



# SPRI

## REVIEW-97

71st Annual Report of the  
SCOTT POLAR RESEARCH INSTITUTE  
University of Cambridge  
Cambridge, England

# SPRI REVIEW 97

## The 71st Annual Report of the SCOTT POLAR RESEARCH INSTITUTE University of Cambridge

### Year ending 30 September 1997

Director's introduction	1
Report on the Scott Polar Research Institute	2
Regulations, Scott Polar Research Institute	3
Research overviews	4
Sea Ice and Polar Oceanography Group	4
Remote Sensing Group	7
Glacier Hydrology Group	9
Polar Ecology and Management Group	10
Social Sciences and Russian Studies Group	10
Polar History and Humanities Group	12
Polar Biology	12
Teaching and lectures	13
Library and Information Services	13
World Data Centre C, Glaciology	15
Picture Library	15
Archives and Museum	15
Polar Publications	17
Visitors to the Institute	17
Friends of the Scott Polar Research Institute	17
Gino Watkins Memorial Fund	18
Scientific Committee on Antarctic Research	18
International Glaciological Society	18
Publications	19
Members of the department	20
Financial support	21

### Director's introduction

In *SPRI Review* for 1995 and 1996, I reported the beginnings of major developments regarding the future of the Institute. These had to do with the Shackleton Memorial Library project and the integration of the Institute's University officers with the teaching function of the University. I need now to report further on these developments. In brief, work began on the construction of the Shackleton Memorial Library on 1 September 1997 — with a planned completion date of 4 July 1998 — and the University has adopted a new administrative structure for the Institute that is to become effective on 1 December 1997.

*The Shackleton Memorial Library.* The library project was originally, in 1994, expected to cost about £0.75 million. Subsequent changes in the specifications, including the installation of a lift and a new heating plant, and rising building costs led to a doubling of the expected cost

by the time it came to letting a contract three years later. The University, as previously reported, had generously primed the pump with a grant of £0.35 million, but a steep hill remained to be climbed. At times we wondered if the hill were getting higher at a greater rate than we were climbing up it. Two major gifts, of £0.46 million (Wan 1.0 million) from Thomas H. Manning and £0.25 million from the government of the British Antarctic Territory, put the summit within our grasp. But still every penny counted, and we could not have reached the top without the very generous gifts from a large number of private individuals. For this broadly based vote of confidence in the future of the Institute, all of us here are deeply grateful.

Following the completion of competitive-tendering procedures, the construction contract was awarded to Messrs Haymills (Contractors) Ltd of Stowmarket on the

basis of architectural designs by Richard Brearley of John Miller and Partners of London. It gives me great pleasure, as I write on the last day of my Directorship (but see below), to be able to report that the stage has been reached where all the tearing out and digging down has been done. From now on the building goes up! But this part of my report would not be complete without paying particular homage to the person who, more than any other, is making it possible for the Institute to continue operating as all this building work goes on around us. Captain Joe Wubbold, retired some years ago from the United States Coast Guard. For many years he had been breaking ice in the Great Lakes and at both ends of the world. He joined us to do the MPhil in Polar Studies, and so loved the Institute and Cambridge that he stayed on. When it became clear that the Shackleton Memorial Library was to move from project to reality, Captain Joe observed that overseeing construction of a building was not in principle different from overseeing the building of a ship — and he had overseen a good few of those. Thus, time in the Institute has come to be measured in nautical watches and the bell of *Terra Nova* is rung accordingly, walls are bulkheads, toilets (loos) are heads, and basements are bilges. To everyone's delight, builders and staff alike, Captain Joe calls the tune with his Plans of the Day, and the work of the Institute goes smoothly on! The Institute is greatly blessed by the many people who contribute their services voluntarily. Captain Joe is one of them, but on 4 July 1998 — a day of special significance to him — we shall owe him a very special vote of thanks.

*Administration.* In the 1995 *SPRI Review*, I reported that it had been agreed 'that preparatory work for [the University review of the Institute] should be brought forward.' Following a great deal of work by Professor N.O. Weiss and Mr J.R. Payne, Chairman and Secretary, respectively, of the Council of the School of the Physical Sciences, the Council submitted a *Report on the Scott Polar Research Institute* to the General Board on 6 November 1996. Past University reviews of the Institute, while underlining the values to be served by the continuing support for the Institute, have broadly resulted in 'steady as you go' policy recommendations. The present report makes some rather more radical recommendations. For this reason the *Summary* of the report, and the 'Draft Regulations' referred to in that *Summary*, following their acceptance by the University, are reproduced below.

The *Summary* refers to the retirement of the present Director in 1997, and to the new Regulations becoming effective on 1 December 1997. Although, strictly speaking, events since the end of September 1997 are not germane to this *Review*, it may be more helpful for some of these events to be recorded here than that they be deferred, on a nicety, to the next *Review*. On 1 December 1997, Professor Keith S. Richards becomes Director for a five-year term. He is currently Head of the Department of Geography, a post that he will hold until 30 September 1999. The possibility that the Shackleton Memorial Library project would become a reality did not become clear

until after the Council's *Report* had been submitted to the University. It was then agreed that it was likely to be helpful if I stayed on until the end of September 1998 to see the Shackleton Memorial Library to its completion. For ten months I have the style and title of 'Executive Director.'

During the last five years the Institute has laboured under some uncertainties relating, in particular, to whether we should be able to continue for the next 30 years to assure our place as the world's most comprehensive polar library and to the outcome of the University review of the Institute, flagged in 1992 but not at that time expected to take place until 1997. The Institute has come through these uncertainties with flying colours. The future of the Library is assured and the opportunities for polar research have been broadened and deepened. The prospects are exciting. A large number of people have contributed resources and time far beyond the call of duty to make these outcomes possible. To all of them, I, on behalf of the Institute as a whole, am grateful beyond measure.

### **Council of the School of the Physical Sciences Report on the Scott Polar Research Institute 1996**

#### **Summary**

The central recommendation of this report is that the Scott Polar Research Institute continue as a separately identifiable enterprise within the Faculty of Earth Sciences and Geography and that the Institute's relationships with teaching departments be optimised with the aim of securing the long-term health of polar studies in the University.

The Council of the School of the Physical Sciences sees the Scott Polar Research Institute as an area studies research institution of a special kind. One thread running through this report is the role of the Institute's library as the pivot about which the other work of the Institute hinges. Another is the importance of the connections between the Institute and other University departments in relation to the various academic disciplines of concern in the polar regions. An important recommendation of the Council of the School in 1987, echoing earlier statements by the General Board and the Council of the School, was that University academic officers assigned to the Institute be associated with some suitable mechanism each with an undergraduate teaching department. The point has been repeated more than once since that time, and is addressed in this report.

Looked at in more detail, the Scott Polar Research Institute is uniquely an area studies institution in which the natural sciences and especially the physical sciences have an interest. The Council of the School believes that the rationale for an area studies institution must be multi- and inter-disciplinarity, both for intellectual reasons and to give the institution flexibility to respond to changing research priorities in its region.

An ideal scenario for the Scott Polar Research Institute in the eyes of the Council of the School is one in which key polar research fields are represented in the interests of its

members but those members are also closely related to departments in which allied research is being done. The Council of the School recommends that the regulations governing the Scott Polar Research Institute be amended so as to permit a special relationship with one particular department while establishing links with other departments and faculties, through a *management committee* which could contain persons from Schools of the University which might have a polar interest.

The Council of the School attaches special importance to continuing and strengthening the Institute's academic links with the Department of Geography. The Council of the School therefore recommends that the Department of Geography be invited to assume the special relationship suggested. The Council of the School recommends that the Head of the Department of Geography become a member of the proposed management committee *ex officio*.

The Council of the School's more specific proposal is to make it possible for any University office in Schedule J (i.e. one entitling the holder to sabbatical leave) to have duties concerning also the Scott Polar Research Institute. The Council of the School proposes that such posts be established in advance by the proposed committee of management for the Institute and that each such office be established in the appropriate department or faculty following appointment, but having duties which also concern the Scott Polar Research Institute. Ultimately all University academic offices having duties concerning the Scott Polar Research Institute would be treated in this way, subject to protection of the interests of the present staff of the Institute.

The Council of the School recommends that the Director of the Institute be appointed by the General Board on the recommendation of the Council of the School of the Physical Sciences for renewable periods of a maximum of five years at a time to hold the office concurrently with his or her substantive University office. The Council of the School recommends that the Director receive an administrative payment of an appropriate size, or that another University officer be appointed Deputy Director in the same manner and the single administrative payment be divided between the Director and the Deputy Director in proportions considered apt by the General Board.

To put into effect the foregoing proposals, the Council of the School recommends that from 1 December 1997 the present regulations for the Scott Polar Research Institute be modified as set forth in the section of this report entitled 'Draft Regulations.'

The Council of the School recommends that the Director of the Scott Polar Research Institute be encouraged to ensure as a matter of policy that postgraduate research students working in the Institute are made aware of the research environment and training opportunities open to them in their particular disciplines throughout the University and that, as far as is possible, reciprocal steps are taken on behalf of appropriate research students working outside the Institute.

The Council of the School recommends that post-

graduate taught courses in polar subjects be reviewed by the Faculty Board of Earth Sciences and Geography.

For the foreseeable future, the Council of the School believes that research in the Institute should be developed and built upon the two main broad areas of the Institute's present strengths, comprising the polar aspects of the physical sciences and the polar aspects of the human sciences, by persons holding posts assigned to departments in which cognate interests are pursued and having duties also concerning the Institute. The Council of the School recommends that the recurrent resources released by the resignations of Drs Dowdeswell and Williams and those which will be released when the present Director retires in 1997 be applied to polar studies in accordance with this grand strategy.

The Council of the School believes that closer contact between the British Antarctic Survey and the Scott Polar Research Institute is desirable. The Council of the School recommends that the Director of the Institute be encouraged to seek ways of strengthening the research links between the Survey and the Institute. The Council of the School recommends that the Faculty Board of Earth Sciences and Geography be encouraged to seek a closer connection between the postgraduate education and training which is carried out by the University and that which is undertaken in the British Antarctic Survey.

### **Regulations Scott Polar Research Institute**

#### *Management*

1. The Scott Polar Research Institute shall be a Department within the Faculty of Earth Sciences and Geography.
2. The Institute shall be under the general control of a Committee of Management which shall consist of:
  - (a) the Chairman of the Council of the School of the Physical Sciences, who shall be Chairman of the Committee;
  - (b) the Director of the Institute, who shall be Secretary of the Committee; and the Deputy Director, to whom the duties of the Secretary may be delegated by the Director;
  - (c) the Head of the Department of Geography;
  - (d) two persons appointed by the Council of the School of the Physical Sciences;
  - (e) two persons appointed by the General Board after consultation with the Councils of the Schools of the Biological Sciences, the Humanities and Social Sciences, and Technology;
  - (f) not more than two persons co-opted by the Committee, provided that it shall not be obligatory for the Committee to co-opt any person or persons. Members in classes (d) and (e) shall be appointed in the Michaelmas Term to serve for four years from 1 January following their appointment. Members in class (f) shall serve until 31 December of the year in which they are co-opted or of the following year, as the Committee shall determine at the time of their co-optation.

