request for assistance was received VXE-6 Squadron based at point Mugu, California, began planning the mission. Two experienced crews were flown to Christchurch by commercial airline - one for the mercy flight and another for the backup Hercules. While the aircraft were on their way the McMurdo winter team prepared the skiway on the iceshelf for 24 hours before the landing. Trucks towed large chains across the it to prevent snowdrifts building up and smoothed the strip with their large tyres. Navigational

aids and marker lights were checked and fuel was kept moving through the refueling hoses because of low temperatures.

A request for a New Zealand doctor to accompany the squadron flight surgeon to care for Mr Harding on the return flight was made by the Americans.

Doctor Johnathan Pascoe who has spent two summers in Antarctica - on non-medical work - was able to discuss Mr Hardings condition with Dr Robert MacFarland, medical officer at McMurdo Station and also with Dr Bramwell Cook, a specialist in gastrointestinal disorders.

Mr Harding had been at Scot Base since October last year and was wintering on Ross Island for the first time. His condition, first diagnosed on May 2, did not respond to treatment at the McMurdo Hospital. He remained there and by the end of the month he had deteriorated to such an extent that full hospital treatment was needed.

Commander Wayne Reeves, who in charge of the VXE-6 Squadron led the mercy mission. Afterwards he ranked it as one of the most difficult in his 20 year flying career but admitted he and his men had been lucky.

## Winter darkness

When the Hercules began its flight into winter darkness it carried a crew of 11 and two passengers. Commander Reeves had with him two pilots, two navigators, two flight engineers, two loadmasters, a flight surgeon and a hospital corpsman. The flight surgeon, Lt. Joe Ataddeo, Dr Pascoe, and the corpsman cared for Mr Harding on the return flight. The second

passenger was Mr Bob Geddis, 37, of Nelson who replaced Mr Harding for the rest of the winter. He had wintered at Scott Base in 1979 and 1988.

There were no problems on the flight. The weather on McMurdo Sound was clear and a temperature of -31deg c was not too cold for flying. The moon was high enough when the Hercules reached the ice to give the crew some surface definition.

Commander Reeve, who monitored the whole operation - the actual landing on the skiway was made by one of his two pilots - was able to pick up Williams Field when the aircraft was more than 65 km out, because there was no cloud cover. Better surface definition was attained closer in with the runway lighting.

On the ice the Hercules kept its four engines running for the 90 minutes of the ground operation while Mr Harding remained in the ambulance with the doctors and Mr Geddis joined his new Scott Base colleagues. Cargo was unloaded and fuel was pumped into the tanks for the return flight.

Precisely at 2.58 p.m. the Hercules took off for Christchurch. This time the departure was in real darkness because the moon had gone behind the horizon. The second stage of the 16.5 hour flight ended at 11.15 p.m.

As Mr Harding was carried off the Hercules he was able to tell the waiting media that he was feeling "pretty good". There was an affectionate greeting from his mother and brother and his girlfriend Nicky Ball, who carried a bunch of flowers for him.

This winter's mercy flight has been described as a classic example of team work between the US and NZ Antarctic programmes. In its Antarctic operation since 1955 VXE-6 Squadron has made many mercy flights, most of them in summer.

Winter flights may have extra hazards; irrespective of the season all have been the result of close cooperation between many Americans and New Zealanders.

All who contributed to the latest flight were concerned primarily with the life of one New

Zealander; it was a humanitarian gesture. There was room in the Hercules for 97 kg of cargo for the New Zealanders; fresh fruit and vegetables, mail which would have not been delivered until the mid-winter airdrop at the end of the month and 35 kg of lithium batteries for satellite navigation equipment used on overhead journeys at Scott Base. **J.M.C.**

**Footnote:** The cost of the project is impossible to determine. One Hercules was already in Christchurch for servicing and runway preparations at McMurdo were due in start anyway for the winter flights. The Americans explain the rescue as "humanitarian gesture" and a useful training exercise.

## New NSF Headquarters proposed

The Division of Polar Programmes is likely to move west about four miles from 18 and G street in Washington to the Ballston section of Arlington. A new building to be called Stafford Place, was begun in the spring of 1991 and should be ready for occupancy in January 1993.

Stafford Place will be hexagonal with a central atrium rising 12 stories and admitting natural light to the interior of all floors. Outside, the first and second levels will be granite and the rest precast with a glass facade. Access will be through two main lobbies at opposite ends of the building. Each lobby will have a hard finish in granite, marble or brick.

It is to be an intelligent building with state-of-the-art equipment and systems designed to meet the National Science Foundations immediate and future needs. A 3,000 square foot exercise facility will be installed on the second floor and a 12,000 square foot Data Center on the third floor. A centralised lunch/vending area will seat about 200 and there will be secured parking in an underground garage for 600 cars.

The building is likely to cost taxpayers \$31.98 per square foot over the next 20 years. With occupancy starting in January 1993 the move for the 1,450 staff from the National Science Foundation, including the Division of Polar Programs, to their 400,000 square feet accommodation is expected to be completed no later

than 26 July 1993. Adjacent is the 200-room Ramada Renaissance Hotel and the building is on the site of Eskimo Nell, (which according to our source for this story the Antarctic Society's April 90-91 newsletter is a polar restaurant polyna in Arlington, famous for its Key Lime Pie).

USSR

## Third long entrapment for the Mikhail Somov

The Mikhail Somov, flagship of the Antarctic fleet, is trapped again in heavy sea ice. In 1977 the vessel was held in ice off the Oates Coast for 57 days and in 1985 she spent 133 days trapped in the ice of the Amundsen Sea. This time she is 30 nautical miles off the coast from the permanent year round Russian Research base Molodeznaja (67deg40'S/45deg/51E) and has been stranded since mid-July. Ice in the area is unlikely to move for another month. About 20 August Soviet technicians began building a 2.8 km airstrip some 28 km from the base for the rescue of the 147 men stranded aboard the vessel. Once completed a long-range Illyushin-76 transport aircraft stood by in Cape Town waiting for for the weather to clear before making the almost 4,000 km flight to the strip. The 147 men were transferred from the vessel to the strip by the ship's helicopters leaving a further 75 either aboard or at the base until the ship can breakout. At the time of the rescue an iceberg was less than three kilometers north-east of the ship and considered potentially dangerous.

