

Scott Polar Research Institute Review 2013

87th Annual Report of the
Scott Polar Research Institute
University of Cambridge, UK



Scott Polar Research Institute
University of Cambridge



**UNIVERSITY OF
CAMBRIDGE**



Memorial to Sir John Franklin, Waterloo Place, London

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Director's Introduction

A very important part of the Institute's activity is through the research of our post-doctoral staff and students, who together number between 30 and 40 in most years, working under the supervision of our senior academics. Many research students and post-doctoral staff of the Institute, in both the polar sciences and social sciences, have gone on to academic posts in universities in the UK and overseas. This provides clear external recognition of the high quality of their research work and of the strong research culture within the Institute. This year, for example, Dr Steven Palmer and Dr Kelly Hogan have obtained established posts in Exeter University and the British Antarctic Survey, respectively, and Dr Alison Banwell was awarded a prestigious Junior Research Fellowship at St. Catharine's College. Similarly, a large number of students taking our Master of Philosophy course in Polar Studies also proceed to doctoral work either in Cambridge or elsewhere; recent external destinations for doctoral studies include Oxford, Berkeley, Harvard and the California Institute of Technology.

As well as writing theses and research papers, the latter often together with senior academic staff, our students and post-doctoral researchers regularly attend international conferences where they give talks and present posters on their work. We are fortunate that, through endowed funds such as the Brian Roberts Fund, the Institute is able to support some of the travel costs associated with this important way of gaining experience in projecting SPRI research and obtaining feedback on emerging research ideas. This year, Christine Batchelor won an outstanding student poster award at the annual European Geosciences Union conference in Vienna for her presentation on the seismic stratigraphy and glacial history of the Canadian Beaufort Sea margin.

Both senior academic staff and research scientists at SPRI were also involved in the field and subsequent analytical work that led to the discovery of the first subglacial lakes beneath the Greenland Ice Sheet. SPRI played a leading role in the field programme of airborne radar measurements in Greenland, the publication of a paper in the journal *Geophysical Research Letters*, and the various media stories that followed the announcement of the discovery. This work was funded by a substantial and competitively won research grant from the UK Natural Environment Research Council. During the year, staff and students of the Institute have participated in further field programmes in Greenland, Svalbard, Iceland, Russian Siberia and Antarctica.

Turning to the Institute's Polar Museum and outreach activities, there have been a number of major exhibitions this year, to go alongside the more permanent displays on polar history, ethnography and science. These exhibitions, which typical last



for between a few weeks and about three months, mean that the 43,000 people that the museum welcomed last year had a varied and changing visitor experience. Exhibition topics ranged from 'Frozen Worlds', which included displays on the Antarctic Ice Sheet and ice bodies in other parts of the Solar System, to an exploration of the culture and history of the port city of Magadan in the Russian Far East, which is ice-bound each winter. Our group of museum volunteers has, as ever, been vital in enhancing the visitor experience in the museum. Behind the scenes, our curatorial staff have also been busy reorganising SPRI's wide-ranging collection of polar textiles and clothing. The Institute is grateful for the continuing support of the UK Antarctic Heritage Trust in funding the post of Conservator, enabling such important back-of-house work to take place. The support of several generous donors also allowed the purchase for our Archives of one of Captain Scott's last letters, written to Sir Francis Bridgeman just before Scott's death on the return journey from the South Pole in 1912. A particularly moving gift to augment our collection of Inuit sculpture was that



The Director in the science laboratory of the research vessel Helmer Hansen in Svalbard waters

of a large and very beautiful soapstone polar bear in the will of the late Jay Klinck, a former Masters student of the Institute, in recognition of his time in Cambridge.

In the Polar Library, the work of transferring our entire catalogue of polar literature onto the Voyager system has continued, and plans are being made for a complete redesign and refurbishment of the Library reception area. It is sad to report that Harry King, who was Librarian of the Institute for almost thirty years before retiring in 1983, died at the age of 91 during the year. Harry, working for many years alongside Gordon Robin and Terence Armstrong in the Institute, was responsible for developing the collection and cataloguing of the Institute's world-renowned Polar Library, and was co-editor of the eighteen-volume library catalogue published in 1976. Harry will be remembered by many, not only for his achievements as Librarian, but also for his unfailing courtesy and good humour, and his kindness to visitors to the Library and the wider Institute.

I would like to thank the staff and students of the Institute for their work over the year, including the administration, support-staff and maintenance teams who provide the backup needed to allow research, teaching and public outreach relating to the polar regions to take place. It is also a pleasure to thank those individuals, trusts and other institutions who have supported our work either financially or in-kind.

Professor Julian Dowdeswell

Institute Staff

Senior Academic Staff

Professor Julian Dowdeswell
Dr Neil Arnold
Dr Michael Bravo
Dr Poul Christoffersen
Dr Gareth Rees
Dr Piers Vitebsky
Dr Ian Willis

Director and Professor of Physical Geography
University Senior Lecturer
University Senior Lecturer
University Senior Lecturer
University Senior Lecturer
Assistant Director of Research
University Senior Lecturer

Research Staff

Mr Toby Benham
Dr Alison Banwell
Dr Marion Bougamont
Mrs Evelyn Dowdeswell
Dr Janne Flora
Dr Kelly Hogan
Dr Stephen Pax Leonard
Dr Shane McCorristine
Professor Elizabeth Morris, OBE
Dr Ruth Mugford
Dr Steven Palmer
Dr Remy Rouillard
Dr Ian Stone
Dr Olga Ulturgasheva

Research Associate
Research Fellow
Research Associate
Research Associate
Research Associate
Research Associate
Research Fellow (to October)
Researcher
Research Associate
Research Associate (to October)
Research Associate (to August)
Researcher
Editor, *Polar Record*
Research Fellow

Library, Archive and Museum Staff

Mrs Heather Lane
Miss Rosie Amos
Ms Naomi Boneham
Mrs Naomi Chapman
Mrs Georgina Cronin
Ms Bridget Cusack
Mr Martin French
Mr Bryan Lintott
Ms Lucy Martin
Mrs Sophie Rowe
Ms Christina Rozeik
Ms Hilary Shibata
Ms Willow Silvani
Ms Kay Smith
Ms Rebecca Stancombe
Mrs Isabella Warren
Mr Jeremy Wong

Librarian and Keeper of Collections
Education and Outreach Assistant (job share)
Archives Manager
Education and Outreach Assistant (job share)
Senior Library Assistant
Museum Development Coordinator
Library Assistant
Exhibitions Officer
Picture Library Manager
Conservator (job share)
Conservator (job share)
Antarctic Bibliographer
Documentation Assistant
Museum Project Manager (to March)
Library Assistant
Russian Bibliographer
Arctic Bibliographer

Support Staff

Mr Grahame Adley
Mrs Nicola Skipper
Mrs Lisa Avis
Mrs Danielle Feger
Mrs Kate Gilbert
Ms Marion Jeffries
Mr Martin Lucas-Smith
Mrs Debbie Moore
Mrs Maria Pearman
Mr Roy Smith
Dr Adam Strange