3. The Committee of Management shall meet not less than twice in each academical year. Five members of the Committee shall constitute a quorum.
  4. Subject to the powers of the Council, the General Board, and the Faculty Board of Earth Sciences and Geography, the duties of the Committee shall be:
    - (a) to promote teaching and research in polar studies;
    - (b) to co-operate with outside bodies in the encouragement of research in polar studies;
    - (c) to administer funds received from any source for the purposes specified in (a) and (b) above;
    - (d) to make recommendations concerning staffing and resources in the Institute;
    - (e) to supervise the work of the staff of the Institute;
    - (f) to make such reports to the Council of the School of the Physical Sciences and the General Board as those bodies may require.
  5. There shall be an Advisory Committee for the Institute, which shall consist of:
    - (a) one person appointed by the General Board on the nomination of the Council of the School of the Physical Sciences, who shall be Chairman of the Committee;
    - (b) the Director of the Scott Polar Research Institute, who shall be Secretary of the Committee, and the Deputy Director of the Institute, to whom the duties of the Secretary may be delegated by the Director;
    - (c) the Director of the British Antarctic Survey;
    - (d) the Hydrographer of the Navy;
    - (e) the Head of the Polar Regions Section, Foreign and Commonwealth Office;
    - (f) the High Commissioner for Canada in the United Kingdom or a person appointed by the High Commissioner;
    - (g) two persons representative of industry appointed by the General Board on the nomination of the Committee of Management;
    - (h) one person appointed by the Royal Society;
    - (i) one person appointed by the Royal Geographical Society;
    - (j) not more than two persons co-opted by the Committee, provided that it shall not be obligatory for the Committee to co-opt any person or persons.
- Members of the Committee in classes (g)–(i) shall be appointed in the Michaelmas Term to serve for four years from 1 January following their appointment. Members in class (j) shall serve until 31 December of the year in which they are co-opted or of the following year, as the Committee shall determine at the time of their co-optation.
6. The Advisory Committee shall meet not less than once in each academical year.
  7. The duties of the Advisory Committee shall be to advise the Director of the Institute as to the most advantageous lines of education and research, and to promote co-operation with other bodies concerned with polar research.

*Staff of the institute*

1. There shall be the University offices of Director and Deputy Director of the Institute, each of which shall be held concurrently with another University office.
2. The Director and the Deputy Director shall each be appointed by the General Board on the recommendation of the Council of the School of the Physical Sciences, and shall be eligible for reappointment. Appointments and reappointments to the offices of Director and Deputy Director shall be for such periods not exceeding five years at a time as the General Board may determine on the recommendation of the Council of the School. It shall be competent for the General Board not to appoint a Deputy Director.
3. Under the general control of the Committee of Management, the Director shall be the administrative Head of the Institute and shall be responsible for the direction of polar studies in the Institute and their encouragement generally in the University.
4. The duties of the Deputy Director shall be to assist the Director in all matters connected with the work of the Institute.
5. The Director and the Deputy Director shall conform to such conditions of residence as may be determined by the General Board after consultation with the Committee of Management.

## Research Overviews

### Sea Ice and Polar Oceanography Group

Dr P. Wadhams

Dr N.R. Davis, S. Wells, J. Wilkinson

Y. Aksenov, Capt. L. Brigham, F. Cottier, R. Hall, M. Huddleston,

I. Jonsdottir, M. Tadross, F. Baud, S. Down, K. Mattar

The Sea Ice and Polar Oceanography Group continued with a strategy of studying sea ice processes that are relevant to the global climate system. During the year, work was undertaken on four European Commission research projects and one project funded by the US Office of

Naval Research.

Two field programmes took place during the year, both occurring concurrently during March 1997, which involved almost the entire group split into two field teams.

The first field operation was a cruise into the Odden ice

tongue region of the Greenland Sea by the ice-strengthened research vessel RV *Jan Mayen*, with Dr Wadhams as chief scientist. The ship was chartered from the University of Tromsø on behalf of the ESOP-2 Programme (see below), and the other Institute participants on board were Jeremy Wilkinson (Research Assistant), Mark Tadross (Research Student), Richard Hall (Research Student), and Anna Bruna Petrangeli (Visiting Scholar). Thirteen scientists in all took part in the cruise, with other invited participants coming from the Dunstaffnage Marine Laboratory, Oban; the University of Paris; CNRS (France); Technical University of Denmark; and the National Aerospace Development Agency (NASDA) (Japan). The ship sailed from Tromsø on 3 March and spent until 13 March working in the area between 72° and 76°N, 0° and 8°W, where the Jan Mayen Polar Current provides cold surface water in which a dense cover of pancake ice develops, with an admixture of multi-year polar floes from the East Greenland Current.

The purpose of the cruise was to carry out an intensive study of sea-ice physics and of ice–ocean interactions within the Odden ice tongue, in order to examine the role of local sea-ice growth and its corresponding salt flux on the convection process. In addition, the French group on board led by J-C Gascard (Paris) was able to deploy sets of neutrally buoyant floats in the area just north of Odden in order to track mid-depth water movements. Work was carried out at 40 stations, each of which involved a CTD cast to 2000 m; the deployment of a directional wave buoy to measure wave fields within the ice zone; the direct sampling of pancakes by lifting them on board the ship and subsequently sectioning them to determine temperature, salinity, 0-18 content, and ice fabric; the sampling of frazil ice between the pancakes using a mesh sampler; and at three sites the deployment of an innovative Argos/GPS ice drifter, the 'pancake buoy,' designed by Wilkinson and intended to track pancake movement by mimicking the shape and size of a pancake and moving with the pancake field. Pancake samples were brought back to SPRI and subsequently analysed in the cold rooms for ice fabric by Dr Jinro Ukita, a cruise participant and visitor from NASDA, Japan. It was found that all pancakes, even up to 60 cm thick, were completely formed out of frazil ice crystals, with no evidence of congelation growth.

The second field operation was an ice-mechanics experiment on the sea ice of the Gulf of Bothnia, entitled ZIP-97 (Zooming in Ice Physics). Participants from the Institute were Yevgeny Aksenov (Research Student), Steve Wells (Research Associate), and Steve Down (Placement Student), with other participation from the Helsinki University of Technology and the Universities of Helsinki, Oulu, and Iceland. The experimental area was located near Hailuoto Island and covered drifting and fast ice zones. The aim was to measure stress and strain in the ice cover at sites where ridge formation was occurring, and relate the results to the rate of deformation as observed on a larger scale by arrays of drifting buoys and remote sensing (hence 'zooming'). The Institute team used strainmeters, tiltmeters,

and accelerometers to measure ice response to deformation, operating from a camp on the edge of the fast ice zone, with measurements done from 6 to 20 March. Temperature measurements were made through the ice by thermistor chains, and the ice was drilled for thickness measurements, especially across ridges. Ice in this region consists of thin layers, each some 30 cm thick, rafted over one another to create a final layered sheet up to 2.5 m thick. Further work was carried out during a visit to the site by the Finnish research vessel *Aranda*.

The *Jan Mayen* cruise was an element in the second phase (1996-1999) of the European Subpolar Ocean Programme (ESOP-2), funded by the EU under the MAST-III initiative, in which Dr Wadhams is a principal investigator. The project is co-ordinated by Dr Eysteinn Jansen (University of Bergen), and seeks to understand the nature of the thermohaline circulation in the Greenland Sea and the mechanism for deep winter convection. Dr Wadhams, as a member of the ESOP-2 Steering Committee, attended a progress meeting on 10-11 October 1996 in Brussels and a mid-term science workshop at Villefranche on 28 September – 2 October 1997 (with Wilkinson).

ESOP-2 overlapped the last stages of its preceding programme ESOP-1 (1993-1996), which was coordinated by Dr Wadhams. The project involved 22 institutions from seven European countries, and was the fourth largest project in MAST-II. Its aim was to understand sea ice–ocean interactions in the Greenland Sea, in particular the processes in the Odden ice tongue region that influence winter convection. The effect of convection on the carbon cycle also formed an important part of the project. The final project science report will form a special issue of *Deep Sea Research*. The final period of the project, to December 1996, involved a study by remote sensing of the unusual 1996 development of Odden, which appeared very late in the season (April) and lasted until August, although it is normally a winter feature.

Dr Wadhams was also coordinator of an EU research project in the Environment and Climate Programme, shared with IMGA-CNR in Modena (Dr Flayio Parmiggiani). The purpose was to measure the thickness of frazil and pancake ice in the Greenland Sea by analysing the change in the wavelength and direction of ocean waves as they enter the ice. This involved the spectral analysis of synthetic aperture radar (SAR) imagery from the ERS-1 and ERS-2 satellites. The project ended in December 1996, but the research by Parmiggiani and Wadhams continues as a component of ESOP-2. Wadhams visited Modena during October 1996, and Parmiggiani visited SPRI twice during the year. Petrangeli (ENEA, Rome) visited SPRI during 1996-1997 as an EU exchange scientist, also working on this project.

The ZIP-97 experiment was a component of the EC 'Ice State' programme (1996-1999), coordinated by Helsinki University of Technology (Professor Kaj Riska), with Dr Wadhams as a principal investigator. This seeks to understand the relationship between sea ice mechanical processes and the resistance offered by an ice sheet to ship

passage. As well as ZIP-97, our participation involves comparing the statistical properties of ice thickness profiles obtained by Dr Wadhams aboard HM submarine *Trafalgar* in summer 1996 with the properties of ERS-2 SAR images from the same time and place, to find parameters in the SAR analysis that are relevant to ice deformation state. A collaborating theoretician on this project, Dr Bryan Kerman of Atmospheric Environment Service, visited the Institute in June 1997.

The ONR-supported project, which ended in February 1997, concerned interpretation of data gathered on the SIMI programme (Sea Ice Mechanics Initiative), an ice camp in the Beaufort Sea north of Alaska in which the Institute had measured ice tilt, heave, strain, and accelerations in conjunction with other groups measuring stress and ice dynamical parameters. The interpretation included the role of ridge-building in generating wave activity, and the flexural response of the ice sheet to the tidal cycle. Results are relevant to the aims of the Ice State project.

New projects in hand included being a partner in the experimental programme of the European Ice Tank, established by the Commission of the European Union as a Large-Scale Facility at the Hamburgische Schiffbau-Versuchsanstalt GmbH (HSVA). A consortium of eight European laboratories, known as IN'ERICE, designed and executed a collaborative experimental programme on physical, biological, and sedimentological processes in sea ice. The scale of the facility allowed the development of biological communities in the tank and enabled environmental effects of current, wind, air temperature, and nutrients to be controlled. The Institute's part of the experimental work was carried out by Finlo Cottier (Research Student), assisted by Matthias Reisemann (DAMTP), during November 1996 to January 1997 on the development of brine drainage channels, and by Hall during April 1997 on the dispersion relation for wave propagation through frazil ice. The first year of experiments was coordinated by Dr Hajo Eicken (Alfred Wegener Institute, Bremerhaven), and Dr Wadhams was appointed coordinator for the second phase of experiments, due to take place during spring and autumn 1998.

Another new project beginning in 1996-1997 was 'Ice Routes,' an EC project under the Transport programme, coordinated by Earth Observation Sciences Ltd. The purpose is to devise improved techniques for real-time classification of ice types from SAR images, for use in a future ice management and forecasting system. The Institute is a partner in the programme, with Dr Wadhams as principal investigator and Hall and Lawson Brigham (Research Student) also involved. Meetings were held during the year in Farnham and at Ruhr University, Bochum.

In February 1997, Tadross submitted a PhD thesis on 'Microwave remote sensing of young sea ice in the Greenland Sea,' supervised by Dr Wadhams; he has remained with the group to work on the Ice State project until November 1997.

Hall joined the group as a research student on a NERC CASE studentship sponsored by Earth Observation Sciences Ltd, Farnham (Dr Neil McIntyre) to do research on remote sensing and classification of ice types in the Greenland Sea. Brigham joined the group to do PhD research on the ice cover of the Kara, Laptev, and East Siberian seas, having completed an MPhil in Polar Studies in 1996 after commanding USCGS *Polar Sea* on the 1994 Arctic Ocean Transect. He spent the year 1996-1997 as ONR Professor of Arctic Marine Science at the US Naval Postgraduate School, Monterey.