Molodezhnaya, is one of eight permanent Soviet Research bases in the Antarctic, the others being Mirnyi, Novolazarevskaja, Vostok, Bellinsgauzen, Leningradskaja, Russkaja, and Progress. There are also six summer stations and one, Druznaja-2 which is unoccupied.

Approximately 100 personnel are wintering at the base where long term projects range from meteorology to geomagnetics, ionospheric programmes, glaciology to hydrographic studies.

The men, airlifted to safety, arrived in Capetown on August 22 and were transferred to the Soviet Research ship Professor Vise which was docked in Table Bay Harbour. Another vessel was due in the following week and was also to help transfer the men back to the Soviet Union. Caption: The Mikhail Somov, flagship of the Soviet Antarctic fleet, was trapped in the ice off Marie Byrd Land for 133 days from March to July 1985.

## Northern men; expedition South

An Antarctic Expedition comprising scientists from the "Northern Countries" has recently been announced in Helsinki. Planned to begin in October the expedition will travel south from Helsinki in the research vessel Academician Federov which was built by the Finnish Company Rauma-Repola. They will call into Gothenburg and Montevideo on their way to Queen Maud Land where they plan to arrive in mid-November. There are three stations in the area the Finnish Aboa, the Swedish Vasa and the Norwegian Trol. The programme is comprehensive and the expedition dedicated to the 30th anniversary of the signing of the Antarctic Treaty.

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*The Mikhail Somov trapped in the ice of the Amundsen Sea in 1985. She was there for 133 days.*



## Sub-Antarctic Whaling Museum being established on South Georgia

A "representative" whaling museum is being established in the former managers villa at Grytviken on South Georgia. A practicable budget has been allowed for by the Commissioner of South Georgia and South Sandwich Islands and preliminary work undertaken last season involved the refurbishment of the building and collection of relics as part of a major environmental cleanup of the four disused whaling stations.

Convened by Dr Nigel Bonner from Cambridge, a committee has been established to co-ordinate the project. It comprises John Smith the Curator of the Falkland Islands Museum, Einar Wexleson, Curator of the Norwegian Whaling Museum, Robert Headland, curator at the Scott Polar Research Institute in Cambridge, Hans Larsen, grandson of C.A. Larsen, the founder of the station at Grytviken and Ian Hart, author of the company history of the Grytviken Whaling Station.

During last summer salvage operations designed to clean up the four disused whaling stations on the Island and remove some 3,000 tons of furnace fuel oil were undertaken by a Marine Salvage Company from Southampton. As part of the contract Bob Cousniak from the Falkland Islands worked on a number of buildings at the settlement and also renovated and refurbished the manager's villa for the museum.

Dr Nigel Bonner and Mr Bob Headland spent part of the summer undertaking preliminary assemblage of the artifacts, which were collected from all over the island, often with the assistance of the salvage company. The collection comprises tripods, cannon, harpoons and other associated relics. In front of the villa will be an open display of indestructible items such as whale claws tripods different varieties of harpoons. Each item will be described and charts will tell of its place and function in the

whaling operation. Inside the building will be photographs and displays of smaller items. A handout will also be available.

The keys to the museum, which will be run on an honour basis, will held by the civilian harbour master who is currently Tony Beachings and the Magistrate both of whom are based at King Edward Point. The keys will be available on request. Such requests are expected about 12 times each year.

Current plans are for Nigel Bonner and Robert Headland to return to the Island in January and February 1992 to continue their work in setting up the displays inside and outside the museum. Both have spent considerable time on South Georgia, Dr Bonner as a scientist with the British Antarctic Survey and Mr Headland as author of a book on South Georgia and curator first at BAS and subsequently at the Scott Polar Research Institute. Two others, as yet unnamed, will work with them. Like last season they will travel to and from the Island with the Royal Navy, which along with the Royal Fleet Auxiliary has vessels in the area regularly allowing for the best access to the Island since the end of the whaling epoch.

In his book on South Georgia Bob Headland explains there were nine sites on South Georgia for which whaling leases were granted: Ocean Harbour, Godthul, Grytviken, Jason Harbour, Husvik, Stormness, Leith Harbour, Prince Olav Harbour and Rosita Harbour. "At Rosita Harbour nothing was built and at Jason Harbour only a small hut was constructed (it still stands and was recently [as of 1984] refurbished). Ocean Harbour was closed in 1920 and now has only two ruined buildings, some machinery parts, and a small locomotive, as most of the equipment was taken to Stormness. Godthul has one large shed, three oil tanks, several wooden "jolle" (the boats from

which the whales were flensed) a dam and many barrels. The other five sites have far more substantial remains although, at Prince Olva Harbour, they are almost entirely ruinous, (having been abandoned in 1931).

"Husvik, Grytviken, Stromness and Leith Harbour were operating in 1960. When they closed by late 1965 they were left substantially intact and prepared so that they could be reopened should whaling resume. In the meantime "the effects of the weather and human interference have caused many of their buildings to collapse and most others are very dilapidated. The remains of boilers, pressure cookers, rotary driers, power houses, and much else is however still there." (1)

"The abandoned whaling stations are strange places", writes Bob Headland "with many large factory buildings where the odour of whale lingers; dilapidated offices, laboratories, hospi-

tals, accommodation, kitchens and much else; paths overgrown with plants' and a substantial population of rats. (1)

According to Mr Headland "the history of South Georgia in a large part the history of whaling in the Antarctic. The island was one of the most important places in the world for the whaling industry between 1904 and 1965. At its peak, in 1917/18 for instance, six shore stations were operating. In 1911/12 eight floating factories worked there; this included those using whole whales and others processing flensed carcasses from shore stations." (2) Because the operations were contemporaneous and the same techniques were used artifacts can be collected from all over the island. *References: The Island of South Georgia, Robert Headland, published by the Cambridge University Press, 1984. (1) page 17 and (2) page 110.*

## Varied programme for Campbell Island team

The new Campbell Island team was announced recently by the New Zealand Meteorological Service.