Maintenance
Saturday Museum Assistant
Receptionist/Secretary (to June)
Research Administrative Officer
Director's Assistant/Institute Administrator
Maintenance
Web Manager
Receptionist/Secretary
Senior Clerk
Maintenance
Administrator

Doctoral Students

Ms Christine Batchelor
Miss Jennifer Brown
Mr Will Dickens
Mr Peter Evans
Mr Jorge Guzman
Ms Tania Kossberg
Mr Conrad Koziol
Ms Terto Kreutzmann
Ms Evelyn Landerer
Miss Natalia Magnani
Mr Evan Miles
Mr Allen Pope
Ms Jackie Price
Mr Tim Reilly
Mr Ciaran Robb
Ms Katya Shipigina
Mr Roman Sidortsov
Mr Craig Stewart
Mr Nicholas Toberg
Mr Joe Todd
Miss Anna Maria Trofaier

Ms Claire Warrior
Mr Matthew Wise

M.Phil. Students

Ms Mia Bennett
Mr David Burton
Mr Grant MacDonald
Mr Edward Pope
Mr Jonathan Ryan
Mr Tun Jan Young

Institute Associates

Dr John Ash
Dr Lawson Brigham
Dr Liz Cruwys
Dr Nick Cutler
Dr Fiona Danks
Dr Bob Hawley
Mr Robert Headland
Dr Neil Kent
Dr Elena Khlinovskaya Rockhill

Ms Dinah Molloy
Dr Ruth Mugford
Dr Beau Riffenburgh
Dr Florian Stammeler
Dr John Tichotsky
Ms Dinah Molloy Thompson
Dr Olga Tutubalina
Dr Emma Wilson

Emeritus Associates

Dr Peter Clarkson, MBE
Mr Harry King (died 4 July 2013)
Dr Simon Ommanney
Professor Larry Rockhill
Dr Bernard Stonehouse
Dr Colin Summerhayes
Dr Charles Swithinbank
Dr Janet West
Professor Peter Williams

Other organisations based at SPRI

World Data Centre for Glaciology, Cambridge

Mr Rick Frolich
Manager

International Glaciological Society

Dr Magnús Már Magnússon
Secretary General

Scientific Committee on Antarctic Research

Dr Michael Sparrow
Dr Renuka Badhe
Dr Eoghan Griffin
Mrs Rosemary Nash
Executive Director
Executive Officer
Project Officer
Senior Clerk

SPRI Committee of Management

Prof. R.C. Kennicutt, Chair
Prof. J.A. Dowdeswell, Sec.
Prof. S.E. Owens, OBE
Prof. J.A. Pyle
Prof. D.A. Hodell
Prof. S. Schaffer
Prof. P.M. Brakefield
Chair of the Council of the School of Physical Sciences
Director, Scott Polar Research Institute
Head, Department of Geography
Department of Chemistry
Department of Earth Sciences
Department of History and Philosophy of Science
Director, Museum of Zoology

SPRI Advisory Committee

Prof. J.A. Jackson, Chair
Prof. J.A. Dowdeswell, Sec.
Prof. A. Rodger
Rear Admiral N. Lambert
Ms J. Rumble
His Excellency, The Hon Mr G. Campbell
Dr E. Jolley
Dr J. Craig
Professor R. Mair, CBE
Professor S. Smith
Head, Department of Earth Sciences
Director, Scott Polar Research Institute
Interim Director, British Antarctic Survey
Chief Executive UKHO and National Hydrographer
Head of the Polar Regions Department, FCO
High Commissioner for Canada
BP
Eni
Department of Engineering
Mistress, Girton College

Polar Research

Research Group Structure

The research work of the Institute continues to focus around its research groups, each of which has a mix of senior academic staff, post-doctoral researchers and postgraduate students. The work of the groups is supported by a number of externally funded research grants, which are listed later in this report. The groups are:

- [Glaciology and Climate Change](#)
- [Glacier-Influenced Marine Sedimentary Environments](#)
- [Polar Landscapes and Remote Sensing](#)
- [Anthropology and Russian Northern Studies](#)
- [Circumpolar History and Public Policy](#)

Institute staff organise seminar series in both polar physical sciences and social science and humanities. Speakers from universities and research centres in the UK and overseas, together with Cambridge colleagues, have contributed during the year. The seminars are well attended by staff and research students from a number of Cambridge departments and from, for example, the British Antarctic Survey. A selection of the physical and social-science research projects in which we are currently engaged is outlined briefly below.

SPRI scientists inspect a huge drainage channel into the Greenland Ice Sheet





Iceberg and sea ice in the Bellingshausen Sea, Antarctica

Polar Physical Science

Lakes discovered beneath the Greenland Ice Sheet

Subglacial lakes are an established and important component of the basal hydrological system of the Antarctic ice sheets, but none has been reported previously from Greenland. Airborne radio echo-sounding measurements at 60 MHz show the first clear evidence for the existence of subglacial lakes in Greenland. Two lakes, with areas of about 8 and 10 km², were identified from strong and very flat reflectors at the base of the northwestern sector of the ice sheet, about 40 km from the ice margin, and below 757 and 809 m of ice, respectively. The setting of the Greenland subglacial lakes differs from those of lakes beneath the Antarctic Ice Sheet, being under

relatively thin and cold ice, pointing to a fundamental difference in their nature and genesis. Possibilities that the lakes consist of either ancient saline water in a closed system or are part of a fresh, modern open hydrological system have been examined, with the latter interpretation considered more likely. This work was undertaken in collaboration with colleagues at the University of Texas, Austin, and at Bristol University, and was supported by a substantial NERC Grant. It is published in *Geophysical Research Letters*.

Steve Palmer, Julian Dowdeswell, Poul Christoffersen and Toby Benham

Break-up of the Larsen B Ice Shelf

After the Larsen B Ice Shelf in Antarctica disintegrated in March 2002, there were still two unresolved questions: i) which process caused the ice shelf to separate into thousands of fragments small enough to capsize; and ii) which process synchronized the ice shelf's widespread fragmentation over just a few days? In a study published in *Geophysical Research Letters*, we showed that the answers relate to the densely configured set of ~2750 surface lakes. Surface lakes (and drained lakes) are mass loads (or deficits) that produce flexure stresses on ice shelves. Fractures occur when these imposed flexure stresses exceed the flexure strength of the ice shelf. The spacing of these fractures caused a large proportion of the Larsen B

Ice Shelf fragments to be unstable and to capsize. The filling or drainage of a single 'starter' lake also caused multiple fractures, able to drain hundreds of surrounding lakes through a chain-reaction process. Such a process probably initiated the rapid breakup of the Larsen B Ice Shelf. Further work is now being undertaken to model the viscoelastic response of the ice shelf to lake-drainage events, in addition to the elastic response. This work is being undertaken as part of a Junior Research Fellowship from St Catharine's College and in collaboration with Professor Doug MacAyeal (University of Chicago).