Cattier continued PhD research on the physics of brine drainage channels in sea ice and their influence on thermal properties and salinity distribution. As well as the Hamburg experiments, he spent July–August 1997 as a British Council–Monbuscho visiting fellow at the National Institute of Polar Research, Tokyo, working with the Arctic Environment Research Centre under Professor Yoshiyuki Fujii on the physical habitat of sea ice biota. He attended a Gordon Research Conference at Ventura, California, on sea ice ecology during 2-7 March 1997.

Aksenov continued PhD research with support from the EU Ice State programme on sea ice mechanics. As well as ZIP-97, he visited Helsinki University of Technology for discussions on results and laboratory experiments.

Matt Huddleston (Research Student) continued with a PhD project on an ice–ocean numerical model for the Arctic Ocean and Greenland Sea, spending 1996-1997 on leave as a primary school teacher in Nepal on an aid scheme.

Ingibjorg Jon sdottir (Research Student) continued PhD research on the historical statistics of sea ice distribution around Iceland. She spent 1996-1997 working with Professor Astrid Ogilvie, University of Colorado, Boulder, to collect statistical material.

Karine Thorat (CNRS, Marseille) visited SPRI during 1996-1997 on an EU exchange scheme to carry out a design study for a new type of rugged long-lasting satellite-tracked drifter for data gathering on polar pack ice.

Dr Wadhams, as Reader in Polar Studies, spent December 1996–February 1997 as British Council–Monbuscho Visiting Professor at the Graduate University of Advanced Studies, Tokyo, based within the National Institute of Polar Research. During this period, he attended the 12th International Symposium on Okhotsk Sea and Sea Ice, Mombetsu, 2-5 February 1997 (also attended by Brigham), giving a paper on 'Downstream evolution of ice thickness in the Arctic Ocean.' He also attended a sea ice workshop at Iwate University, Morioka, and visited the Institute of Low Temperature Science at Hokkaido University, Sapporo. He continued joint work with NIPR on the interpretation of Japanese ERS satellite imagery, as project 38 of the NERC-Japan agreement on collaboration in remote sensing.

Dr Wadhams gave invited papers at the EuroGOOS Conference (European component of Global Ocean Observing System), The Hague, 9 October 1996, being ap-

pointed to the Arctic Ocean Task Team for the project; the ASAR conference (design of an Advanced Synthetic Aperture Radar), Defence Evaluation and Research Agency, Farnborough, 26 November 1996; the International Conference on the Oceanography of the Ross Sea, Antarctica, Lercici, Italy, 24-28 March 1997; the Arctic Climate System Study (ACSYS) Workshop on Ice Thickness, Monterey, California, 7-11 April 1997 (with Dr Norman Davis); and the Orkney Science Festival, Kirkwall, 5-8 September 1997 (with Maria Pia Casarini), organising a session on climate change.

He also attended the Italgas Prize ceremony in Turin in

October 1996 (having been a winner in 1990); a conference in Bergen on the European Space Agency satellite altimeter project, 8-9 June 1997; a NATO Advanced Study Institute on Ice Physics in the Natural and Endangered Environment, Maratea, Italy (with Aksenov), 9-20 September 1997; and the European Science Foundation Conference on Polar Regions and Quaternary Climate, Maratea, 21-25 September 1997.

In September 1997, Dr Wadhams was appointed to the Scientific Steering Committee of ASPECT, Antarctic Sea Ice Processes and Climate, the SCAR Global Change Programme for the Antarctic Sea Ice Zone.

## Remote Sensing Group

Dr W.G. Rees

A.W. Bingham, D.L. Feltham, O.V. Toutoubalina

The Remote Sensing Group continued and expanded its work of developing methods for the analysis of satellite data and applying them to the study of polar environments. This research can be divided into four main (although overlapping) categories: polar oceanography; land ice and snow; tundra and boreal forest environments; and research support projects.

During the past year, Daniel Feltham (Research Student) has continued his investigation of the thermodynamics of sea-ice formation as part of a more general study of the interactions of fluid dynamics and thermodynamics and solidifying binary alloys. This work has been performed in collaboration with Dr Grae Worster of the Department of Applied Mathematics and Theoretical Physics, University of Cambridge. A linear perturbation analysis, including a complete treatment of a viscous melt, has been completed. In addition, some work on obtaining pseudo-analytic solutions to the melting alloy equations has been successful. This work is currently being prepared for publication.

An obvious development of both this work and the study, described below, of the behaviour of hydrocarbon contaminants in frozen ground, is to investigate the behaviour of such contaminants within sea ice. During the year Dr Gareth Rees commenced discussions with Professor Manfred Lange (University of Munster, Germany) about a potential collaboration in this field.

The collaboration between Dr Rees and Dr Ray Williams (University of Tasmania), begun in 1996 with the aim of using satellite radar data to monitor iceberg distributions in the Southern Ocean, was continued. The algorithm developed while Dr Williams was a visiting scholar at the Institute was successfully subjected to further testing, and a paper describing it has been submitted to the *International Journal of Remote Sensing*.

During the past year, Dr Rees continued to serve as the technical assessor for the Sea Ice Information Service, a project sponsored by the British National Space Centre (BNSC) and led by Earth Observation Sciences Ltd. This

project was brought to a successful conclusion during the year.

Andrew Bingham (Research Student) continued his investigation of the problem of monitoring the mass balance of Arctic glaciers and ice caps on a routine basis, using satellite remote sensing techniques, in particular synthetic aperture radar (SAR) data. Such images can be acquired in all weather conditions, validated when possible with visible imagery.

In order to use SAR effectively a precise digital elevation model (DEM) is required to correct for geometric distortion and incidence angle effects in a SAR image. Using shape-from-shading techniques combined with airborne radio echo sounding (RES) data, a new DEM of Austfonna, Svalbard, has been constructed. The work has demonstrated how high-resolution DEMs can be derived from low-spatial-frequency altimetric data and should be of particular importance when laser altimetric data sets become available.

Using in situ data collected during the summer of 1995 from Finsterwalderbreen, Svalbard, models have been developed and tested for predicting the radar backscattering coefficient. A model has been identified that works well over Arctic glaciers and this may be used to minimise topographic effects in SAR imagery.

Using normalised SAR data, methods have been developed for classifying the surface facies on Arctic glaciers and ice caps at the end of the summer melt season. This provides vital information on the spatial distribution of the accumulation and ablation zones on a glacier. Moreover, this information may be used to measure mass balance, an important indicator of climatic change and for assessing future sea-level-change scenarios.

During the year the Remote Sensing Group joined a consortium, led by Anite Systems Ltd and including Dundee University, which bid to BNSC for a contract to develop a system for monitoring snow conditions in temperate latitudes. The system will combine several types of satellite data including radar, and, although the develop-



ment work will be based on study sites in Scotland, it should have wide geographical applicability, including to sub-polar regions. The project is due to begin in October 1997.

During the last year, the Remote Sensing Group's activities directed towards the study of high-latitude vegetation expanded in scope and volume to become the group's predominant research area.

Although the project to use satellite and ground-based measurements to investigate the state of the vegetated environment in the vicinity of the nickel-copper smelter at Monchegorsk, on the Kol'skiy Poluostrov, Russia, formally ended in 1995-1996, results continued to flow from the large body of data collected during its course. A substantial paper was published in the *International Journal of Remote Sensing*, describing the novel methods of data analysis developed during the project and some of the results arising from them. This showed, amongst other things, that the zone of heavy vegetation damage, caused by pollutants emitted by the smelter, has recently begun to expand at an increased rate, probably as a result of a long-term change in local weather patterns. Other analyses of the Monchegorsk data also continued during the year, in particular an assessment of the usefulness of satellite vegetation indices for high-latitude vegetation. Dr Rees presented a public lecture, to the Friends of the Institute, on the results of this project in January 1997.

The investigation of the effects of atmospheric pollution from the nickel-copper smelter at Noril'sk (north central Siberia) that was begun in 1995 was continued during the year. A field expedition was mounted in July and August, jointly by the Institute and the Geography Faculty of Moscow State University. The participants from the Institute were Dr Rees, Olga Toutoubalina (MPhil Student), and Simon Reeve (Field Assistant). During this field expedition, which was based in the town of Oganer, near Noril'sk, ecological characterisation, field radiometry, and satellite ground-truth data were collected over a large area. Substantial logistical assistance (provision of road and river transport) was provided by Dr L. Solomacha of the Taimyr Centre of the Russian Hydrometeorological service and by the Russian Army. Toutoubalina submitted a dissertation entitled 'Remote sensing methods for the study of industrial impact on vegetation in the Russian Arctic' for the MPhil in Geographical Information Systems and Remote Sensing, based to a significant extent on the results of the field expedition. This dissertation was awarded the highest grade of the year, and Miss Toutoubalina will now continue this work towards a PhD.

The continuing and extremely fruitful links between Cambridge and Moscow led Professor Andrei Kapitza and his brother Sergei to found the Kapitza Trust during the last year, in honour of their late father, the Nobel laureate physicist Pyotr Kapitza. The aim of this charitable foundation is to promote the exchange of students between Russia and the United Kingdom. Dr Rees was appointed as a trustee.

Research into the effects of oil contamination on frozen ground, and the extent to which it can be monitored and modelled from spaceborne observations, continued throughout the year. This research is currently being carried out as a collaboration between Dr Rees and Professor Peter Williams (Visiting Professor) of Carleton University, Ottawa, but also involves Moscow State University and the University of Caen. Discussions have also taken place with the Cambridge Arctic Shelf Programme (CASP), the US Army's Cold Regions Research and Engineering Laboratory (CRREL), and a multi-national company with interests in oil exploration and extraction. Two significant developments during the year were the elaboration of a joint research strategy with the University of Caen, and the organisation of an international workshop in Cambridge in July. This workshop, on 'Contaminants in frozen ground,' was organised jointly by the Institute and the Geotechnical Science Laboratories of Carleton University, and was sponsored by the US Army's European Research Office and the Canadian Polar Commission. It attracted 32 delegates from the UK, USA, Canada, Russia, Norway, Finland, France, Germany, and the Czech Republic, and the proceedings will be published both as hard copy and on the internet as part of a continuing 'virtual conference'.

During the year a new focus emerged for the Remote Sensing Group's studies of changing Arctic vegetation. This is the BASIS programme, an international proposal for EU funding to investigate the potential impact of local, regional, and global environmental disturbance on the physical, biological, economic, and social conditions in the Barents Region. The Remote Sensing Group has been working closely with the Social Sciences and Russian Studies Group to define a sub-programme of interdisciplinary research into changing indigenous land use. The project will begin its two-year pilot phase in early 1998.

Research support projects, intended to provide theoretical and practical background to remote sensing analyses, continued through the year. Two projects were aimed at methods of determining position on the Earth's surface. Richard Alton and Dominic Walker (Part III physics students) carried out an analysis of the spatial coherence properties of the Global Positioning System (GPS) to determine the extent to which low-cost non-differential GPS receivers can be used to make accurate position measurements. Nick Folwell (Part III physics student) analysed the performance of the Global Location System (GLS), a system described in earlier copies of *SPRI Review* for tracking the motion of migratory birds such as albatrosses. John Stark (Part II physics student) performed a comprehensive survey of the natural variability in the spectral reflectance properties of environmental surfaces. Dr Rees continued his work of editing the *Remote sensing data book*, a source of reference material on methods of remote sensing due for publication in 1998 or early 1999. He also continued to serve on the NERC Earth Observation Science and Technology Board's working group on future

remote sensing requirements. His work on the use of fractals in remote sensing was recognised by an invitation to present a course of lectures at the Scottish Universities Summer School in Physics at the University of Dundee in August 1997.