Mike Fraser, a meteorological technician of Wellington will be the leader. It will be his second year at Campbell, the first being in 1979-80. He also spent a summer at Vanda Station in the Antarctic in 1983-84 and made three visits to Raoul Island in 1977-78, 1981-82 and 1987-88.

The electronic technician is Rob Humphrey of Wellington, who has also spent time at Campbell and Raoul and the second meteorological technician is Linda Summersby of Auckland who is making her first trip. The mechanic will be Angus McAllister of Wairoa and the conservation officer Jacinda Amies from the Department of Conservation at Tuatapere.

All five were to sail south on the Daniel

Solander, a Nelson based fishing boat on the 14 October. Enroute they will call into Enderby Island to resupply a fuel depot left there during a Naval Department of Conservation expedition last season. They will be met there by a helicopter from Helicopter Services in Taupo which will be undertaking a proving flight to establish a route to Campbell Island in case of emergencies. The Aerospatiale Squirrel will be piloted by John Funnell and Grant Biel. An automatic weather station will also be installed at Enderby Island as part of the meteorological network.

Returning to Nelson by October 23, the Daniel Solander will bring the 1990-1991 party back. Led by Mark Crompton of Hokitika it comprised Roger Moffat, a mechanic from Christchurch; Bill Perry, an electronic technician from Wellington; Steve Croasdale, maintenance officer from Tauranga and Steve Knowles, from Nelson who was the met officer.

While last years team had possibly a record number of visitors from the tourist ships Trade Wind, World Discoverer and Frontier Spirit

this season only the Trade Wind is likely to call, although the navy may visit late next year.

As most of the meteorological programme has now been automated much of the team's work will be the two upper atmosphere soundings taking by balloons each day and manual surface visual operations taken three times daily, base maintenance and support for the work being undertaken by the Department of Conservation.

This is likely to involve a number of projects. They include monitoring the population of black-browed and grey-headed mollymawks at Bull Rock to collect further data so that breeding success of the different species can be assessed. It is already known that the success between the species and between the colonies is variable and the additional information may reveal patterns. More information is needed on the numbers of each species rather than the totals of both. Little is known of the diet. Photographs may be taken each month at Bull Rock and the Courrejolles as well as regular ground counts. The Yellow-Eyed penguins are

also likely to be counted regularly. Data, collected this coming year can then be compared with that 1987-88 when some colonies were intensively monitored. Trends can also be compared with those on the mainland and Stewart Island. Counting the population of Rockhopper penguins and monitoring of the banded birds is likely to be part of the work as is the recording of the band numbers of the Royal Albatross and monitoring of their population and breeding success. Observations of the Wandering Albatross and other birds will also be made.

Sealions and Elephant Seals at Whale Bay, Capstan Cove, Middle Bay and Sandy Bay will be counted regularly and occasional counts made at other sites. The date and location of pup births will be recorded and pups tagged. Tag numbers and colours of other sealions will also be noted. A survey of the New Zealand fur seals at Rocky Bay may also be repeated from previous years. Whale sightings will be recorded.

In addition Linda Summersby and Mike Fraser are keen divers and will be undertaking limited work for the Ministry of Agriculture and Fisheries and the National Museum.

*A semi-albino yellow-eyed penguin, Enderby Island, along side a bird with regular plumage. Photo Neville Peat, DOC*



IWC

## 43rd meeting of the Commission decides to continue moratorium

The 43rd meeting of the International Whaling Commission (IWC) concluded in Reykjavik, Iceland in late May with the continuation of the moratorium. No interim quotas were set and the policy of setting small quotas for aboriginal subsistence whaling was continued. The core element of a revised management procedure for any resumed commercial whaling was adopted. The lethal scientific research proposals from Japan and the USSR were condemned and a report provided by the scientific committee, in response to a New Zealand initiative from the 1990 meeting, which gave an account of the most threatened species of small cetaceans was adopted by consensus. Small aboriginal subsistence quotas were set for the traditional whale hunting communities in Alaska, Greenland and the USSR.

Participating nations included Australia, Brazil, Chile, China, Denmark, Finland, France, Germany, Iceland, India, Ireland, Japan, Lucia, Mexico, Monaco, Netherlands, New Zealand, Norway, Oman, St. Lucia, St Vincent, Seychelles, South Africa, Spain, Sweden, Switzerland, USSR, UK and USA. Among the observers for the 1991 meeting were representatives of the Animal Protection Institute, Care for the Wild, Dolphin Connection, Center for Marine Conservation, Cetacean Society International Environmental Investigation Agency, Greenpeace International, Humane Society for the USA, International Fund for Animal Welfare, International Wildlife Coalition, Monitor Consortium, Whale and Dolphin Conservation Society, World Society for the Protection of Animals and the World Wide Fund for Nature.

As usual the Commission met in two parts with scientific committee meeting this year, for 12 days prior to five days of meetings of the working groups and sub committees of the technical committee followed by the five day plenary session.

Key issues considered by the scientific committee comprised Comprehensive assessments

of four main groups of whale stocks and the revised management procedures. The stocks considered were the North Atlantic fin whales (which had been the subject of a special meeting held at Reykjavik in February); the bowhead whales considered at a further special meeting held immediately prior to the annual meeting in May, the North Pacific minke whales and the North Atlantic minke whales as well as the completion of work relating to the Northeast Atlantic arising from the 1990 Comprehensive assessment of North Atlantic minke whales.