Alison Banwell



Humpback whales in Dallman Bay, Antarctic Peninsula

Hydrology of the Greenland Ice Sheet

A hydrological model developed at SPRI has been applied to the Paakitsoq/Swiss Camp region of the Greenland Ice Sheet. The model is used to calculate melt patterns across the ice sheet, the surface routing of water to depressions, where they form lakes, the drainage of those lakes to the ice-sheet base, and the routing of water to the ice-sheet edge. This is the first model tracking water from surface melt to outflow discharge that has been applied to a specific region of the ice sheet, driven and tested using observed data. The model predicts future scenarios for altered climate. A key output is spatial and temporal patterns of water pressure (an important parameter in ice-flow models, controlling how fast the ice sheet moves). Preliminary results suggest that, through the 21st

Century, water pressure fluctuations will increase beneath some parts of the ice sheet and decrease in others, depending on how surface melt is delivered to the bed and how the conduits at the bed are able to adjust to the extra melt water. Aspects of the model are being improved by incorporating the roles of: i) surface lake water on the underlying melt process; ii) surface lakes overtopping and incising channels into the ice, thereby allowing lake drainage; iii) subglacial linked cavities at the bed and the exchange of water between cavities and channels. The work is being undertaken with PhD student Conrad Koziol and in collaboration with Dr Ian Hewitt (University of Oxford).

Neil Arnold, Alison Banwell and Ian Willis

Airborne remote sensing of Langjökull, Iceland

In August 2013, a repeat SPRI airborne survey of Langjökull, Iceland's second largest ice cap, took place six years after an initial survey. The instruments on board the aircraft were a laser scanner (lidar) and hyperspectral sensors measuring radiative properties spanning the visible, through near infra-red, to short wave infrared wavelengths (400-2450 nm). The lidar data have generated a very high spatial resolution (2 m) digital-elevation model (DEM) of the ice-cap surface, and the hyperspectral data are being used to characterise the reflectance properties of the ice cap at a high spatial and temporal resolution. The 2013 DEM was compared with the 2007 DEM and with other lower spatial resolution DEMs for 2004 and 1997 derived from satellite and ground-based measurements respectively. Preliminary results suggest that the ~920 km² ice cap lost about 7.5 km³ of ice (water equivalent) between 2007 and

2013, a rate of 1.25 km³ per year. This compares with losses of 0.37 km³ per year between 2004 and 2007 and 1.64 km³ per year from 1997 to 2004. The hyperspectral data are also being compared with similar data collected in 2007 and with lower spatial and spectral resolution satellite data collected in others years. This will inform how the distributions of ice, firn and snow types vary over time in response to climate variability and change. The data are being used to calibrate and validate a surface mass-balance model for the ice cap, which will be used to predict how the ice cap will change into the 21st Century. The work is being undertaken with current and former graduate students of the Institute and Finur Pálsson (University of Iceland) and Tomas Johannesson (Icelandic Meteorological Office).

Ian Willis, Neil Arnold and Gareth Rees

Spectral Library of Arctic Plants

The project 'Spectral Library of Arctic Plants' (SLAP) was began in 2013, bringing together a number of strands of research that have been developed over the last decade at SPRI and at Moscow State University. The aim of SLAP is to develop a systematic archive of hyperspectral reflectance measurements of high-latitude plant species representative of particular plant functional types. Such information will allow full advantage to be taken of new hyperspectral remote sensing data and also permit much more detailed

studies of plant physiology under stress from climate change and pollution effects. Data have already been collected on some lichens and dwarf shrub species. During June and July 2013, fieldwork was conducted around the field station of Moscow State University in the Khibiny Mountains on the Kola Peninsula, when over a hundred plant spectra were collected. Fieldwork was conducted with colleagues and students from Moscow State University.

Gareth Rees and Olga Tutubalina

Remote sensing of penguin colonies in a changing environment

This project is a collaboration with British Antarctic Survey (BAS) scientists Phil Trathan and Peter Fretwell to develop a method, first demonstrated by Fretwell at BAS, to identify and characterise Antarctic penguin colonies using high-resolution remote-sensing imagery. New research directions include advanced image-analysis techniques and the use of hyperspectral data,

which we intend to collect in the field, from which it should be possible to extend the range of species that can be monitored in this way. Jennifer Brown was appointed to a PhD studentship in this project and began work in October 2013.

Gareth Rees and Jennifer Brown

CryoSat-2

Liz Morris continued to participate in an international programme to validate data collected by a new radar altimeter (SIRAL) carried by the CryoSat-2 satellite. Data collected on the Greenland Ice Sheet over the period 2004-2011 have been used to derive a new empirical snow-densification equation. A consortium bid to the European Space Agency (ESA), *Cryosat Land Ice Product Validation using CryoVex and IceBridge campaign data*, was successful and will fund further analytical work. Meanwhile, work began

on a project to study the surface mass-balance of Pine Island Glacier, West Antarctica. New equipment was purchased and tested and Peter Lambert, a PhD student based at the Meteorology Department of Reading University, was trained at SPRI in techniques of density profiling. Liz Morris completed this training during a visit to Rothera Station, Antarctica, and Peter Lambert successfully completed his first field season on Pine Island Glacier.

Liz Morris

Pancake ice forming on the sea surface in Baffin Bay



Buried iceberg ploughmarks in the Early Quaternary sediments of the North Sea

Buried linear to curvilinear depressions, interpreted as ploughmarks produced by the underwater keels of drifting icebergs in contact with the sea-floor, were identified through most of the 2 million year-long and 700 m-thick Early Quaternary sedimentary record in two 3-dimensional seismic cubes from the central North Sea basin. The ploughmarks were an average of about 50 m wide and 3 km long. The features, sometimes buried by hundreds of metres of subsequent sedimentation, are similar to multibeam sea-floor images of iceberg ploughmarks forming today on Arctic and Antarctic continental shelves.

The buried features indicate that drifting icebergs were present in the North Sea throughout most of the Early Quaternary. The iceberg source was probably an Early Quaternary Scandinavian ice sheet extending intermittently onto the continental shelf of western Norway. A lack of iceberg ploughmarks in the last few hundred thousand years of the North Sea record suggests that, by the Middle/Late Quaternary, the basin was largely sediment-filled, precluding the drift of icebergs. This work was undertaken in collaboration with Dag Ottesen (Exploro AS, Trondheim).

Julian Dowdeswell

Amplified calving on tidewater glaciers in Greenland

The Greenland Ice Sheet is losing mass at an accelerating rate, owing to increased surface melting and discharge of ice by fast-flowing glaciers terminating in fjords. Whereas these two factors are typically considered as independent of each other, a recent study at SPRI showed that discharge of water into fjords through atmospherically connected

subglacial drainage systems amplifies ice-front melting and calving. Marine-terminating glaciers in Greenland may consequently calve at a higher rate as climate warms, and thereby potentially increasing the rate of global sea-level rise. Outcomes from this study were published in the journal *The Cryosphere*.