Bingham attended the third ERS Symposium, organised by the European Space Agency and held at Florence, Italy, in March, where he presented the paper 'Satellite data synergies for monitoring Arctic ice masses,' jointly written with Dr Rees. Feltham presented papers at the British Applied Mathematics Colloquium (Edinburgh) and the International Centre of Mathematical Sciences

(Edinburgh). He also presented a poster, which has been submitted for publication, at the NATO Advanced Study Institute on Ice Physics in the Natural and Endangered Environment. Toutoubalina attended a seminar on high resolution optical satellite missions in London in February; a one-day student meeting of the Remote Sensing Society in London in April; the fifth 'International conference on artificial neural networks' in Cambridge in July; the 18th ICA/ACI 'International cartographic conference' in Stockholm in June, at which she presented a paper; and the 23rd annual conference of the Remote Sensing Society in Reading in September.

## Glacier Hydrology Group

Dr N. Arnold

Dr G. de Q. Robin, Ms Hazel Jones

Dr Neil Arnold was appointed to a joint University Assistant Lectureship with the Department of Geography in November 1996. His main interests are modelling the interactions between ice masses, glacier hydrology, and climate, at a variety of spatial and temporal scales.

The main recent work by the group focused on an ongoing, detailed investigation of the dynamics and hydrology of a valley glacier in southern Switzerland, Haut Glacier d' Arolla. Dr Arnold's contribution to these projects has been the development of a distributed, physically based model of the hydrology of the glacier. This model uses meteorological data and glacier and catchment topography to calculate hourly melt-rates over the entire glacier surface for a whole summer melt season. The calculated water production is then used as the input data for a second, linked model that calculates runoff of meltwater over the surface of the glacier, allowing for the seasonal removal of the winter snow-pack, and the effect this has on surface water hydrology. Finally, the outputs of this model are used to calculate water inputs to moulins at the glacier surface, which feed water into the en- and sub-glacial hydrological systems. These are modelled using a physically based model of water flow in tunnels, which allows the hydrological system to evolve over the course of a melt season in response to changing water inputs. These linked models have been successfully used to simulate the hydrology of Haut Glacier d' Arolla during melt seasons.

Work by the group this year focused on the ongoing development of these linked models and the inclusion of additional processes. Ongoing work to investigate the role that subglacial conduit shape may play in determining the dynamics and seasonal evolution of subglacial hydrological systems was presented at the British Branch meeting of the International Glaciological Society at Keele University in September.

In conjunction with Dr Martyn Tranter at the University of Bristol, Ms Hazel Jones (Research Student based initially in the Department of Geography), has been developing a linked model for suspended sediment and solute

transport for Haut Glacier d' Arolla. The initial versions of this model seem very promising.

Dr Arnold travelled to Switzerland for five weeks during the summer to start a new project, with Dr Stuart Lane and Professor Keith Richards of the Department of Geography, University of Cambridge, to investigate the links between sediment supply from Haut Glacier d' Arolla, and the role this might play on the hydrology of the proglacial river. Funding for Dr Arnold's trip was provided by the Royal Society. This work will involve the development of a model for bedload entrainment and transport beneath the glacier, and the linking of this model to existing models of the proglacial river. The field trip was quite badly affected by unusually cold and wet weather, which prevented the collection of some data, particularly for the proglacial river. This trip was linked to an undergraduate field-trip for 10 2nd year students.

Dr Arnold was also invited to join an interdisciplinary group, led by Professor Tjeerd van Andel, of the Department of Earth Sciences, University of Cambridge, which aims to reconstruct the climate of Europe during Oxygen Isotope Stage 3, a warmer interval during the last glacial period, around 40,000 years ago. The central part of this work is the implementation of a general circulation model for this period, and the development of a more detailed local area climate model for Europe. This climatic modelling will be conducted by Dr Eric Barron of Pennsylvania State University. Dr Arnold's contribution to the project was to provide the baseline ice sheet topographic data needed for the climatic models. At a meeting in September, the initial model results were discussed, and the second phase of the project, to implement more detailed sensitivity analyses with a variety of ice sheet, earth-orbit, and vegetational inputs, was agreed.

Dr Gordon Robin continued his research on ice dynamics of polar ice sheets and related data from radio-echo sounding. From 24 to 26 February 1997 he participated in the 'Mars polar science and instrumentation workshop' in the Lunar and Planetary Institute, Houston, Texas.

## Polar Ecology and Management Group

Dr B. Stonehouse

P.K. Crosbie, J. Minbashian, A.J. Nimon

This group has continued to concentrate on ecological issues in both polar regions, with special emphasis on polar tourism. From mid-October Dr Bernard Stonehouse took part in four cruises in *Explorer* (Explorer Shipping Corporation), joining the ship in Tenerife and visiting islands in the South Atlantic Ocean, South Georgia, the South Shetland Islands, and the Antarctic Peninsula. During this period he collected ecological data on more than 20 Antarctic landing sites.

In late November, accompanied by surveyor K.V. Blaiklock, he joined the Polish research station Henryk Arctowski, to start a three-year joint programme of study of the management and monitoring of visitors and station personnel in the station area and environs. Immediate objectives were to define the border between the station area and SSSI No 8, and to identify a border zone, about 200 m wide, for special studies of ecological impacts arising from activities of both tourists and station personnel within the station area. Blaiklock completed a baseline topographic and ecological survey of the station area and border zone on a scale of 1:1000, adding ecological detail of vegetation and concentrations of seals and colonial seabirds that will be useful for future monitoring.

During the following month, Dr Stonehouse, assisted by Polish students Kasia Salwicka and Piotre Ciaputa, developed procedures for managing tourists in and around the station area. These included a visitor trail around the station area and environs, to provide both an educational facility for tourist visitors, and marked paths to be used by station personnel, that would avoid more general movements over the moss beds close to the station. Procedures were developed also for measuring and monitoring seasonal impacts of tourists and year-round activities of

station personnel in the station area, and recommendations made for studies of damage, regeneration, and growth in the soils, moss, grass, and fresh-water communities.

Dr Stonehouse and Salwicka also studied movements and physiology of three species of seals in relation to human activities, devising a non-intrusive method of monitoring heartbeat and respiration. Weddell and elephant seals especially were found to be using apnoea (suspended breathing, accompanied by reduced heart-rate), while resting ashore. Stonehouse left in *Explorer* on 28 December for a further Peninsula cruise, returning to the UK in early January.

Kim Crosbie (Research Student) served as a cruise leader in *Explorer* for three Antarctic voyages between February 7 and April 5, gaining valuable experience and information toward her studies of Antarctic landing-site management.

In March Dr Stonehouse attended a four-day conference and workshop in Svalbard, sponsored by WWF Arctic, on developing guidelines for Arctic tourism. In May he spent a week in the Department of Antarctic Biology, Polish Academy of Sciences, Warsaw, followed by a week in the Czech Republic, where he lectured on current Antarctic research issues at the Universities of Brno and South Bohemia. He also discussed with Czech scientists and officials possibilities for establishing a Czech research station and long-term research programme in Antarctica. Both visits were sponsored by the British Council, which provided further funding for visits to the Institute by Polish and Czech scientists. During the year Dr Stonehouse lectured in the Department of Geography, University of Reading, and at the Rutherford Laboratories of the Natural Environment Research Council, Banbury.

## Social Sciences and Russian Studies Group

Dr P. Vitebsky

T. Argounova, M. Core, P. Fryer, J.O. Habeck, K. Hill,

I. Nobl-Overland, S. Sawhill, B. Seligman, G. Tagg-Randall, J. Tichotsky

This year saw the completion of the ESRC-funded project on 'Environmental change and indigenous knowledge in Siberia and Alaska.' Directed by Dr Piers Vitebsky, the project's other senior researchers were Dr Igor Krupnik, Dr Mark Nuttall, and Dr Nikolai Vakhtin. Substantial contributions were also made by Research Students Tatiana Argounova and Mary Core, and by a number of local indigenous researchers and organisations, especially Anatoly Aleskeyev and Lyudmila Ainana.

Based on extended fieldwork in Alaska, the Chukotka Autonomous District, and the Sakha Republic (Yakutia), the project focused on social processes in northeastern

Siberia, using comparative material from Alaska. On the basis of in-depth local case-studies, the results highlight many of the region's most pressing issues for policy-makers and identify major long-term trends.

The project demonstrates that changes in the social environment are, like changes in the physical environment, fast and far-reaching. The researchers identified an increasing regional diversity in Siberia and showed how even neighbouring sub-regions can have quite different environmental, social, political, economic, and managerial 'microclimates.' The case studies showed how communities are forming new kinds of networks to cope with

uncertainty, and analysed crucial points in the processes of transmission and adaptation of indigenous knowledge between the generations, as well as gender differences. Theoretically, the results offer a theory of indigenous knowledge that moves on from the conventional concept of a body of knowledge to a processual view based on knowers, contexts, and action. The findings are already being widely used by indigenous groups. The identification of ways in which changes to vegetation and animals can be caused by social instability rather than by climate change will shortly be incorporated into an EU-funded project, jointly with the Remote Sensing Group, to collate this method with satellite imagery in the Russian north.

Dr Piers Vitebsky continued fieldwork among Evenk reindeer herders of the Verkhoyansk Mountains, working on the history of pasture use in relation to administrative changes and family history. He also analysed the current demographic crisis in terms of inter-generational relations within the family, working in the field on psychodynamic and therapeutic aspects of rapid culture change. This work was also extended into Yakutsk city.

Dr Vitebsky attended a conference on shamanism in Chantilly, France, and meetings of the American Psychoanalytic Association in San Diego and New York. He gave a paper at the annual meeting of the American Association for Slavic Studies in Boston and chaired a panel at the annual meeting of the American Anthropological Association in San Francisco. He was appointed external examiner at the School of Oriental and African Studies, London, for the two MA courses in Social Anthropology and in Medical Anthropology.

Dr Vitebsky also carried out fieldwork among high-altitude shepherds in the Nepal Himalayas and studied shamanism among the Tamu (Gurung) people in order to compare it with the indigenous peoples of Siberia. With Anatoly Alekseyev (University of Yakutsk), he organised a workshop in which an Evenk (Tungus) shaman and several other traditional healers from the Sakha Republic visited Cambridge to exchange viewpoints and experiences with western therapists and healers. He also worked with a retired shaman in the Peruvian Amazon and appeared in a BBC documentary on the ancient lines in the Nazca desert. Two of his PhD students in the Department of Anthropology successfully completed their theses, on shamanic dialogue in Nepal and on scientific discourse and environmental activism in Germany. He also gave a paper at the conference on 'Varieties of scientific experience' at the Max Planck Institute in Berlin.

Joachim Otto Habeck (Research Student) worked on the current crisis and the future prospects of reindeer herding in the Evenki Autonomous District in connection with the ethnic identity of the Evenki people. He collected data on methods and patterns of traditional land use and presented a paper at the 35th International Congress of Asian and North African Studies in Budapest. Habeck also designed and edited a new World Wide Web site presenting the Group's research projects as well as a data profile of some of the main regions of the Russian north, which

will go on-line in October 1997.