At the conclusion of the previous meeting of the IWC in July, 1990 (see Antarctic Vol. 12/2/3), the scientific committee had been given the task of advising the Commission on a revised management procedure. Several options were discussed and agreement was reached on the "Cooke" procedure, a complicated model designed to project the number of whales that could be killed in any one year from a specified stock while still maintaining at least 55 percent of the original stock size with a certainty of 95 percent. A resolution sponsored by the leading conservationist countries embodying the core of the procedure outlining management rules to control future whaling was subsequently

adopted with the final details still to be worked out. New Zealand was the only conservationist nation to abstain from the vote adopting the revised management procedure. Explaining New Zealand's vote Commissioner Ian Stewart said that the government and of New Zealand could not support a management procedure which aimed inter alia to achieve a reduction in numbers for Antarctic Minke whale of over 100,000 animals over a time. The first stock which would be exploited if commercial whaling resumed would be minke whales in the southern ocean. Japanese scouting expeditions over the past have provided an agreed estimate for minke population for Antarctic waters in the summer. Some of these whales will have overwintered in New Zealand waters. It is expected that by next year's IWC meeting the Scientific Committee will have worked out the final details of the procedure which might lead to renewed allocation of quotas for some stocks. A major limitation of the procedure is that it adopts one uniform approach to all whale stocks regardless of their depletion or relative abundance; if the stock is above a certain target conservation size it has to be depleted or "turned" until the population level conforms with the standard pattern. However it does tie quotas to smaller geographical areas than in the past.

The scientific committee was unable to recommend a multi-stock procedure and the trade off between high catch levels and lower final stock size and lower catches with higher final stock size was unresolved with the committee requesting advice from the Commission. Independent verification of the computer programmes for the revised management procedure has also been requested by the scientific committee.

Chaired by Mr Irberger of Sweden, the plenary session of the meeting began in Reykjavik on 27 May and continued until May 31.

The pro-whaling nations Iceland, Japan and Norway sought to have the moratorium lifted, opening the way for a resumption of commercial whaling. Indeed Japan announced its intention to seek at the 1992 meeting IWC to

seek a quota for 4,800 minke whales for the 1992/93 season. This would allow Japanese to continue to take the minke whale found in the sub-Antarctic waters of New Zealand and Australia. Conservationist nations sought continuance of the moratorium.

Requests from Japan for 300 minke whales in Antarctica and the USSR for 95 for minke and fin whales to be caught in the Okhorst Sea under the guise of scientific research, the proposals were condemned.

As well as reaffirming New Zealand initiative for the inclusion of small cetaceans in the work of the commission there was discussion of a US proposal to include an ongoing agenda item on the Commissions Competence for Cetaceans contributing to a debate on the role the IWC might play in management. A number of small cetacean species are already endangered because of commercial fishing. Opposed to IWC regulation of small whales were Japan, Iceland, Peru, St. Vincent, Mexico and Norway but in favour were the Netherlands, Sweden, Australia, Germany, UK, Switzerland Seychelles, Finland, Oman and Ireland in addition to the US and New Zealand.

In the meantime however, the commission received the report of the scientific committee regarding the status of certain small cetaceans and agreed to forward it to the secretariat for the United Nations Conference on Environment and Development (UNCED). The report confirmed the severely depleted and endangered status of many species of small whales, dolphins and porpoises, and led to renewed calls from conservationist countries for the IWC to take a more active role in managing small cetaceans. The whaling nations and other countries with large deliberate or incidental dolphin kills, however, are firmly opposed to IWC involvement in providing management advice on small cetaceans and have for many years blocked further progress by the IWC.

Since the IWC meeting Ian Stewart went to the UNCED preparatory meeting in Geneva in August and put on the table a proposal that New Zealand is actively promoting which calls for three things:

> a reaffirmation of the recommendation to the 1972 UN conference on the Human Environment calling for a ten year moratorium to be continued i.e. until 1995.

> Support for the IWC's role in relation to small cetaceans and encouragement to take further measures towards their protection.

-> The convening of an International Conference by 1995 to revise international measures for the protection of cetaceans.

The next meeting of the Commission will be held in Glasgow in June 1992 and will be chaired by the Mexican Commissioner.

### *July update\**

## **Decision on environmental protection protocol temporarily deferred**

*\*(Please note that there has since been a further meeting at which a decision was made on the Protocol. Coverage of that meeting is included in our next issue Vol 12.7.)*

The third session of the Antarctic environmental protection negotiations concluded on 23 June, 1991 in Madrid without the adoption of the Antarctic environmental protection protocol agreed to tentatively at a previous meeting in April. The Protocol to the Antarctic Treaty included a ban of 50 years (at least) on mining activities in Antarctica. Parties had hoped to sign the Protocol on 23 June, the 30th anniversary of the Antarctic Treaty.

Two days before the beginning of the meeting the US indicated that it was unable to accept the agreement without significant amendment to the provisions of the mining ban.

The US delegation tabled an amendment that would have enabled the veto powers given to the Consultative Parties to be overridden. Under the proposal a party may withdraw from the agreement if an amendment following mining had not been ratified within three years of its being accepted. (By implication this would mean that nations that did not ratify an amendment to block mining approval would be condoning mining without regulation.)

During the meeting a compromise text negotiated maintained the withdrawal clause proposed by the US and toughened the amendment clause and conditions under which the

protocol could enter into force. While most of the delegations present at Madrid were able to accept the compromise text the American delegation announced that it was not in a position to do so and would need time to refer the document to Washington for approval.

In Washington on 3 July President George Bush announced that the US was willing to sign the compromise text.

The Protocol puts in place a comprehensive and internally consistent environmental protection regime that will apply to all human activity in Antarctica. It includes a prohibition on mining that will last for at least 50 years.

At the conclusion of that 50 year period the mining ban could only be lifted by the decision of the majority of the Consultative Parties including three quarters of the current consultative parties as at 1991. Any such amendment lifting the ban would only enter into force on its ratification by three quarters of the Consultative parties including all the current (1991) consultative parties.

The cutting edge of the new regime is a set of detailed Environmental Impact procedures annexed to the protocol with which all activity whether government or non-governmental must comply. Also included are strong measures on collective inspection and compliance and response action and dispute settlement. The committee for environmental protection which will be established when the protocol comes into force has been given a single "whistle-

blowing" function where environmental problems arise. Non-government organisations will have observer status on that committee.

In addition to the Environmental Impact assessment annex the Protocol also attaches annexes on the conservation of flora and fauna, marine pollution and waste disposal.

The protocol was expected to be adopted and open for signature at the final session of

the 11th Special Consultative meeting on the Antarctic Environment which took place in Madrid prior to the Bonn meeting which is the 16th Antarctic Treaty Consultative meeting and was held from 7 to 18 October. This meeting looked at a number of issues associated with the protocol such as the protected areas and non-government activity.