Poul Christoffersen

Michael Bravo showing traditional seasonal routes in Arctic waters drawn by Inuit elders of Pond Inlet, Nunavut, Canada



Atlas of Pan-Inuit Trails

This project set out to create an historical atlas of the trails travelled by Inuit over the course of the last two centuries. Many of the trails are of course much older and require further archaeological research to place in time. The documents that form the foundation of the Atlas consist of both published and unpublished accounts of cartographic encounters with maps drawn by Inuit to assist visitors. All documents are available to the public through publications, libraries and archives. The novelty of the Atlas is that the historical material is not only relationally linked, but also referenced geospatially and displayed on a base map. One distinctive feature of the Atlas is that it gives

a glimpse, although incomplete, of how Inuit have used the waters and adjacent lands of the Northwest Passage and other areas, as documented in written historical records (maps of trails and place names). Because the maps were a product of encounters between Inuit and outsiders, the material represents not only Inuit occupancy, but also provides indirect evidence of northern surveys through the travel records of traders, missionaries, and scientists. The Atlas can be accessed at <http://paninuittrails.org>. This project is collaborative with Claudio Aporta and Fraser Taylor, Carleton University, Ottawa, Canada.

Michael Bravo

Spectral geographies of Arctic exploration

This project, funded by an Irish Research Council CARA (Marie Curie COFUND) Fellowship (2010-13), concerns material histories of the apparently immaterial – dreams and reveries of air, earth, water and the ghosts that haunt the Arctic. To Euro-American audiences the Arctic was so much more than an unknown blank space waiting to be discovered and mapped. Rather, the Arctic was seen as overflowing the cartographic space in which it was usually bounded by those few who promoted and handled polar exploration. Linear narratives of geographical achievement or failure, then, were only a part of the whole. For many ordinary people, the Arctic was thought of as a space of spectral and affectual forces, where intense bundles of bodies, thoughts and spirits gathered, were sensed, and were then expressed through private emotions and public

entertainments. Several articles have been written and a book is in preparation that seeks to re-think some of the stories that explorers, readers, consumers and nations tell themselves about Arctic exploration. One inherent value in this approach is to question the standard narratives of polar exploration which posit a rational male hero either conquering or being conquered by an inanimate Nature. Such a dichotomy not only ignores the everyday dreaminess and ‘superstitious’ behaviour which explorers carried with them, but also obscures the spiritual values that could be sensed by people in polar landscapes, whether through atmospheric phenomena like the *Aurora Borealis* or the embodied journeys of Inuit shamans and British clairvoyants across vast distances.

Shane McCorristine

Sacrifice as the ideal hunt: a cosmological explanation for the origin of reindeer domestication

Piers Vitebsky and Rane Willerslev (Århus) worked with Anatoly Alekseyev (Yakutsk), an indigenous Siberian hunter, reindeer herder and anthropologist, to develop a radical new answer to the long-standing mystery of the transition from hunting to pastoralism in Siberia. Combining Alekseyev's personal experience as a hunter with a close analysis of a century's worth of sources, the researchers detected striking parallels in the Siberian Northeast between the cosmologies of hunters and of reindeer herders, despite their environmental and socio-economic differences. Their analysis revealed a structural identity between hunting and sacrifice, in which the domestication of the reindeer is seen as a result of indigenous peoples' efforts to use sacrifice to control the accidental variables of the hunt. Developing Ingold's theory of a

tension between trust and domination, they compare the bear festival of the Amur Gulf region and the consecrated reindeer (*kujjaŋ*) of the Eveny to argue that hunters can practise their ethos of trust with their prey only through highly controlled ritual enactments. Both examples display the same overall logic by which sacrifice functions as an ideal hunt in order to overcome a double bind inherent in the spiritual and environmental morality of Arctic animism. It is not with wild prey that a relationship of trust is developed, but with the reindeer as it undergoes a process of taming. They therefore conclude that the origin of the reindeer's domestication may be found not primarily in patterns of ecological or economic adaptations, but rather in cosmology.

Piers Vitebsky

Using indigenous research methods to study youth socialisation in Alaska and Siberia

This international comparative ethnographic inquiry, funded by the US National Science Foundation, explores ways in which indigenous research methods can be utilised in the study of youth, with special focus on socialisation practices and the experiences of growing up in Arctic indigenous communities in Siberia and Alaska. The design and methods of the study arise directly from community requests and contemporary circumpolar social exigencies to develop more effective and culturally responsive ways of working with indigenous youth. The involvement of indigenous Alaskan and Siberian social scientists has allowed the development of an innovative method of anthropological peer-observation in each

community to document and address the complexities of conducting research as an indigenous person. This approach brings their local expertise, empathy, and native viewpoint to bear on the contemporary socio-economic and global environmental context. This participatory study explores the key characteristics of indigenous research methodologies and how they can be applied in the study of indigenous Arctic youth, to address several questions. How can anthropological peer observation methods impact critically upon social issues in communities? What are the benefits and challenges of utilising such an approach to research, and how can this be applied across cultural and academic contexts?

Olga Ulturgasheva

Exploring histories - Polar exploration and the construction of history at the National Maritime Museum, Greenwich

This project examines the relationship between the family, the museum and Polar exploration, in the context of the National Maritime Museum. The investigation concerns how Polar families construct themselves and their histories, and how this intersects with a national institution like a museum - what is remembered, by whom and how? The role of artefacts in remembering in a family context is considered, along with what happens when things move from families to museums, often leading to negotiations over value and relationships that persist for extended

periods of time. An analysis of museum displays over a period of some fifty years raises questions about the extent to which families influence public representations of exploration, whilst the museum's role as an active site of commemoration is also examined. The work suggests that the role of the family in both exploration history and museums has often been underestimated, and demonstrates the multiple ways in which family histories and national histories are entangled.

Claire Warrior



Early houses in the settlement of Ny-Alesund, Spitsbergen

Current Research Grants

Staff of the Institute currently hold research grants of about £3.4 million, of which about £2 million is from the UK research councils.

Grants from UK Research Councils

Airborne geophysical investigations of basal conditions at flow transitions of outlet glaciers on the Greenland Ice Sheet

Source: Natural Environment Research Council, Grant NE/H020667/1
£840,000 (2010–2014)

Airborne geophysical investigations of conditions at the bed of fast-flowing outlet glaciers of large Canadian Arctic ice caps.

Source: Natural Environment Research Council, Grant NE/K004999/1
£573,000 (2012–2016)

Subglacial Access and Fast Ice Research Experiment (SAFIRE)

Source: Natural Environment Research Council, Grant NE/K005871/1
£261,920 (2013–2016)

Dynamical Response of Pine Island Glacier, West Antarctica (iSTAR-C)

Source: Natural Environment Research Council and the Newton Trust
£134,409 (2012–2015)

The contribution to sea-level rise from the Amundsen Sea sector of Antarctica (iSTAR-D)

Source: Natural Environment Research Council, Grant NE/J005797/1
£20,451 (2013–2016)

Validation and provision of CryoSat measurements of fluctuations in the Earth's land and marine ice fluxes

Source: Natural Environment Research Council, Grant NE/R015203/1
£116,192 (2009–2015)

Will climate change in the Arctic increase the landslide-tsunami risk to the UK?