Mary Core (Research Student) is currently writing a thesis entitled 'On the importance of incorporating traditional knowledge of indigenous people into research programs concerning bowhead whales (*Balaena mysticetus*) that winter in the Bering Sea.' This thesis examines the management of bowhead whale stocks and the role of native people in establishing a scientific basis for insuring a whale harvest quota. Core has conducted field work in Barrow, Alaska, in cooperation with the North Slope Borough Department of Wildlife Management and the Alaska Eskimo Whaling Commission. This fieldwork involved interviewing whaling captains, their wives, and other whaling crew members. Through programs sponsored by the North Slope Borough, Core also works with Chukchi and Siberian Yupik people from Chukotka, Russia. These Russian aboriginal people re-established a subsistence gray whale hunt in 1992 and, in October 1998, received International Whaling Commission approval to share a bowhead whale quota with the Alaska Eskimo Whaling Commission for the next five years. Subsistence whale harvesting has been opposed by several governments and non-governmental organizations since 1976.

Steven Sawhill (Research Student) began research on Norwegian—Russian environmental diplomacy in the Barents region. His study focuses on how regionalization has affected the discourse between Norway and Russia regarding transboundary ecological threats in the region. Sawhill conducted preliminary fieldwork in Scandinavia during the summer of 1997, visiting research institutes and the Barents Region secretariats in Norway, Finland, and Sweden. He also attended the 'International symposium on environmental pollution in the Arctic' in Tromsø, the 'Barents Region today' conference in Rovaniemi, and he presented a paper on water-quality improvement projects in northwest Russia at the 'Border regions in transition' conference held in Sortavala, Russia, and Joensuu, Finland, 14-18 June. Sawhill's research has gained enthusiastic support from the Barents Secretariat in Kirkenes, Norway and the Fridtjof Nansen Institute. At their invitation, he will be continuing his studies from Norway as a visiting researcher from January 1998 to March 1999.

Professor Peter Williams (Visiting Professor) and Ben Seligman (Research Student) acted as consultants for an industrial consortium, on the physical and social problems of a large pipeline proposed from Sakha to China and onwards. Seligman also continued his work on the planning, construction, and operation of trunk gas pipelines in the Yamalo-Nenetskiy and Taymyrskiy Autonomous Regions and the Komi Republic. He carried out fieldwork in Nadym as a guest of Nadymgazprom and organised an agreement (memorandum of understanding) with ECET (Ecological Centre for the Study and Protection of the East European Tundra) of the Ministry of Nature of the Komi Republic for future collaboration on issues of industrial development, geocryology, tourism, and environmental monitoring. He attended the energy sector meeting of the Gore-Chernomyrdin Initiative in Petropavlovsk-

Kamchatskiy. Keith Hill attended the transport sector meeting on the same occasion and worked on eastern Siberian sectors of economic development: aviation, railways, and telecommunications. He also visited the aviation faculty at the University of Alaska Anchorage and was invited to join the Northern Forum's aviation group.

John Tichotsky (Research Student) completed his PhD thesis on the place of diamonds in the economy of the Sakha Republic and in the Republic's relations with the federal government in Moscow.

Tatiana Argounova (Research Student) developed her work on the evolution of ethnic identity in the Sakha Republic (Yakutia) under successive political conditions. She focused on the Tatta region, which had particularly strong indigenous cultural traditions and was singled out for condemnation for 'bourgeois nationalism' in the 1930s to 1950s. She examined the connections between these facets and analysed how this has fed into ethnic identity under the self-government and greater economic power of the 1990s. With Dr Julia Cruikshank (University of British Columbia), she continued working on a comparative study of oral history and memory under the different political systems of Canada and the Sakha Republic. They carried out fieldwork in the Yukon district in Canada and presented a joint paper at the Alaska Anthropology Associa-

tion meeting in Whitehorse, Canada. Argounova also served as English-Russian interpreter at the Geneva workshop of the World Wildlife Fund and at the General Assembly of the Northern Forum in Yakutsk.

Paul Fryer continued to look at recent attempts to create a national Komi elite. He analysed the emphasis on Komi language and culture at the new Finno-Ugrian Faculty at Syktyvkar University and showed how the assumption that a national elite must be based on mastery of the Komi language has already been undermined by a split between a Komi cultural elite and a non-Komi political elite. He attended a course on regional development at the northeastern edge of the European Union in Joensuu, Finland, and gave papers at conferences on borders and peripheries at the University of Helsinki (with Nick Lynn, University of Edinburgh) and on Russia and the north at the University of Aberdeen.

Indra Nobl-Overland began fieldwork in the Russian Saami village of Lovozero, in Kol' skiy Poluoostrov, on Saami ethnic identity. Keith Hill also continued his work on eighteenth-century German explorers and scientists in Siberia. He spoke at a conference in Halle on Steller and the Great Northern Expedition and organised an agreement with the Frankesche Stiftung on a pilot project for a translation of the works of Steller and Messerschmidt.

## Polar History and Humanities Group

Dr B. Riffenburgh

H.G.R. King, P. Speak, Dr J. West, M.P. Casarini-Wadhams

During the year, the Polar History and Humanities Group and its corresponding members continued with a wide range of research, dealing with polar, maritime, and exploration history and Arctic humanities studies.

Dr Beau Riffenburgh continued his research into the roles of the British popular press and other aspects of popular culture in the creation, dissemination, and effect of imperial heroic exploration myths in the nineteenth and early twentieth centuries, and the relationships of those myths to European imperial expansion and nationalism. This research has been carried forward in conjunction with members of the Faculty of History at the universities of Cambridge, Lancaster, and London.

In addition to his regular lecturing on nineteenth century exploration at the University of Cambridge, Dr Riffenburgh gave invited lectures at three other British universities. In July and August, he also lectured about

exploration on two cruises to the North Pole, on which he gained immeasurably by being able to spend extensive time in Zemlya Frantsa-Iosifa. Two corresponding members of the Polar History Group — Professor T.H. Baughman of Benedictine College, Kansas, and Ian Stone of the University of Kent — also lectured aboard ships in the polar regions.

Maria Pia Casarini-Wadhams (Research Student) continued research for her doctoral thesis entitled 'Lady Jane Franklin and her role in the Franklin searches, 1848-1860.' Her research has included the 150 volumes of Lady Franklin's diaries and correspondence housed in the SPRI archives, for a thesis that is an examination of the impact of Lady Franklin on the search expeditions for her husband and his crew. In September, Ms Casarini-Wadhams presented an invited paper entitled 'The fate of Franklin no man may guess' at the Orkney Science Festival.

## Polar Biology

Dr E. Cruwys

Research in polar biology continued in two main areas during the year. First, Dr Elizabeth Cruwys continued investigations into the numerical taxonomy of pinnipeds in an on-going project with Dr Adrian Friday at the

Department of Zoology at the University of Cambridge. The project aims to use craniological and dental measurements to assess taxonomic relationships between and within the Otariids and the Phocids and to compare re-

suiting cladograms with results using DNA analysis. Samples were collated from around the world, including South Africa and New Zealand and deposited in the Cambridge University Zoology Museum with a view to establishing a permanent database.

Second, Dr Cruwys continued research into the elemental structure of the teeth of seals from the Antarctic in a collaborative project with Ken Robinson at the British Antarctic Survey. The project is working to develop a method to assess the calcium and phosphorus content in the incremental growth bands of pinniped teeth using energy-dispersive x-ray (EDX) analysis. It is anticipated

the research will elucidate not only differences within and between the chemical and physical structure of mammalian dental tissues, but will allow conclusions to be drawn regarding the uptake of minerals from the diet; the environmental conditions, particularly in relations to diet, under which mineralisation occurs; variation in species signatures in calcium and phosphorus ratios; and an indication of the selective mechanisms that determine this variation in mineral ratios between the species. Dr Cruwys attended three conferences on electron microscopy during the year, and the possibility of several collaborative projects with other academic and industrial groups is being investigated.

## Teaching and Lectures

### MPhil

Nine students took the Master of Philosophy course in Polar Studies during 1996-1997, of which seven were successful. The course involved some 65 seminar papers that were presented by the staff of the Institute, visitors, and invited speakers from outside Cambridge. The course director was Dr John Heap. The students were assessed on the basis of a 20,000 word thesis and six essay papers. The theses are available in the Institute Library, and the students and their thesis titles were:

- James Allen: Lessons of Arctic free market experience for potential hard rock mining in Antarctica.
- Kaisa Hietala: A case study of the fresh water components in the Arctic hydrological cycle.
- Michael Johnson: Little fish in big ponds: fisheries and community development in Alaska and Greenland.
- Jasmine Minbashian: Biological integrity: an approach to monitoring human disturbance in the Antarctic peninsular region.

Carol Moore: Arctic environmental co-operation 1987-1997.

Philip Pope: British influence on the Antarctic Treaty System 1959-1964.

Andrew Spurgin: The evolving accountability of the Antarctic Treaty System.

### Other teaching

As in previous years, Dr Peter Wadhams gave four lectures in the 'Glacial studies' course in Part II of the Geographical Tripos. Dr Gareth Rees continued to deliver a course of eight lectures to the MPhil programme in Geographical Information Systems and Remote Sensing, and was appointed deputy course director. He also presented a new course of 16 lectures on remote sensing to the Part H physics programme. He continued to act as External Examiner in Combined Science for the degree programme at Canterbury Christ Church College, and as senior S-level physics examiner for one of the national A-level examination boards.

## Library and Information Services

W.J. Mills, Keeper and Librarian

This area witnessed significant reorganisation this year with the establishment of a Picture Library under the management of Philippa Hogg and the coordination of all Institute collections — Archives, Library, Museum, and Picture Library — under William Mills, whose title has been changed from Librarian and Information Officer to Keeper of Collections and Librarian. These changes are more than purely administrative and were carried out with the intention of ensuring that the Institute is best placed to make maximum use of the many opportunities presented by the building of the Shackleton Memorial Library.

### Library

S. Sawtell, S. Banks, N. Egorova (from 1.5.97), J. Freeland (20.1-30.4.97), P. Hogg (to 31.13.96),  
Bibliographers: J. Pinhey, H. Shibata, I. Warren

Naturally enough, this year was dominated by preparation

for the Shackleton Memorial Library. However, this has not meant that other projects were placed on hold. Cataloguing efforts exceeded all previous years' totals by 25%, an achievement very largely made possible by the continued generous support by the British Antarctic Survey of the Historic Antarctic Bibliography Project and by the exemplary efforts of our growing team of volunteers assisting in the RECON programme. Library users who know of the vast size of the card catalogue built up since the Institute's foundation may be able to imagine the size of the task involved in converting its records for loading to a database. This task is far from yet achieved but rapid progress is being made. During this year we completed processing Antarctic literature for the period 1951-1961 for the Historic Antarctic Bibliography Project. Anyone interested in Antarctica's history and the development of scientific knowledge relating to it will now find a near

comprehensive bibliography to 1961 in the Institute's database. Much more work remains to be done on the Arctic and glaciological records but by the end of the period covered records had been created for the majority of monographs and for many major authors.

As reported in last year's *SPRI Review*, an Institute webserver (<http://www.spri.cam.ac.uk>) was set up last September, and received more than 180,000 interrogations during the year. Managed by Oliver Merrington, this site now gives basic information about the Institute: staff, research, MPhil programme, facilities, Shackleton Memorial Library Appeal, etc. The most popular pages were those about the volcanic eruption under the Vatnajokull ice cap. Other much consulted pages gave information about the world's museums with polar holdings and a directory listing organisations carrying out polar and cold-region research. In addition to the Library's own pages, Isabella Warren and Oliver Merrington contributed to a joint project with the Social Sciences and Russian Studies Group, which aims to set up webpages for each of the districts of the Russian north and far east. This site will be launched in October 1997.