## Evaluation of the Bahia Paraiso continues

Scientific and technical assessment of the environmental impact caused by the sinking of the ARA Bahia Paraiso, in Antarctica near the US Palmer Station in January 1989 is continuing according to a joint progress report prepared by the Instituto Antarctica Argentino and the U.S. National Science Foundation in April of this year. Recently released, the report says that both countries are studying the impacts of possible future action regarding the sunken hulk and also that they are looking at the effects of natural changes to the current situation and developing contingency plans accordingly.

The ship is currently stable with no significant, readily visible oxidation or other corrosive phenomena weakening the hulk. It is resting solidly upside down on a firm foundation. Only two meters of the surface of the hulk remain visible at low tide and it is unlikely to move from this position or break up, for the moment.

Because the ship is virtually surrounded by islands and rock outcrops it is protected from encroaching icebergs and vessels. Towards the east of Anvers Island a small area is exposed to the open sea but it is relatively shallow.

Although the initial spill affected breeding sea birds and the intertidal community consisting of limpets and macroalgae, fish and mammal populations and the subtidal benthic community are said not to have suffered significantly. Any further spill is allegedly unlikely as the remaining hydrocarbons are contained in

several interior tanks. Such a spill however, would cause the greatest damage during the summer when seabird populations are breeding in the area. The intertidal community also remains vulnerable.

Immediately after the accident, the National Science Foundation organised a scientific response team, which included some Argentine scientists. They quickly gathered data to help with an assessment of the environmental consequences within the area. At the same time Argentine, and US groups were working together, with support from Spanish, Korean and Chilean ships to minimise the scope of the spill, recover hydrocarbons and other possible pollutants and to pump oils and other fuels from the exposed exterior tanks of the ship. This cooperation between the scientists and technicians from the states and Argentina continues as they try to determine the long-term effects of the spill by carrying out studies on the behaviour of hydrocarbons within the maritime environment and assessing possible alternatives regarding the disposal of the bulk and remaining fuel. Technical and scientific studies are also being developed in order to address future contingencies.

In the meantime the hulk is periodically inspected by the Argentine and US personnel and during the summer Argentine is likely to base a ship near the Bahia Paraiso carrying qualified personnel and special equipment to contain a limited spill should it occur. At Palmer

Station the US maintain complementary equipment and personnel ready to work with the Argentineans.

A number of alternatives for dealing with the hulk are being considered both in terms of their economic feasibility and environmental preservation. Many of the alternatives require the removal of the remaining hydrocarbons and all require a safe, efficient and comprehensive capability to contain and clean any further spillage that may occur as a result of a natural phenomena or any such a removal operation. The report also points out that removal of the hydrocabrons would involve significant industrial activity, highly skilled personnel specialised equipment, and a potential risk of spills during the operation. The two organisations estimate however that if the operation is feasible it should be possible to recover between 70 and 80 percent of the estimated 64,000 gallons remaining in the hull. Another alternative is to leave the hulk alone

and monitor its condition and the rate of hydrocarbon loss while always keeping readily available, the ability to contain and absorb any unforeseen, catastrophic spill.

Part of the process for assessing the environmental impact of these alternatives includes a survey of the area which will focus on the topographic and water circulation characteristics and the synchronizing of recovery operations with the life cycles of different species. The initial survey would be based on the information obtained by the National Science Foundation at Palmer Station and "the analysis that both countries are making on the consequences of the spill caused by the accident..

The report concludes with the statement that the assessment, which could continue during 1992, "will permit, in the end, a choice of the course of action that provides the best protection of the environment in the affected area. The results will be provided to the Contracting Parties of the Antarctic Treaty System.

## Further developments at International Antarctic Centre

The tender for the building of the second of the three stages involved in the construction of the International Antarctic Centre in Christchurch, New Zealand was let in November and building has begun. Set on a two hectare site in Orchard Road the first stage comprising, offices, warehouse facilities and a terminal, was begun on 8 January 1990 and opened seven months later in time for the 1990-91 Antarctic season. Costing nearly \$12 million it accommodates the US National Science Foundation and DSIR, Antarctic.

The purpose-built complex is owned by the Christchurch Airport Company and leased to the two Antarctic organisations. According to Mr George Bellew, Chief executive of the Airport of the Company "The first stage of the complex basically looks after the logistic and administrative needs of the existing national programmes.

There are essentially three elements within the two buildings with the terminal providing the interface. The terminal acts as an assembly and processing point for people going to and coming from the ice. For practical reasons such as the clothing required for Antarctica and the

frequent long delays prior to departure of southbound aircraft it is considered that such a function is best performed away from the air conditioned main terminal building. Within the terminal is a check-in counter and basic customs facilities.

Accommodated in the warehousing building are the cargo and clothing stores for the National Science Foundation, the US Navy and the New Zealand Antarctic Research Programme. The building has a high stud with mezzanine floors and fronts a large secure cargo apron. Personnel going south deliver all baggage that is not hand-carried to this build-

ing and are kitted out with Antarctic clothing. The building also contains a small post office for US personnel.

On the eastern end of the ground floor of the administration building are the DSIR offices and a conference room. A large lobby separates them from the Library. Above the library on the western end of the building are the National Science Foundation offices and support services. At the eastern end are the US Navy and Airforce offices.

Also to be accommodated upstairs at the eastern end of the building will be the IEIS, the International Environmental Information System. Initiated by Professor George Knox, formerly Professor of Zoology at the University of Canterbury, this facility is being designed to provide a computing environment for capturing, documenting and preserving useful Antarctic data and information providing a research resource that will be available to all Antarctic Scientists. It will also provide the computational basis for the development of a comprehensive Antarctic data information system, incorporating Antarctic Environmental Data Directories, as a computerized information tool for the conduct of research in Antarctica. Such a tool will be an aid to management and provide a broadly based resource for public information and education.