Source: Natural Environment Research Council, Grant NE/K00008X/1
£32,154 (2012–16)

Late Quaternary deglaciation of the NW Barents Sea

Source: Natural Environment Research Council, Radiocarbon Facility
£5,800 (2012–2013)

Grants from Other Sources

Collaborative research: using visual methods to engage indigenous youth and community members in cross-site, international analysis: a methodological study (ARC-1219344).

Source: University of Massachusetts/National Science Foundation
£20,000 (2012–2013)

Developing indigenous research methodologies in the Arctic (IRM-A): examining the impacts of settlement on socialization and youth experience in Siberia and Alaska (ARC-1207894)

Source: University of Alaska Fairbanks/National Science Foundation
£199,266 (2012–2014)

Heritage Lottery Fund Stage 2 Museum Grant - Renovation of museum and archives: developing the Scott Polar Research Institute Museum

Source: Heritage Lottery Fund, Grant HG-06-01385/2
£994,000 (2009–2013)

Heritage Lottery Fund Collecting Cultures - Arctic visions: Inuit art and material culture

Source: Heritage Lottery Fund, Grant CC-07-011106
£200,000 (2008–2013)

Publications by Institute Staff

Books

Sovacool, B., **Sidortsov, R.** and Jones, B., 2013. *Energy Security, Equality and Justice*. London and New York: Routledge, 240 pp.

Rees, W.G., 2013. *Physical Principles of Remote Sensing (Third Edition)*. Cambridge University Press, 441 pp.

Wilson, E. and Blackmore, E., (Eds), 2013. *Dispute or Dialogue? Community Perspectives on Company-Led Grievance Mechanisms*. London: International Institute for Environment and Development, 165 pp.

Papers

Arthern, R., Corr, H.F.J., Gillet-Chaulet, F., **Hawley, R.** and **Morris, E.M.**, 2013. Inversion for the density-depth profile of polar firn using phase-sensitive radar. *Journal of Geophysical Research*, v. 118, p.1257-1263.

Banwell, A.F., MacAyeal, D.R. and Sergienko, O.V., 2013. Break-up of the Larsen B Ice Shelf triggered by chain-reaction drainage of supraglacial lakes. *Geophysical Research Letters*, v. 40, doi: 10.1002/2013GL057694.

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Doctoral and Masters Theses

Bennett, M., M.Phil., North by Northeast: towards an Asian-Arctic region

Burton, D., M.Phil., Submarine glacial landforms and past ice flow in the Krossfjorden system, Northwest Svalbard

MacDonald, G., M.Phil., Modelling the sub-glacial drainage system of Petermann Glacier, NW Greenland

Pope, A., Ph.D., Multispectral classification and reflectance of glaciers: in situ data collection, satellite data algorithm development, and application in Iceland and Svalbard

Pope, E., M.Phil., Surface reflectance characteristics of Langjökull, Iceland

Ryan, J., M.Phil., Submarine geomorphology of SE and SW Greenland from Olex data

Shipigina, E., Ph.D., Remote-sensing methods for environmental monitoring of human impact on sub-Arctic ecosystems in Europe

Young, T.J., M.Phil., Remote sensing of recent changes in permafrost-influenced wetlands

Seminars

Polar Physical Sciences seminars, including:

Using sediment archives from fjords to reconstruct past glacier and ocean variability
Camilla Andresen (Geological Survey of Denmark and Greenland)

Glacial landsystems: modern polar and alpine analogues for Quaternary palaeoglaciology
David Evans (Durham University)

Antarctic elevation change from satellite radar altimetry
Malcolm McMillan (University of Leeds)

Are Karakoram glacier surges linked with climate?
Duncan Quincey (University of Leeds)

Sea Ice Research at the Finnish Meteorological Institute – from ice charts to climate studies
Eero Rinne (Finnish Meteorological Institute)

Early East Antarctic Ice Sheet growth recorded in the landscape of the Gamburtsev Subglacial Mountains
Kathryn Rose (British Antarctic Survey)

Unveiling the glacial and landscape evolution of West Antarctica: subglacial insights from ice-penetrating radar and satellite imagery
Neil Ross (University of Newcastle)

Ice sheets, glaciers and sea-level rise: a perspective from the 5th Assessment Report by the IPCC
David G. Vaughan (British Antarctic Survey)

Polar Social Science and Humanities seminars, including:

The geographical unconscious: mapping the supernatural in current research
Shane McCorristine (SPRI – convenor)

The journals of William Hooper: Inuit ethnographer and evangelical
John MacDonald, Carolyn MacDonald, and Wim Raising

The politics of sovereignty
John Agnew (UCLA)

Breaking Ice Group on polar interdisciplinarity
Michael Bravo, Janne Flora, Rémy Rouillard, Shane McCorristine (SPRI – convenors)

Ideology or democratisation in a post-Soviet psychiatric clinic
Vieda Skultans (Bristol University)

Mastery and luck among Orochen-Evenki reindeer herders of Eastern Siberia
Donatas Brandisauskas (Aberdeen/Vilnius)

Inviting Native Americans to a Siberian reindeer camp
Olga Ulturgasheva (SPRI)

Intimate relations between hunters and spirits in Greenland
Terto Kreutzmann (SPRI)

Polar Information and Historic Archives

Library and Information Service

Two major infrastructural projects formed the core of the Library's work programme for 2013: the proposed refurbishment of the Library (including redesign of the main entrance, improvement of reader facilities, relocation of special collections and rationalisation of book-stacks) for which outline plans have now been submitted by architects Hibbs Walsh; and continuing work on preparation of cataloguing data for its forthcoming migration to Voyager, Cambridge University's library management system, ultimately leading to improved public access to the Library's bibliographic records.

Gratitude is recorded to several funding bodies which have made available grants for the general support of information and library services during 2013.

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| Ministry of Defence grant in aid (DC-ICSP) | £35,000 |
| Royal Society grant-in-aid (for WDC-GC) | £16,000 |
| FCO Polar Regions Department | £10,000 |
| Ferring Pharmaceuticals | £50,000 |

A total of 2,828 monographic items was added to the Library during the year. Three issues of *Polar and Glaciological Abstracts* were published and customary bibliographic updates supplied to the IPY Publications Database (www.nisc.com.ipy) and the Antarctic Bibliography (www.coldregions.org/dbtw-wpd/antinfo.htm). Under the editorship of Hilary Shibata, work has also been proceeding on a substantial annotated bibliography, *Scott and the Antarctic*, in commemoration of the centenary of Scott's death. Publication is anticipated in early 2014. On behalf of the European Union Arctic Initiatives Compendium, Georgina Cronin and Heather Lane undertook a study of polar collections existing in libraries and archives within the EU, and published results as *A Survey of Arctic Information Provision for the European Union*.

During 2013, the Library received over 500 visits from external readers and the usual support services were offered to students and academic staff from many University departments. Regular use of library services is made by students at the Institute and the Department of Geography, including undergraduates taking the Geographical Tripos Part II courses *The Human Geography of the Arctic Region* and *Glacial Environments* that are taught by SPRI staff. International scholars visiting the Library in 2013 included Dr Justiina Dahl, Prof. Sean Fitzsimons (Otago University, New Zealand), Russell Miles, Dr Ursula Rack (University of Canterbury, New Zealand), and Alexander Vinokurov.