Three members of library staff travelled abroad as part of their work. William Mills was invited to attend the AGM of the International Arctic Science Committee in St Petersburg as representative of the Polar Libraries Colloquy, of which he continues to be Secretary/Treasurer. This provided a useful opportunity to speak to science policy-makers and senior scientists on the design of information services best meeting the needs of Arctic science, as well as to draw attention to the Institute's developing facilities and collections. He was able to visit the library of the Arctic and Antarctic Institute, the Arctic and Antarctic Museum, and to bring back AARI publications, some previously classified. Isabella Warren (Russian Bibliographer) attended the North Calotte Library conference entitled 'Environment – library – knowledge: libraries as promoters of ecological awareness,' 22-29 June, Arkhangel'sk, hosted by the Archangel Regional Scientific Library. In addition to visiting local libraries and building up contacts with libraries from across the Barents Region, she presented a paper 'Acquisition of Russian language materials relating to European Russian north: gains and losses since the demise of the Soviet Union.' Shirley Sawtell (Information Assistant), made a study tour of libraries of Canada's Northwest Territories where she visited libraries at Arviat (school and community libraries), Rankin Inlet (regional library), Iqaluit (Thomas Manning Library and Archive, and Arctic College Library), Pond Inlet (community library), and Yellowknife (Prince of Wales Heritage Centre and Library of the Legislative Assembly of the NWT). Given Thomas Manning's very generous support to the Shackleton Memorial Library, of particular interest was the opportunity to draw up an outline description of collections in the Thomas Manning Library and Archive at Iqaluit. Another highlight was the possibility of working for a short period in the new pur-

pose-built community library at Pond Inlet.

Following Philippa Hogg's appointment as Picture Library Manager, the post of Librarian's Secretary (Library Assistant) was filled on a temporary basis by Julia Freeland, and then from 1 May by Natasha Egorova.

New Antarctic libraries in Siena (Italy) and Sao Paulo (Brazil) are the latest to adopt the Universal Decimal Classification using the polar schedule maintained by the Institute's Library. The Librarian was also consulted on a proposed revision of the general geographical schedules of this international classification system.

#### **Acquisitions and cataloguing programmes**

A total of 2,783 items were added to the Library, including 601 books. These figures do not include two major donations yet to be fully processed: the bequest of Terence Armstrong's Russian library and the gift of the pamphlet collection of Gerald Seligman by the International Glaciological Society.

Last year's *SPRI Review* referred to the large quantities of books being brought back by Institute PhD students carrying out fieldwork in remote parts of Russia. This year our collections have again been augmented by materials brought back by Tanya Argounova (Sakha Republic), Paul Fryer (Karelia and Komi republics), Indra Nobl-Overland (Kol'skiy Poluostrov), and Ben Seligman (Kamchatka and Nadym). In recognition of the national importance of this acquisition programme, the Institute was awarded a British Library grant to enable its detailed cataloguing, abstracting, and indexing.

By the end of the period covered, SPRI LIB held 110,506 records, with 13,772 records added during the year. 22,563 monograph records have been added to the Cambridge University Union Catalogue, including 4354 new records this year. The SPRI Periodicals Catalogue has been mounted as a separate database on the Arctic and Antarctic Regions CD-ROM. Cooperation has continued with the Library of Congress (Cold Regions Bibliography Project) in compiling the *Antarctic Bibliography*.

#### **Volunteers and work placements**

The contribution of volunteers has been even more substantial than in previous years. Pat Little and Ron Wilbraham have continued their long-standing contributions to the RECON programme and Map Collection, respectively. Among other volunteers contributing to the RECON programme, Jed Brierley should be singled out for his work in helping to process several thousand Arctic monograph records; help in this work has also been received from Frances Boud, Nat Hibbs, Emily Ingram, Isona Shibata, Marion Thomas, and Derek Warham. Natasha Egorova, Dr Olga Kimkhai, and Ursula Stubbings provided useful assistance in processing Russian-language material. Roland Warren is currently working on a children's page for the Institute's Internet site. Finally, without the help of Mary Wubbold, the Library would have experienced extreme difficulty in coping with the extended absence of one staff member due to a broken leg.

Work placements were found for Octavia Leigh (University of Wales, Lampeter) and Helen Rowland (Trinity School, Warwick). The majority of work placements are now allocated to the Picture Library.

### **World Data Centre C, Glaciology**

Manager: O.J. Merrington

From 7-11 April, Oliver Merrington attended the joint WDC/International Geosphere Biosphere Programme Data Workshop at Boulder, Colorado, held to facilitate collaboration between data centres in many different disciplines. This visit was funded by the International Council of Scientific Unions (ICSU) Panel on World Data Centers. Opportunity was taken to visit, and where possible set up joint projects with, the many polar and glaciological institutes at Boulder during the week previous to the meeting. These included WDC-A Glaciology (the National Snow and Ice Data Center), with whom mirror websites are to be established showing the data holdings at each centre; the Arctic System Science Data Coordination Center, to discuss future cooperation with the new NERC Arctic Environmental Metadata Centre (see below); the Institute of Arctic and Alpine Research (INSTAAR), to review joint cataloguing ventures; and the National Geophysical Data Center (incorporating WDC-A Solid Earth Geophysics, WDC-A Marine Geology and Geophysics, WDC-A Paleoclimatology, WDC-A Solar-Terrestrial Geophysics), with whom there was a fruitful cross-fertilisation of ideas on many subjects, especially with regard to advanced webpage design.

Acquisitions and cataloguing programmes have continued, with a major glaciological contribution to the SPRLIB database and *Polar and Glaciological Abstracts*. The WDC-C Manager continued to concentrate on cataloguing items from European authors, and this will lead in 1997-1998 to a European Directory of Glaciology as a webpage for each country.

Contributions to the RECON programme by volunteers during recent years have enabled the Data Centre to produce seven bibliographies, six listing all monographs on major glaciological topics and the seventh listing all glaciological periodicals held in WDC-C's collections held in the Library. Copies of these have been distributed to the other glaciological data centres.

Towards the end of the period under review, the NERC Arctic Environmental Metadata Centre was set up at the Institute. This initiative resulted from a successful application made to NERC jointly with the Centre for Glaciology (University of Wales, Aberystwyth). The Metadata Centre, funded initially for two years from 1 September 1997, will be managed by Merrington on a half-time basis with responsibilities extending to data of all disciplines generated by NERC grants and carried out in the Arctic. The objectives of the Metadata Centre are to identify the relevant datasets, particularly those meriting more active stewardship, and to disseminate information about them to the national and international scientific communities.

### **Picture Library**

Manager: Philippa Hogg

For some years it has been apparent that in its excellent photographic, film, and art collections, the Institute possesses assets of economic as well as academic value. The demand for reproduced photographs from publishers, journalists, and members of the general public, in particular, has proved increasingly difficult for the Archivist and Curator to meet, given the many other duties of that post. In creating the new post of Picture Library Manager, our intention was to establish a service that would be self-funding within two years, a target that is already well on the way to being met. Clearly a dedicated member of staff is much better placed to improve not just speed of response and marketing but also to undertake detailed cataloguing of the collections. In this Philippa Hogg is being helped by a team of volunteers: Joy Haughton, Harry King, Ailsa Macqueen, David Powell, John Reid, and Andrew Spurgin. Useful work has also been carried out by work placement students: Kate Adcock (St Mary's School), Jennifer Cowdrey (Swavesey Village College), and Joy Haughton (Impington Village College). The Shackleton Memorial Library includes provision for a Photographic Archive in which the Institute will for the first time be able to store its holdings in ideal environmental conditions.

Establishment of the Picture Library as a separate entity has encouraged the donation of several important slide collections including those of Dr T.E. Armstrong (by bequest), Gordon Buchan, Chris Furse, Mrs Edwin A. MacDonald, and Dr Charles Swithinbank. These new collections have significantly extended the scope of the collection and further donations are encouraged. Such donations represent a very material way of assisting the Institute's work.

### **Archives and Museum**

Archivist: R.K. Headland

Despite preparations for the construction of the Shackleton Memorial Library extension, the 1996-1997 period was another very active year. Services did become somewhat restricted as it ended, and the museum was closed in preparation for the building works.

The Archivist and Curator delivered lectures to many organizations, both at the Institute and outside; these included the Royal Geographical Society (the Eva Taylor Lecture), the Society for the History of Natural History (Dundee), the Gestingthorpe Association (Captain Oates' village), the Tom Crean Association (Dublin and Tralee), the Cambridge Photographic Society, Oyas Venne (Sandefjord), at St John's College (Johannesburg), the British Geological Society, and one of the public lectures at the Institute.

The Antarctic Heritage Trust requested a series of lectures, at the time of the Antarctic Treaty meeting in New Zealand, to support its objects. The travel funds were provided by the British Council and the Antarctic Society



made many of the internal arrangements. Things were rather hectic (10 lectures in six cities, during 18 days) but very productive. The time allowed visits to many organizations with polar documents and artifacts, including the Canterbury Museum and the Antarctic Centre (Christchurch); the Lyttelton Museum; the Hocken Library (Dunedin); the Port Chalmers Maritime Museum and the Southland Museum and Art Gallery (Invercargill); the Alexander Turnbull Institute, the National Archives, and the Maritime Museum (Wellington); and the Naval Museum and Maritime Museum (Auckland). The opportunity was taken to present two books, formerly from Apsley Cherry-Garrard's library in the Cape Evans hut, to the Trust on the occasion of a lecture delivered for the British High Commission. These books had been given by Mrs M.T. Wells and were originally purchased in Cardiff on the day of sailing of *Terra Nova* in 1910.

The Archivist and Curator was again requested to lecture on an Antarctic voyage. This made the first passenger circumnavigation of Antarctica (and tenth such circumnavigation), covering 25,223 km. Sixteen stations of nine nationalities and a large number of historic sites were visited. The opportunity to reinforce theory by observation was greatly appreciated. As a result of an auction, passengers aboard made a substantial contribution to the building fund and the Antarctic Heritage Trust.

A selection of organizations for which information was provided included: the Hydrographic Office (charts of the South Shetland Islands, especially related to Midshipman C.W. Poynter in 1819-1820), the Foreign and Commonwealth Office (including information for HMS *Endurance*), Crown Agents (stamp design), the National Geographic Society (several historical inquiries and a Shackleton exhibition), the Royal Geographical Society (polar records), and the Historic Warship Preservation Society (Antarctic wrecks).

The many concise notes and information papers were kept up to date in both paper and electronic forms. Editing of the revised *Antarctic chronology* continued and was very much assisted by records consulted in New Zealand. This has allowed much improvement in the sections for the Auckland Islands, Campbell Island, and adjacent groups. Several edited extracts were prepared, notably those for French and Australian expeditions on the occasions of their fiftieth anniversaries, and for Bouvetoya on the occasion of two visiting passenger ships. A major polar display in Bonn, to be in the Kunst- and Ausstellungshalle, was supplied with much information and advice. Polar artifacts will be displayed there from collections in many parts of Europe.

### Archives

The prodigious increase in prices for documents and artifacts with a polar association referred to in last year's *SPRI Review* continued. Although several major auction sales were attended, there were only disappointing results to report. Conversely, several generous gifts were re-

ceived, including copies of papers from Mr No Meisner, Miss Fauno Cordes, the Rev Bogle, and several others. Such continuing generosity shown to the Institute enabled a variety of major acquisitions to be made.

Readers arrived, as usual, from all continents. During this year the comprehensive set of Antarctic Treaty documents was frequently consulted by readers from Australia, New Zealand, South Africa, and Sweden, as well as Britain. Maintaining the chronological records of Antarctica was assisted by much information from several of these visitors, as well as from Argentine and Netherlands sources.