A comprehensive Antarctic environmental data base will provide data critical for environmental impact assessment, data for environmental management and for the coordination of developing programmes in environmental monitoring and information against which to measure change. Plans also exist for the integration of the proposed development with data management in connection with the Antarctic contribution to the International Geosphere-Biosphere Programme (IGBP). Another aspect of the project is the development of a Geographic Information System GIS for the Ross Sea and adjacent areas. In short the centre will bring together scientific and general information from a variety of sources. Utilising a budget of \$200,000 to be available for each of the next three years, hardware and

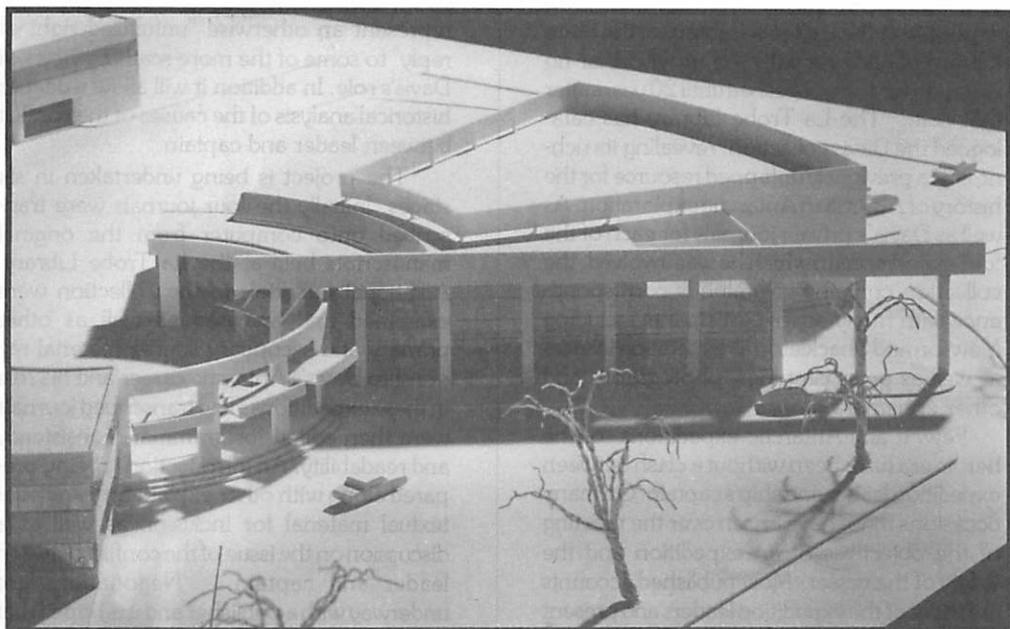
processing equipment from the US, digitized maps from the Department of Lands and Survey Information will be the first features of the facility to be available to interested users. (A basic display of Geographic Information System is scheduled for early December.) It is hoped that the facility will, in due course, work with similar systems operated by associated organisations.

The design of the first stage of the complex in which these facilities are accommodated allows for administrative and logistic support for other nations working in the larger Ross Dependency to be added. Among those who have expressed interest are the Italians, West Germans, French and South Koreans.

In March 1991 The Board of Directors of Christchurch International Airport Limited gave approval to proceed with the second stage of the International Antarctic Centre complex. Costing in excess of six million dollars this building will comprise a foyer and exhibition area, a shop and cafe/restaurant.

Plans have been drawn up by Christchurch architects Warren and Mahoney for the end of 1991 and the contract for the building of the next stage has been awarded to Armitage Williams Construction Ltd. The total floor area is approximately 1900 square meters. It will be a wedge shaped building with tall steep walls of white precast concrete. The axial lines of the existing buildings are reinforced and extended by the straight line of columns and beam so as to continue the references to the South Pole and east-west meridian. The foundations for the new building have already been laid. It should be handed over to its managers by April for installation of interior fittings and displays and opening in September.

An Australian consultant Tim Hobson of T.J. and L.E. Hobson Pty Ltd, Sydney, exhibition concepts designers and project managers, has been appointed to design the displays for the centre which will provide "visitors with a high level of experience, enjoyment and entertainment through the use of the latest technology as well as participatory and interactive exhibits. It will be accurate, credible, informa-



tive and educative and appeal to the general public. The development will also provide a forum for communicating the work of the various national Antarctic programmes participating in the International Antarctic Centre illustrating the principles of international cooperation within the Antarctic Treaty system and encouraging balanced presentation of issues. Tenders have already been let for aspects of

*The International Antarctic Centre* the project including some engineering work and montages. A photographer, Kim Westerskov is currently in Antarctica "collecting images."

A feasibility study is also being undertaken for an accommodation block which will represent stage three of the International Antarctic Centre.

## Books

### "Gloomy" Davis to have a "right-of-reply"

Louise Crossley, of the University of Tasmania has undertaken the editing of the the Antarctic Journals of Captain John King Davis which should be published in 1991-92.

Captain John King Davis's Antarctic career spanned nearly 25 years, and included three of the most important expeditions of the heroic age of Antarctic exploration. He served with Shackleton's British Antarctic Expedition of 1907-09, Mawson's Australasian Antarctic

Expedition of 1911-14 and Shackleton's Imperial Trans-Antarctic Expedition of 1929-30 and BANZARE, Mawson's British, Australian and New Zealand Antarctic Research Expedition of 1929-30.

Although British by birth, Davis spent most of his working life in Australia as a Merchant Navy Captain and as Commonwealth Director of Navigation until his retirement in 1949. On his death in 1967 his extensive papers were

deposited at the La Trobe Library of the State Library of Victoria with the proviso that no material was to be published until 20 years after that date. The La Trobe Library has catalogued the Davis collection, revealing its richness as a previously untapped resource for the history of Australian Antarctic exploration. As well as Davis's private journals for each of the four expeditions in which he was involved, the collection contains voluminous correspondence with many other participants including Mawson and Shackleton as expedition leaders as well as press clippings, photographs and other ephemera.

Few, if any Antarctic expeditions of the heroic era have been without a clash between expedition leader and ship's captain. On many occasions these have arisen over the meeting of the objectives of an expedition and the safety of the vessel. Most published accounts are those of the expedition leaders and present only one side of the story; few of the captains serving Mawson or Shackleton wrote but Davis is an exception. His journals written during BANZARE and the Ross Sea Relief Expedition of the ITAE provide a unique and illuminating insight into other side of the controversies.