Heather Lane continued to represent the Institute on the Journals Coordination Scheme Consultative Committee for the School of Physical Sciences, the Faculty and Departmental Librarians' Group and the Steering Group for the EU Arctic Information Compendium. She also represented the Institute at meetings of the Antarctica 100 committee and at the British Antarctic Territories Stakeholders meeting. Displays of printed material have been produced to amplify the Museum's exhibitions programme; most recently, an exhibition of Soviet Gulag-related material was assembled to supplement *Magadan: Life in the Russian North*.

At the conclusion of 2013, the Library's Senior Assistant, Georgina Cronin, left to take up the post of User Experience Librarian at the Judge Institute of Management Studies. In June, Martin French was appointed as a Library Assistant. In addition to her cataloguing activities, Ann Keith provided occasional support in the Library Office during periods of staff shortage during the year. Cathy Cooke also assisted temporarily with various clerical and acquisitions-related tasks. As always, the Library is indebted to its volunteers for work undertaken on the newspaper cuttings collection (Erika Drucker) and the map collection (Percy Hammond and Jean Cruttwell).

Jeremy Wong



World Data Centre for Glaciology, Cambridge (WDCGC)

The WDCGC manager acquires and catalogues glaciological material for the SPRI Library and responds to requests for glaciological information from academic and media researchers and the general public, either directly or by referral. The Data Centre Manager also maintains the SPRI Library catalogue database, contributes to, edits and produces the SPRI Library publication *Polar and Glaciological Abstracts*, and provides the link through which SPRI contributes to the International Polar Year Publications Database (IPY-PD).

A focus in 2013 on preparations for migrating the SPRI Library database to the Cambridge University Library system, together with exploration of WDCGC's possible membership of the World Data System, have presented an ideal opportunity to review the SPRI

glaciological collection and complete its electronic cataloguing. A new project is now adding to the database several thousand glaciology-related items in the SPRI pamphlet collection, many of which are rare and historically significant, and preparing a comprehensive guide to one of the world's largest glaciological collections. The guide also aims to trace the association of the Scott Polar Research Institute with glaciological research in the century since Scott's Antarctic expeditions. The Data Centre Manager was therefore pleased to provide technical support for the production of the bibliography *Scott and the Antarctic*, which contains a significant glaciological component.

Rick Frolich

Picture Library

The Picture Library continues to assist visitors and enquirers from many parts of the world with their research of photographic material for use in a variety of publications, television programmes, lectures and museum exhibitions. Photographic material has been supplied for a number of exhibitions, academic theses, journals and lectures, television programmes and books. Included amongst these are exhibitions at the Hertford Museum, the University of Birmingham, Chatham Historic Dockyard, the Fram Museum in Oslo, and the Science Museum and the National Maritime Museum in London; with associated exhibition publications and lectures at the Louisiana Museum of Modern Art in Denmark and Parks Canada. Images have also been reproduced in the television programmes *Find My Past-Scott of the Antarctic* produced by Lion TV; *Great Continental Railway Journeys*, produced by Boundless Freemantle Media; and *Shackleton: Death or Glory* produced by

RAW TV. Many websites have chosen images from the SPRI collection to enhance their text, including the BBC and EMI.

Images have been published in a number of books covering a diverse selection of subjects including: *The Power of Others* by Michael Bond; *South Pole* by Elizabeth Leane; *Drawing Water* by Tania Kovats; *The Greatest Show in the Arctic* by P.J. Capelotti; *Broken Environmental Photography* by Anne Noble; *Exploring the Last Continent* by Patrick Shepherd; *Much ado about Mutton* by Bob Kennard; *Tryggve Gran: A biography* by Anne Hege Simonsen; *Aurore Polari* by Ada Grilli; *With Sails Whitening Every Sea: Mariners and the making of American Maritime Empire* by Brian Rouleau; *The Floating Factories* by Geir Rosset; *Empire of Ice* by Edward Larson, National Geographic Society – Spanish & Portuguese editions of *Antarctica*; *Explore!* By Deborah Kespert and *Antarctica: Malaysia's Journey to the Ice* by Prof. Azizan Abu Samah.



The preventive conservation programme continues with the boxing of three albums of photographic prints from the Oxford University Ellesmere Land Expedition, 1934-35. The albums were presented to the Institute by Lord Edward Shackleton (son of Sir Ernest Shackleton), who organised the expedition. The three albums have been beautifully boxed in tailor-made drop-spine boxes, which provide a 'snug fit' so

reducing the movement of the individual pages. This has been made possible with the generous assistance of the Friends of the Institute and the Augustine Courtauld Trust. The Picture Library would also like to acknowledge the invaluable help given by Angela Haines for her dedicated voluntary work throughout the year.

Lucy Martin

The Thomas H Manning Polar Archives

Interest in Captain Scott's British Antarctic Expedition, 1910-13, continued at a high level through the first half of the year, and early plans for the centenary of Shackleton's Imperial Trans-Antarctic Expedition, 1914-16, began towards the end. Enquiries and visits from academics, writers, the media and those undertaking personal family research were received.

The archive continued to grow with acquisitions covering a variety of expeditions and polar explorers. Thanks to generous donations by the V&A Purchase Grant Fund, the John R. Murray Trust, the Friends of the National Libraries and other individual donors, and with help from the Vice-Chancellor's Discretionary Fund, the Archive was able to acquire one of the very few known last letters written by Captain Scott to remain in private ownership. Scott's letter to Sir Francis Bridgeman was written in March 1912 from his final camp in Antarctica. The Institute was also successful with an application, under the government's scheme in Lieu of Inheritance Tax, for the Archive to have permanent allocation of papers relating to Scott's last expedition. The diary and papers of Petty Officer Jacob Cross added to our holdings for Scott's earlier *Discovery* expedition. Additions to our growing mid-20th Century collection included John Peashall's diaries, written during the voyage of *Discovery II* to

the Antarctic, Robert Bentham's papers relating to expeditions in Greenland from 1934 and Hal Lister's papers from the 1950's onwards relating, for example, to the Commonwealth Trans-Antarctic Expedition. In December, the Institute accepted a six-month loan of letters by Apsley Cherry-Garrard, written to his mother during the British Antarctic expedition, 1910-13. The letters have been placed on display in the Polar Museum. The Richard C. Dehmel Trust is thanked for making this loan possible.

Naomi Boneham presented a paper on the history of the Institute's collections at the British Records Association annual general meeting and also showcased past Cambridge students' papers on polar research at the annual Cambridge Alumni weekend. This year's major digitisation collaboration saw many of the logs of Antarctic ships, on loan to us from the UK Meteorological Office, photographed as part of a project to map sea-ice extent from historical observations. Archive volunteers Sally Stonehouse, Deirdre Hanna, Michael Laughton, Judy Skelton, Laura Kirby, Kath Lagario and Ursula Chojnacka kindly provided support on a variety of projects throughout the year.