A brief visit to Norway at the invitation of Oyas Venne (Friends of South Georgia) was very productive. Thomas Binnie, the grandson of Edward Binnie, one of the earliest Falkland Islands and Dependencies Government representatives, who served in the South Shetland Islands and South Georgia, allowed copies of early whaling reports and associated papers to be made. These predate many of the records already held and give fascinating information for Deception Island whaling. A similar visit for a few days to South Africa was useful in securing copies of some Antarctic papers.

The Alpine Club directed several inquirers about Edward Whymper materials here, and a copy of the catalogue of his materials was supplied for them. Biographical information was provided for Admiral John Myers, who continued the work of editing the list of recipients of the Polar Medal.

Sir Ernest Shackleton and Edward, Lord Shackleton, were much in the news during the year. A generous gift of their papers and artifacts from Lady Alexandra Bergel was received. There were several visitors involved with various Shackleton expeditions and biographies of those involved, with a concentration on *Endurance*. With the theme of the Shackleton Memorial Library, a lecture and presentation of Frank Hurley's film *South* was given at Christies in London.

Several persons assisted with cataloguing material: Miss Jan Nonely continued with the Frank Illingworth papers; Mr A. Billinghurst helped with several projects, including translation of an amount of French literature on sealing voyages; and Graham Hoover and Amanda Briggs helped get the rather disparate series of Antarctic Treaty exchanges of information of national planned activities organized.

### Museum

After the events of the seventy-fifth anniversary year, the museum had a comparatively calm year, but was open only until July. The only new special exhibition was to commemorate the polar voyages of Jean Charcot. After closure, much movement took place to house all the cases under the domes in a compact but accessible way to make space for offices, the map collection, and other property displaced during the demolition work. A plan for an extensive refurbishment is being prepared, but, because it

was the first to be packed, the Museum will be one of the last parts of the Institute to reappear in 1998.

Although the prices precluded some purchases of material, two Antarctic paintings, by George Marston, were acquired. Miss Barbara Peyton had generously instructed they be bought and, after framing, given to the Institute. They are to be displayed in the new Shackleton Library. A small gavel, with *Discovery* associations, was given by Jan Smith from Canada.

The second spare sledge, made specially for the film *Scott of the Antarctic* (1948), was refurbished by Tim Flood and given to the Annascaul Community Development Association, where it will form part of a display on Tom Crean to be built near his South Pole Inn in County Kerry. Another heavy metal sledge, one of those used by Ranulf Fiennes, was given to a school in Yorkshire.

As well as with the several New Zealand museums, useful liaison was maintained with Swedish, Belgian, and French museums to commemorate the centenary of Salomon Andree's fateful Arctic flight aboard *Omen* and of the *Belgica* expedition, and the fiftieth anniversary of France in the Antarctic, respectively. The Shirase Museum, in Japan, is preparing models of several famous Antarctic ships; copies of the plans and specifications for

*Terra Nova* were supplied. A small display of material related to Captain Scott was given to the church at Binton, where he had family connections; this was coordinated by Colin Bishop. Exchange of information continued with the Bronx County Historical Museum, from which a donation to the building funds was received. The Norwegian Riks Antiquariat department has been involved in surveys of several Antarctic whaling stations, for which information and plans were provided. Likewise information was provided for the South Georgia Whaling Museum at Grytviken. After some delay, it was reported that the special Antarctic exhibition prepared last year for display in Kiev, Ukraine, was opened and has proven popular. A series of photographs made for the Culture Ministere in Paris were exhibited as part of a special polar display; the work of Herbert Ponting and Frank Hurley was particularly well represented.

Voluntary invigilation, undertaken in the Museum by Mr Robert Menzies and Mrs Mary Swithinbank, was very helpful. Miss Lucy Martin assisted with the beginnings of the preparation of a computer listing of the museum catalogue, which will be incorporated with a future catalogue of the archives and that of the Library to produce a unified SPRI catalogue.

## Polar Publications

Four issues of *Polar Record* were published by Cambridge University Press, and the journal continued its development under the editor, Dr Beau Riffenburgh, as an internationally refereed journal of polar research for the sciences, social sciences, and humanities. The editor agreed with the

organisers of VII SCAR Biology Symposium that *Polar Record* would devote a special issue to one of the sub-themes of the symposium. The editor was regularly assisted in the production of *Polar Record* by Dr Elizabeth Cruwys, Dr Peter Clarkson; and Mrs Ailsa Macqueen.

## Visitors to the Institute

Visitors to the Institute from October 1996 to September 1997 included Professor Tim Baughman (Benedictine College, Kansas), Dr Helgi Bjornsson (Science Institute of Iceland), Dr Claude de Boyer (Belgium Antarctic Programme), Professor Peter Clancy (St Francis Xavier University, Nova Scotia), Professor Richard Davis (University of Calgary), Agnieszka Halemba, David Harrowfield (Christchurch, New Zealand), Governor Walter J. Hickell (Alaska), Professor Andrei Kapitza (Moscow State University), Dr Bryan Kerman (Atmospheric Environment Service), Keith Hill, Ms Marie Jacobson (Ministry of Foreign Affairs, Stockholm), Dr Igor Krupnik, Dr Yuri Macheret (Institute of Geography, RAS), Senator Gary Nehl (Australian Parliament, Canberra), Mr Juha Nurminen

(Nurminen Foundation, Helsinki), Dr Mark Nuttall (University of Aberdeen), Dr Flavio Parmiggiani (CNR, Modena), Ms Anna Petrangeli (ENEA, Rome), Dr Ricardo Quadri (Argentine Ambassador), Jamil Rashid (Arviat, NWT), Vasco Rodrigues (Sao Paulo, Brazil), Lady Heather Rossiter (Melbourne, Australia), Dr Martin J. Siegert (University of Aberystwyth), Dr John Tichotsky, Mead Treadwell (Institute of the North, Alaska Pacific University), Mr Rose Turner (Shell, New Zealand), Dr Jinro Ukita (NASDA, Japan), Dr Nikolai Vakhtin, Dr Charles van der Merwe (South African Antarctic Programme, Cape Town), Professor Peter Williams (Carleton University, Ottawa), and Dr Ray Williams (University of Tasmania, Hobart).

## Friends of the Scott Polar Research Institute

We welcome new members and thank everyone for their support. Subscriptions, covenants, and donations amounting to £6323.03 were received during the year. This support, which is gratefully acknowledged, was used to

purchase additions for the collections and to conserve archival material. In addition, many members gave extra donations towards the Shackleton Memorial Library building fund. Dr Pamela Davis continued her work to raise funds, and to develop business and organise events during the year. Mrs Anne Millar was appointed secretary to the Friends Committee.

Thanks also go to Mrs Philippa Foster Back, chairman

of the Friends Committee; Mrs Jennifer Dale, Friends Membership Secretary; and to Ron Wilbraham and Tony Billingshurst for their regular help with the map collection and archives, respectively. Thanks are also due to Robert Menzies and Mary Swithinbank for their help with the shop; Mary Ledzion, Ann Todd, Sally Stonehouse, David Powell, Audrey Disney, Pam and Adrian White, and others who have helped with events.

## Gino Watkins Memorial Fund

The Gino Watkins Memorial fund, under the joint trusteeship of the University of Cambridge and the Royal Geographical Society, gives grants towards expeditions that meets its objectives of guiding and inspiring enterprising young people towards scientific research and exploration in the polar regions. We thank the Augustine Courtauld Trust for a contribution of £7000.00 this year. We also thank the members of the Committee who served during the year: Professor R.C. Schroter (Chairman), Dr I. Campbell, Mr R. Crabtree, Col N.A.C. Croft, Mr D. Fordham, Dr P. Friend, Dr J. Heap, Mr J. Lowther, Cdr C.J.W. Simpson, Mr A. Stephenson, Dr B. Stonehouse, and Mr N. Winser.

Grants for this past year were made as follows:

Svalbard Polar Dawn: £800  
 Arctic Research Group (and Oxford University): £500  
 British Territorial Army Medical Services Expedition to Greenland 97: £800  
 Aberdeen University East Greenland Project: £1200  
 Arctic Wintering, Kap Tobin: £500  
 Queen's University, Belfast, Oksfjordjokelen Expedition 97: £1500  
 Trans-Spitsbergen Expedition: £500  
 Friends of the Innu, UK: £500  
 Oxford University, Svalbard 97: £800

## Scientific Committee on Antarctic Research

Dr P.D. Clarkson

The Scientific Committee on Antarctic Research (SCAR) of the International Council of Scientific Unions (ICSU) continues to be housed within the Scott Polar Research Institute. Dr Peter Clarkson and Mrs Pat Richmond continued as Executive Secretary and Secretary, respectively, throughout the year.

In February 1997, Dr Clarkson represented SCAR at the fiftieth anniversary celebration of Expeditions polaires francaises held in La Tour Eiffel Tower, Paris, France.

In May 1997, SCAR was represented at the Twenty-first Antarctic Treaty Consultative Meeting (XXI ATCM) in Christchurch, New Zealand, by Professor A.C. Rocha-Campos, Dr D.W.H. Walton, and Dr Clarkson. Papers on a variety of topics were tabled, notably on scientific research in general and global change research in particular, as well as two papers prepared jointly with the Council

of Managers of National Antarctic Programmes (COMNAP) on data management and on monitoring environmental impacts.

The SCAR Group of Specialists on Environmental Affairs and Conservation held its meeting (GOSEAC IX) in Bremerhaven, Germany, during July 1997. The Executive Secretary took part in and serviced the meeting. The Meeting of the SCAR Executive Committee was held in Cape Town, South Africa, during August 1997. The Executive Secretary serviced the meeting.

Four issues of *SCAR Bulletin* (nos 123-126) were published within *Polar Record* and as separates during the year with the assistance of Polar Publications. SCAR continues to initiate, promote, and coordinate scientific research in the Antarctic and also to provide scientific advice to the Antarctic Treaty System.

## International Glaciological Society

Dr Simon Ommanney

The Society continued its service to the glaciological community, its publishing activities, and the organisation of symposia around the world from its headquarters within the Scott Polar Research Institute.

It published three issues of the *Journal of Glaciology*

and three issues of *CE, the News Bulletin of the International Glaciological Society* in 1997. Douglas MacAyeal (University of Chicago) continued as chief editor of the *Journal*, with copy editing being done by Ray Adie and Ken Moxham. Papers from the 'International symposium

on changing glaciers: revisiting themes and field sites of classical glaciology' (held in Fjaerland, Norway, 24-26 June 1996) were published in October as *Annals of Glaciology* 24. Papers from the 'International symposium on the representation of the cryosphere in climate and hydrological models' (held in Victoria, British Columbia, Canada, 12-15 August 1996), should be printed by the end of 1997 as *Annals of Glaciology* 25.

An 'International symposium on snow and avalanches' was held Chamonix, France, from 26-30 May 1997. It was organised in collaboration with the Association Nationale pour l'étude de la Neige et des Avalanches (ANENA) and several other French glaciological groups. Papers from this meeting will be published as *Annals of Glaciology* 26, edited by David McClung (University of British Columbia).

The MS participated in the 'International symposium

on Antarctica and global change,' held in Hobart, Tasmania, 14-18 July, and organised by the Australian Antarctic Cooperative Research Center. Papers from this meeting will be published by the Society as *Annals of Glaciology* 27, edited by William F. Budd (University of Tasmania).