The journals also reveal some of the enormous technical difficulties of navigating an underpowered overloaded ship in uncharted waters in extreme ice and weather conditions as well as the intense physical and psychological strain that this imposed on the ship's captain. Davis's account of his struggles to hold the Aurora in the precarious anchorage at Commonwealth Bay to wait Mawson's return from his ill-fated expedition, coupled with his anxiety over the relief of the Western base, is said by Louise Crossley "to rival in its dramatic power Mawson's own account of his terrible privations."

Davis is known to us only through the writings of the expedition leaders and from other brief accounts. The journals provide a unique insight into the real nature of the man known as "Gloomy" and their publication will

represent an otherwise "unfulfilled right of reply" to some of the more scathing views of Davis's role. In addition it will allow a deeper historical analysis of the causes of the conflict between leader and captain.

The project is being undertaken in six stages. Initially the four journals were transcribed onto computer from the original manuscripts held at the La Trobe Library. Additional materials in the collection were examined and analysed as well as other primary and secondary source material relevant to Davis's Antarctic career and his role in these expeditions. The transcribed journals were then edited for grammar, consistency and readability. An introduction is being prepared along with other explanatory and contextual material for inclusion as well as a discussion on the issue of the conflict between leader and captain. Negotiations are underway with a publisher and it is hoped that the journals will appear sometime in 1992.

***Antarctica, the Ross Sea Region,***  
**edited by Dr Trevor Hatherton for**  
 DSIR Publishing, 1990. Reviewed by Dr  
 Peter Barrett, Victoria University  
 WELLINGTON

To summarize 30 years of scientific endeavour covering all fields of science in a land that very few of one's readers have visited is a daunting task. It is one that Trevor Hatherton has for some time urged on New Zealand Antarctic scientists, and has now guided them to its completion.

The product is a comprehensive survey of our present knowledge and understanding of the Ross Sea Region of Antarctica, the most varied sector of the continent in physiography and biology. It is divided into five parts - exploration, the land, the climate, life and Man, the most recently introduced species. Each part comprises several chapters, 16 in all, written by New Zealand scientists who are all authorities in their fields. The near 300 page volume concludes with a sketch of the authors' background, a list of suggested reading, and an effective index.

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The introductory section on exploration takes us all the way from the postulated existence of a polar continent by the early Greeks through the "Heroic" era of exploration culminating in the conquest of the South Pole, through the Byrd expeditions to West Antarctica and the International Geophysical Year of 1956-57 to the mid 1960s, by which time the Ross Sea region, like the continent itself, was largely known if not understood. The three subsequent sections present what is currently known of the region, most of which most of which has been gained in the last 30

years.

The section on the land begins with a comprehensive survey of 3000 million years of geological history recorded, albeit somewhat patchily, by the rocks of the Ross Sea region. Fossil plants and animals are illustrated and show that in past times the climate was much milder than today. Then follows a brief but well illustrated description of the landscape represented by the Transantarctic Mountains and the processes that are modifying them. One facet of the landscape that deserves and receives special treatment is soil, which many will be surprised

to discover can form at all under polar conditions. The descriptions and photographs leave no doubt. Erebus, the volcano, is singled out as one of the outstanding landmarks of the Ross Sea region, as well as the object of significant advances in the understanding of volcanic behaviour. The section concludes with a review of the shoreline features of the Ross Sea, and an assessment of likely consequences to the coast of exploitation of petroleum.

The climate and its effects is introduced with an excellent synopsis of climatic history, radiation balance and temperature, atmospheric circulation over the continent and local weather with a sound justification for continuing atmospheric and meteorological research. Concern over global warming is picked up in the following section, which reviews the region's many forms of ice - ice sheet, glaciers, ice shelves and sea ice, and makes the point that the mass balance for the continent is still unknown. The section concludes with a section on the Dry Valleys, for many the most fascinating part of the Ross Sea region, and here very nicely described and explained - almost a book within a book. But why did the writer not have a paragraph to answer the question, which I have heard the editor ask on several occasions, "Why are the Dry Valleys dry?". The answer is in there, but requires searching.

Life in the region is introduced with a discussion of the environment and processes operating in the marine realm and the biota that flourish there. The illustrations show an amazing variety of colour in a lightless submarine environment, in contrast to the stark landscape of rock and ice above. The composition of flora and fauna are moderately well known and scientific interest is now concentrating on adaptations by many different types of organisms to environmental extremes. Temperature in the marine realm, though near freezing, is at least stable year round. Here both fish and marine mammals have adapted with impressive success, though the chronology and sequence of adaptation are

poorly known. The discussion of life on land documents far more difficult living situations to which organisms have adapted, for example annual air temperature changes from +10 to -20 deg C on the land surface, or an increase in salinity from 35 to 100 0/00 and in temperature from -2 to +250C as the bottom of Lake Vanda became isolated from the sea hundreds of thousands of years ago. As one might expect algae, earth's oldest organisms, have done the best, and are in fact quite widespread in the otherwise barren landscape, some even living between the grains of ancient sandstones that cap the Transantarctic Mountains.

The chapter on birds of the region reviews the enormous advances in documenting and understanding the distribution, behaviour and life cycle of penguins and other birds in the region in the last 30 years, and indeed gives this non-biologist the impression that few major scientific questions remain. One of these is plainly the behaviour of birds away from their nests - the first results of satellite tracking point to exciting advances from this new technology. It is clear, though, that birds have a fairly tenuous hold on the continent, which could be weakened as a result of increasing human activity on the continent.

The volume concludes with a comment on Man in the Antarctic describing the qualities of successful expeditioners and reflecting on the change in style of life and work that has taken place in the Antarctic largely in the last 20 years. For some, it is claimed, national science programmes in the Antarctic no longer offer sufficient challenge or opportunity, giving rise to private expeditions and a rapidly expanding tourist industry. Perhaps the most significant direct threat to the Antarctic environment is not mineral exploitation, but the impact of tourism itself. The last few pages reviewing the international background against which all Antarctic activity takes place, foresee this, though at the time of writing the minerals issue had not been finally resolved. Now, of course, mineral exploitation has been banned for 50 years at least, and a

comprehensive environmental protection plan is being developed for all activity, not just that relating to minerals.