Naomi Boneham

Polar Record

Four issues of *Polar Record* were published by Cambridge University Press during 2013. The journal continued as an internationally refereed journal of polar research for the sciences, social sciences and humanities. 38 articles appeared during the year, together with 8 notes, and 25 book reviews appeared in the web version. One of the issues in the year was devoted to the proceedings of the Polar Worlds International Conference held in Paris in 2011. By coincidence this was the 250th issue of *Polar Record* and, reflecting the increasingly international character of the journal, there were contributions from authors from no fewer than 12 countries.

A pleasant duty is to report that the journal now benefits from the services and advice of Nikolas Sellheim of the University of Lapland, in Rovaniemi, Finland who accepted the appointment of Book Reviews Editor in January 2013. Reflecting the ever increasing variety of topics upon which articles are received, 92 referees were consulted during the year. This is by far the largest number ever and, for their input towards making the journal a success, the Institute is most grateful.

Ian R. Stone (Editor)

SPRI Website

This year there has been much work carried on behind the scenes to prepare for a major upgrade to the Library's cataloguing system. Additionally, work has been continuing on the SPRI Polar Museum website, which will be launched in 2014. Several areas of the

website have seen some upgrades, including a new news section on the front page, and improvements to the Library pages.

Martin Lucas-Smith

Teaching, Learning and Understanding

University Teaching

Academic members of the Institute's staff coordinate and deliver undergraduate lecture courses, and run laboratory classes, in the departments of Geography, Physics and Social Anthropology. Undergraduate supervisions are also provided to students in many colleges. Members of our staff are Fellows of Christ's, Downing, Jesus, Murray Edwards, St. Catharine's and St. John's colleges. Our M.Phil. course in Polar Studies has academic strands in Physical Sciences and in the Social Sciences and Humanities, and staff also

contribute to other M.Phil. programmes taught in the Department of Geography and to Part III of the Natural Sciences Tripos. We have more than twenty doctoral students, registered to study topics ranging from measurements and modelling of glacier and ice-sheet change to the cultures of Canadian and Greenlandic Inuit groups. Each student works within one of our research groups, providing a strong and integrated research culture.

Julian Dowdeswell

The Polar Museum

There were almost 43,000 visits to the Polar Museum in 2013. The museum mounted a number of temporary exhibitions during the year. *Robert Falcon Scott: A Century On* (October 2012 to February 2013) invited a wide range of expert guest curators to consider the impact of Captain Scott's achievements. *Antarctic Science and Exploration; Frozen Worlds* (February - May) investigated the links between polar exploration and science on Earth and the exploration of other ice worlds in our Solar System. *Re-Imagining Scott: Objects and Journeys* (May - July) exhibited new work by artist Paul Coldwell, exploring Scott's final expedition and how it might be possible to re-imagine aspects of the tragic final journey through the objects left behind. *The Snow Queen Retold* (August), inspired by the Hans Christian Andersen story, was curated by the Education and Outreach staff. *Life on the Land* (September) showed a range of Inuit art works featuring domestic and hunting scenes which capture a vanishing way of life. Opening at the start of December, *Magadan: Life in the Russian North* explored the stories, culture and history of the city and region of Magadan, from its communist past to its vibrant present, combining images from Russian photographers Pavel Zhdanov and Andrey Osipov, and artefacts collected by Institute Associates Professor Lawrence H. Khlinovski Rockhill and Dr Elena Khlinovskaya Rockhill. In addition, two shorter exhibitions were held. The first commemorated Arctic explorer Benjamin Leigh Smith's centenary, bringing together documents and mementos from the family, with items from the Institute's collections. A second exhibition showcased Captain Scott's field telephone, used during his last expedition. Our thanks go to Exhibitions Officer, Bryan Lintott for his tireless work on the exhibitions programme.

Showing art from the British Antarctic Survey's Artists and Writers Programme 2001–2009, *Landscapes of Exploration* (October - November) was a joint exhibition presented by the Polar Museum and the Ruskin Gallery of Anglian Ruskin University. The

environment of Antarctica was examined through the work of ten contemporary visual artists and one musician who undertook residencies in the Antarctic supported by Arts Council England. The exhibition was curated by Liz Wells, Professor in Photographic Culture at Plymouth University.

The Institute is grateful for the continuing support of the UK Antarctic Heritage Trust for the post of Conservator (job-shared by Sophie Rowe and Christina Rozeik). Sophie Rowe organised a major rotation of the Greenlandic clothing displays during the year. Our conservators and collections-care staff, assisted by a number of volunteers, also continued work on the reorganisation and photography of the textile collection. Three further conservators, Rebekah Parkinson, Cathy Tully and Sophie Louise Rowe, helped with several projects. Willow Silvani managed the increasing number of acquisitions and loans of material both to and from the museum, acting as courier to Museum d'Histoire Naturelle, Ville du Havre, France and supervising the work of volunteer Sandra Hiron in updating the Arctic material culture catalogue.

We were also joined in May by Bridget Cusack (former Curator of the Millais Gallery and Associate Lecturer in Fine Art at Southampton Solent University), who has helped to steer the museum's public programming, publications and building relationships with external partners during 2013. Heather Lane attended the monthly University of Cambridge Museums (UCM) Steering Group, the termly General Board Museums Committee and chaired the Conservation and Collections Care Consultation Group. She also assisted in writing successful bids to secure funding for shared conservation services from the J. Paul Getty Jr Foundation and the Isaac Newton Trust. The UCM also offered assistance by appointing Verity Sanderson as Marketing and Press Coordinator and Joseph Minden as Development Intern, both posts based part-time at the Polar Museum.

Acquisitions during the year included the purchase of an artwork by Paul Coldwell. Donations included a polar bear carving by Lucassie Echalook, a legacy gift from the late Jay Klinck, a former Institute M.Phil. student; a steel cigarette lighter from Operation Deep Freeze; a maquette of Robert Falcon Scott by Kathleen Scott - allocated to the SPRI under HM Government's scheme of Acceptance in Lieu of Inheritance Tax; a Zeiss RMK large format aerial photography camera; the dog tag of Tresor, one of thirty-three Siberian sledging dogs on Scott's British Antarctic Expedition; a silk scarf designed by Emilio Pucci (USARP); Sami fur boots and other Arctic clothing and furs; a replica of Oates's sledging flag; carvings given by Patrick Morris and a musk ox horn and whale bone carving of a bird with egg by David Avilinga Kuptana. Donated artworks included a print by Chris Drury, oil paintings by Rebecca Collins and prints and post cards by Paul Coldwell.

The Museum lent material for display to a number of national institutions, including the Dimbola Museum and Galleries, Isle of White; Kettle's Yard in Cambridge; HMS Collingwood, Fareham; and Chatham Historical Dockyard, Kent. Internationally, the Museum made loans to the Museum d'Histoire Naturelle, Ville du Havre, France and to the Royal British Columbia Museum, Victoria, Canada.