In 1998, the IGS is organising an 'International symposium on glaciers and the glaciated landscape,' to be held in Kiruna, Sweden (17-21 August), and will be collaborating with SCAR in the publication of papers from the 'Sixth international symposium on Antarctic glaciology' (ISAG-6), being held in Lanzhou, China (5-9 September). These will form the basis of *Annals of Glaciology* 28 and 29 to be published in 1998.

The Society continues to actively promote the exchange of information and ideas on all aspects of snow and ice and co-sponsors meetings besides those it organises itself.

## Publications

- Brigham, L. 1997. Northern Sea Route draws international involvement. *Witness the Arctic* 5 (1): 8.
- Brigham, L. 1997. Satellite remote sensing of sea ice in the Laptev Sea. In: *Proceedings of the Twelfth International Symposium on the Okhotsk Sea and Sea Ice, 2-5 February 1997, Monbetsu, Hokkaido, Japan*. Hokkaido: Okhotsk Sea and Cold Ocean Research Association: 175-178.
- Brigham, L. 1997. Scientific expedition across the Arctic Ocean: US/Canada Arctic Ocean Section 1994. *Proceedings of the Twelfth International Symposium on the Okhotsk Sea and Sea Ice, 2-5 February 1997, Monbetsu, Hokkaido, Japan*. Hokkaido: Okhotsk Sea and Cold Ocean Research Association: 228-231.
- Brigham, L., and T.E. Armstrong. 1996. The Northern Sea Route, 1995. *Polar Record* 32 (183): 353-355.
- Casarini, M.P. 1996. Activities in Antarctica before the conclusion of the Antarctic Treaty. In: Francioni, F., and T. Scovazzi (editors). *International law for Antarctica*. Amsterdam: Kluwer Law International: 627-681.
- Clarkson, P. 1997. Antarctica: wilderness or wasteland? *Alpine Journal* 102 (346): 8-12.
- Cruwys, E.; K. Robinson, and I.L. Boyd. 1997. Measurements of calcium and phosphorus concentrations in the neonatal dentine of Weddell and crabeater seals using energy-dispersive x-ray analysis. *Polar Record* 33 (184): 21-28.
- Headland, R.K. 1996. An early Antarctic landing. Captain Cooper's log of the *Levant*, 1853. *American Neptune* 56 (4): 371-381.
- Headland, R.K. 1997. La photographie aux poles: les enjeux nationaux, politiques et scientifiques. In: *France. Caisse rationale des monuments historiques et des sites. La conquete des poles. 150 ans de photographie en Arctique et en Antarctique*. Paris: Editions du patrimoine: 98-102.
- Heap, J.A. 1996. Environmental protection in the polar regions: a bureaucrat's view. In: Larsen, E.S., and R. Buzza (editors). *Deep ecology in the high Arctic 1994 - International ecophilosophical symposium, Svalbard, Norway, 29th August-2nd September 1994*. Longyearbyen: Norsk Polarinstitutt: 75-80.
- Kravtsova, V.I., I.K. Lourie, and O. Toutoubalina. 1997. Mapping of dynamics of industrial damage to vegetation to Monchegorsk Region using multitemporal satellite images. In: *Proceedings of the 18th ICA/ACI International Cartographic Conference (ICC97), 23-27 June 1997, Stockholm*. Gavle, Sweden: I: 67-73.
- Lensu, M., and 8 others. 1996. *Arctic '96: Polarstern ice station report*. Helsinki: Helsinki University of Technology, Ship Laboratory (Report M-214).
- Mills, W.J. 1997. *Ultraviolet radiation: a bibliography compiled for the annual general meeting of the International Arctic Science Committee, St. Petersburg, 5-7 May, 1997*. Cambridge: Scott Polar Research Institute (SPRI Library Occasional Bibliography 41).
- Mills, W.J., and H. Shibata. 1997. *Heard and McDonald Islands: a bibliography*. Cambridge: Scott Polar Research Institute (SPRI Library Occasional Bibliography 39).
- Mills, W.J., and H. Shibata. 1997. *Macquarie Island: a bibliography*. Cambridge: Scott Polar Research Institute (SPRI Library Occasional Bibliography 40).
- Rees, W.G. 1997. Physics on ice. *Physics Review* 6: 8-11.
- Rees, W.G., and M.J.F. Satchell. 1997. The effect of median filtering on synthetic aperture radar images. *International Journal of Remote Sensing* 18: 2887-2893.
- Rees, W.G., and M. Williams. 1997. Monitoring changes

- in land cover induced by atmospheric pollution in the Kola Peninsula, Russia, using Landsat-MSS data. *International Journal of Remote Sensing* 18 (8): 1703-1723.
- Rees, W.G., and M. Williams. 1997. Satellite remote sensing of the impact of industrial pollution on tundra biodiversity. In: Crawford, R.M.M. (editor). *Disturbance and recovery in Arctic lands: an ecological perspective*. Dordrecht: Kluwer Academic Publishers: 253-282.
- Splettstoesser, J.F., R.K. Headland, and F. Todd. 1997. First circumnavigation of Antarctica by tourist ship. *Polar Record* 33 (186): 244-245.
- Stonehouse, B. 1996. Arctic and Antarctic tourism: can the one learn from the other? *Arctic Centre Reports* 22: 347-356.
- Swithinbank, C.W.M. 1996. Non-government aircraft in the Antarctic 1995/96. *Polar Record* 32 (183): 355-356.
- Swithinbank, C.W.M. 1997. New intercontinental air route: Cape Town to Antarctica. *Polar Record* 33 (186): 243-244.
- Swithinbank, C.W.M. 1997. *An alien in Antarctica: reflections upon forty years of exploration and research on the frozen continent*. Blacksburg, VA: McDonald & Woodward Publishing Company.
- Toutoubalina, O. 1997. *A closer look at quick looks: environmental applications of Internet browse imagery*. Cambridge: Scott Polar Research Institute (Technical Reports in Remote Sensing 8).
- Vitebsky, P. 1997. What is a shaman? *Natural History* 106 (2): 34-35.
- Wadhams, P. 1996. The Antarctic ice edge in summer from SAR imagery and field observations. In: *Proceedings of Oceanology International '96*. Kingston-upon-Thames: Spearhead: III, 271-282.
- Wadhams, P. 1996. The European Subpolar Ocean Programme (ESOP): investigations of the role of sea ice in Greenland Sea convection. In: Watanabe, O. (editor). *Proceedings of the International Symposium on Environmental Research in the Arctic, July 1995*. Tokyo: National Institute of Polar Research: 277-298.
- Wadhams, P., and M.P. Casarini. 1996. Statistical study of sea-ice variability at the planned locations of Leg 151 drilling sites. *Proceedings of the Ocean Drilling Program. Scientific Results* 151: 25-36.
- Wadhams, P., and N.R. Davis. 1997. Climate-related research in the UK on Antarctic sea ice. *Globe* 36: 11-13.
- Wadhams, P., G. De Carolis, F. Parmigianni, and M. Tadross. 1997. Wave dispersion by frazil-pancake ice from SAR imagery. In: *Proceedings of IGARSS'97, International Geoscience and Remote Sensing Symposium, Singapore, 3-8 August 1997*.
- Wadhams, P., J.A. Dowdeswell, and A.N. Schofield (editors). 1997. *The Arctic and environmental change*. London: Gordon and Breach.
- Williams, P.I., W.G. Rees, and others. 1997. Research strategies for development of predictive and remedial measures for oil spills in permafrost regions. In: *Proceedings of the Conference on Techniques and Technologies for Hydrocarbon Remediation in Cold and Arctic Climates, Royal Military College Canada, Kingston, Ontario, 6-7 June 1995*: 82-95.

## Members of the department

### Academic and research staff

Dr John Heap	Director
Dr Peter Wadhams	Reader in Polar Studies
Dr Gareth Rees	Assistant Director of Research
Dr Piers Vitebsky	Assistant Director of Research
Dr Neil Arnold	Assistant Lecturer
Mr William Mills	Keeper and Librarian
Dr Beau Riffenburgh	Editor, <i>Polar Record</i>
Mr Robert Headland	Archivist and Museum Curator
Dr Pamela Davis	Fundraising and Business Development
Mrs Eileen Aldworth	Research Associate
Dr Norman Davis	Research Associate
Mr Michael Gorman	Research Associate
Mr Stephen Wells	Research Assistant
Mr Jeremy Wilkinson	Research Assistant
Dr Liz Cruwys	Senior Associate

Mr Harry King	Senior Associate
Dr Gordon Robin	Senior Associate
Dr Bernard Stonehouse	Senior Associate
Dr Charles Swithinbank	Senior Associate
Mr Peter Speak	Senior Associate
Dr Janet West	Associate

### Picture Library

Ms Philippa Hogg	Manager
------------------	---------

### Library Bibliographers

Mr Jonathan Pinhey	Nordic Bibliographer
Ms Hilary Shibata	Antarctic Bibliographer
Ms Isabella Warren	Russian Bibliographer

### World Data Centre C (Glaciology)

Mr Oliver Merrington	Manager
----------------------	---------

### Scientific Committee on Antarctic Research

Dr Peter Clarkson	Executive Secretary
Mrs Pat Richmond	Secretary

**International Glaciological Society**

Dr Simon Ommanney      Secretary General  
Mrs Linda Gorman      Secretary

**Shackleton Memorial Project Manager**

Capt Joseph Wubbold

**M Phil Students**

Mr James Allen  
Mr Michael Conerny  
Miss Kaisa Hietala  
Mr Michael Johnson  
Miss Jasmine Minbashian  
Miss Carol Moore  
Miss Julie Morgan  
Mr Philip Pope  
Mr Andrew Spurgin

**Research Students**

Mr Yevgeny Aksenov  
Miss Tatiana Argounova  
Mr Andrew Bingham  
Capt Lawson Brigham  
Ms Maria Pia Casarini-Wadhams  
Ms Mary Core  
Mr Finlo Cottier  
Miss Kim Crosbie  
Mr Jeff Evans  
Mr Daniel Feltham  
Mr Paul Fryer  
Mr Richard Hall  
Mr Joachim Otto Habeck  
Mr Matthew Huddleston

Ms Ingibjorg Jonsdottir  
Mr Douglas Low  
Mr Gareth Marshall  
Miss Amanda Nimon  
Mr Indra Nobl-Overland  
Mr Mathias Reisemann  
Mr Ben Seligman  
Mr Steven Sawhill  
Miss Olga Toutoubalina  
Mr Mark Tadross

**Administrative and other Assistants**

Mrs Margaret Aitchison	Receptionist (am)
Miss Sharon Banks	Library Assistant
Miss Frances Boud	Secretary (Sea Ice)/Receptionist (am)
Mrs Irene Burns	Accounts Clerk/General Office Secretary
Mrs Teresa Clark	Director's Assistant
Ms Marion Curran	Secretary (Social Sciences and Russian Studies Group)
Mrs Jennifer Dale	Secretary
Ms Natasha Egorova	Library Assistant
Ms Khadisha Mattar	Secretary (Sea Ice)
Mrs Paula Sands	Receptionist (pm)
Miss Shirley Sawtell	Information Assistant
Ms Gisela Tagg-Randall	Secretary (Social Sciences and Russian Studies Group)

**Placement Students**

Mr Steven Down	University of Wales, Cardiff
Miss Angharad Howells	University of Wales, Cardiff

**Financial support**

In addition to research grants received for specific projects, the Scott Polar Research Institute received, during the financial year, sums for the general support of information and library services. Special thanks are due to the following generous supporting bodies:

NERC British Antarctic Survey	50,000
Ministry of Defence grant in aid (DSNOM)	35,000
Royal Society grant in aid (for WDC-C)	<b>11,000</b>
Crown Agents	5,000
Commonwealth of Australia	4,337
British Library	3,365