The challenge for the writers of this volume, as well as the editor, was to present their field of knowledge in a form that would make it accessible to the public. To what extent they have succeeded must be left for the public to judge, but in my view success is deserved. The strengths of the volume are in the impressive body of information it contains, the helpful way in which the information is structured and the superb coloured illustrations of all aspects of the region from microbes to mountains - the volume will be as much at home on coffee tables as in bookshelves. It should be an excellent resource book for school projects, and a good introduction to the Antarctic continent for any interested adult.

I have only a few points of difference with the volume. More mention could have been made of individuals and institutions in recent times. This would have been particularly useful where different points of view were taken for example the dynamic glacial history presented for the Dry Valleys is the Webb-Harwood hypothesis (Ohio State University), but is inconsistent with the Denton (University of Maine) hypothesis favouring an old cold icesheet implicitly accepted in the preceding discussion on soil development.

It also seems unfortunate not to have included a fuller treatment of two areas of endeavour led by NZ scientists - the structure and history of the Transantarctic Mountains, which form the margin of one of the world's largest rifts, and studies on the behaviour and properties of sea ice.

And perhaps more could have been made of the scientific challenges that remain, for they do, despite the last three decades of good work. The science in many cases is presented as if our understanding were sufficient. This is far from the case, and the public should be made aware of it. New Zealand's Antarctic research programme has allowed us to contribute significantly to and given us some leverage in global debates on ozone and clim-

ate change, and the minerals regime, precursor to the current environmental protection regime recently negotiated. To maintain the benefits and our international standing we must continue with good research programmes

Two further points. The choice of colour in several diagrams is awful (deep blue for ice and white for sea in figures 3.1 and 3.4, and the intensity of redness decreasing with elevation for the topographic map of Ross Island in figure 6.10. And a point of curiosity - Professor Taylor notes quite correctly that female scientists have made substantial contributions to Antarctic research, and references Plate 15,16, an excellent photograph showing a woman geologist preparing dinner at a field camp. An editorial quirk?

None of these comments should be allowed to diminish the considerable achievement represented by the volume, which does excellent service to New Zealand as well as Antarctic science in presenting the discoveries and improved understanding of this significant part of our natural world to the wider community.

**Footnote:** *Some readers will observe that this is the second review that "Antarctic" has published of the Ross Sea Region. Before engaging in lengthy correspondence your editor wishes to point out that the "marbles" are not dispersing and nor will this be a common occurrence. The first review was rather general and some felt that justice was not done.*

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**Chronological List of Antarctic Expeditions and Related Historical Events Studies in Polar Research, Cambridge, compiled by Robert K. Headland, Cambridge U.K. Hardcover N.Z. \$221. ISBN 0 521 30903 4**

This volume of 730 pages is possibly one of the most useful handbooks of the Antarctic yet produced. By the author's admission "The purpose of the Chronology has been to

record as concisely as possible the history of discovery, exploration, exploitation, mapping, scientific investigation, administration and some related subjects in Antarctic regions". That it does in its 3,342 entries covering 2,800 expeditions mostly private and a host of other items some only remotely associated with the continent.

In the introduction he explains the origin and development of the work, its preparation and computing. We are told that a list was first compiled by Dr B. B. Roberts in 1945 for the Research Department of the Foreign Office in London. It became available publicly in 1948 as part of the second edition of the *Antarctic Pilot* when it was issued by the Hydrographic Department in London. Dr Roberts continued editing the list and published more comprehensive versions in two issues of the *Polar Record* in 1958 with a view to producing a larger volume. He died in 1978 leaving an extensively annotated copy of the 1958 edition and about 800 index cards giving details of additional entries, a series of files on many national expeditions with related correspondence, a collection of notes about supplementary sources which he intended to check and other related papers. In addition he left an endowment the Brian Roberts Fund, to provide money for research on polar matters.

In 1983 the administrators of the fund asked Robert Headland, archivist at the Scott Polar Research Institute in Cambridge to revise the chronology. Even using a computer it has taken six years to complete the volume. Every entry is independent and includes unprinted data that are extracted and combined with printed information to generate the index.

Events and voyages have been interpreted somewhat liberally and cover a geographical area which includes the sub-Antarctic Islands or those in the "peri-Antarctic" as Headland refers to them; the list is comprehensive.

In another section entitled *Observations* he covers Legislation, the Antarctic Treaty

and SCAR, stages of exploration and other activity, Antarctic industries, National Antarctic operations, International expeditions, tourist and other private expeditions, and winter scientific stations. A fourth section entitled *Statistical examination* covers the early sealing industry, vessels engaged in the Antarctic sealing industry from 1786 to 1928 and sealing vessels visiting certain sub-Antarctic sealing grounds. He has compiled the stations and vessels and numbers of whaling taken as part of the industry and includes an independent section on Antarctic winter stations open between 1900 and 1988. This is followed by section five entitled *Information*, providing sources, acknowledgements and advice. A detailed *Chronological list* and a *bibliography* have of course been included. The index is a mere 105 pages in length!

The first reference the chronological list is to a Phoenician expedition circa 700 BC and the last is 1988 eighth Special Consultative Meeting held in Paris at which Sweden and Spain were admitted to consultative status. Did you know that in 729 AD the Venerable Bede from England postulated that the poles were regions of eternal cold; in the other he thought there was an ocean but in the south, a great land. Many others were to postulate too as the book, which is far from boring, indicates. Did you also know that Captain Robert Falcon Scott's "Discovery Expedition was the first to use electric light in Antarctica - power was provided by a windmill.

In addition to the text there are maps, drawings and black and white photographs. In short Robert Headland has compiled a comprehensive reference book which should be in the libraries of all organisations associated with the Antarctic and is an extremely useful addition to private collections.

**Footnote:** *By special request Mr Headland would like to know of any items missing from the Chronology relating to the Campbell and Auckland Islands in the 1940's and post war.*

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