During the year the museum held 27 public events, attended by almost 4,000 people. Highlights included a repeat performance of Jenny Coverack's one-woman play, *A Father for my Son*, film screenings and Arctic storytelling sessions. The Antarctic photographs of Herbert Ponting toured to The Forrester Gallery, Oamaru, New Zealand in February 2013. We were privileged to host Jo Shapcott as Poet in Residence for three months from January, as part of the University's Thresholds project, sponsored by Arts Council England. In March, the museum worked with the Canadian High Commission and National Film Board of Canada in partnership with the Arts Picturehouse to co-present a series of film screenings and discussions as an Arctic Film Festival: *Voices from the North*.

The Museum would not function so effectively without the help and enthusiasm of its dedicated volunteers. The front of house volunteers, looked after by our volunteer manager Grant Rabey, provide a cheerful and knowledgeable welcome to the museum and run the shop during opening hours. The museum staff wish to record their thanks for the assistance of their colleagues in the General Office, whose help in enabling the museum to run smoothly is much appreciated.

Heather Lane and Bridget Cusack

Historic hut at Kapp Lee on Edgeoya in eastern Svalbard



Education and Outreach

Having covered the Education and Outreach role since September 2012, Rosie Amos and Naomi Chapman were appointed to the post as a job-share in June 2013. Public awareness of the research undertaken at SPRI has been raised through a series of events and workshops. 2013 has been a successful year, with 8,100 people taking part. This is a substantial increase on previous years.

Highlights of 2013 include events linked to the *Frozen Worlds* and *Landscapes of Exploration* exhibitions, the Arctic Film Festival and working with the Canadian High Commission to present the latest information on archaeological discoveries relating to Franklin's fateful 19th Century Arctic expedition. Links to the various festivals run by the University of Cambridge continue, with participation in the Science Festival, Twilight at the Museums, the Cambridge Alumni Weekend, Summer at the Museums, The Big Draw and the Festival of Ideas. Family activity days are run for each festival and are well attended.

The Snow Queen Retold was one of the most popular events in 2013. This was our first child-focused exhibition and was held throughout the summer in the museum. Inspired by Hans Christian Anderson's fairy tale, SPRI's invited poet, Kaddy Benyon, collaborated

with local textile artist Lindsey Holmes to create an installation which enabled visitors to explore storytelling by travelling through a fabric igloo, with each section representing a chapter of the fairytale.

School visits to the Polar Museum have continued to rise. In the last year, the Education and Outreach team worked with 4,250 school children; almost 4,000 of these children visited the museum for workshops and a further 860 children attended outreach sessions. Key projects included working with a group of Museum Ambassadors from the North Cambridge Academy; a continuing partnership with a local school on running research projects and teacher training sessions for promoting practical enquiry-based learning and questioning in 'A' level lessons.

Throughout the year, Rosie Amos has been developing the 'Rising Stars Science Communication Programme', enabling University staff to promote their research in new and interesting ways that make it accessible to a wider audience. The year ended with Naomi Chapman telling polar inspired stories to an enthusiastic young audience at Cambridge Central Library for Midwinter Day.

Naomi Chapman and Rosie Amos

Projecting the Significance of the Polar Regions

Institute academic staff and research students continue to be involved in the outward projection of polar research and education through, for example, media work, public lectures and visits by schools to our Polar Museum. Views and quotations on polar topics, many of which include an emphasis on polar environmental change issues, have also appeared in broadsheet newspapers both in Britain and internationally, and on the increasingly visited websites of media organisations. An example is the discovery of lakes beneath the Greenland Ice Sheet by SPRI scientists. A number of our staff have given external talks at primary and secondary schools, in addition to academic seminars at UK and foreign universities.

The Director gave the annual Gordon Manley Lecture at Durham University; a public lecture organised on behalf of the Royal Meteorological Society. Emeritus Associate Peter Clarkson, for example, has given 12 talks to school and adult groups during 2013. Our regular series of Saturday evening Public Lectures, organized by Celene Pickard on behalf of the Friends of SPRI, also attracts audiences of up to about 75. These external activities are time consuming, but are important in ensuring that the work of the Institute, in terms of both its scholarship and heritage activities, is projected as widely as possible.

Julian Dowdeswell

Expedition Support: Gino Watkins Memorial Fund

The Fund, under the joint trusteeship of the University of Cambridge and the Royal Geographical Society, provides grants towards expeditions that meet its objectives of guiding and inspiring enterprising people towards scientific research and exploration in the polar regions. The Committee of Managers of the Fund would like to thank the Augustine Courtauld Trust for the generous contribution of £9,000. The members of the Committee who served during the year were:

Mr. D. Fordham (Chair), Dr. P. Adams, Dr. I. Campbell, Mr. R. Crabtree, Dr. L. Craig, Professor J.A. Dowdeswell, Dr. D. Goodman, Dr. M. Humphreys, Professor M. Lea, Mr. J. Muston, Professor R.C. Schroter and Dr. M. Tinsley.

The Committee made the following awards for 2013, from the Gino Watkins Fund and the Arctic Club:

| Expedition | Award |
|--|--------|
| Tri-Province Arctic Canoe Expedition 2013 | £1,000 |
| 2013 Baffin Island Ski Mountaineering Expedition | £500 |
| Bearly Adventures 2013 | £1,000 |
| Expedition of the High Chugach Mountains of Alaska by ski | £1,000 |
| Oxford University Geological and Educational Outreach Expedition | £2,000 |
| Clipperton Project, South Georgia Expedition | £3,000 |
| Oxford West Greenland Expedition | £2,000 |
| Arctic 2013 – the return: Northwest Passage | £2,000 |
| The Fortrose Academy, East Greenland Expedition 2013 | £2,500 |
| East Greenland Summer 2013 | £2,500 |
| Measuring circulation in Sermilik Fjord, SE Greenland | £500 |

External Contributions to Polar Activities

National and International Roles of Staff

Members of the Institute are active in many roles relating to national and international committees and advisory groups involving the polar regions, and are members of the editorial boards of a number of international journals. These include:

- Vice-Chair and UK representative on the International Arctic Science Committee (IASC) Working Group on the Cryosphere; J.A. Dowdeswell
- UK representative on the International Arctic Science Council (IASC) Working Group on the Humanities and Social Sciences; M. Bravo
- Member of the UK Antarctic Place-Names Committee; J.A. Dowdeswell
- Member of UK National Committee on Antarctic Research; J.A. Dowdeswell
- Member of the International Arctic Social Sciences Association (IASSA) International Polar Year Taskforce; M. Bravo
- Member of the NERC Peer Review College; N.S. Arnold, J.A. Dowdeswell
- Vice-President, Geological Society of London; C.P. Summerhayes
- Treasurer, International Glaciological Society; I.C. Willis
- UK Delegate to the International Science Initiative for the Russian Arctic; W.G. Rees
- Member of the Advisory Council, European Union Arctic Forum Foundation; M. Bravo
- Member of the International Steering Group for the Tundra-Taiga Initiative; W.G. Rees
- Trans-Antarctic Association; P.D. Clarkson (Chair); K.A. Hogan, R.K. Headland, E.M. Morris (UK Advisory Committee members).
- Permanent UK representative of the Association of Marine Mammal Hunters of Chukotka; P. Vitebsky
- Trustee: Sutasoma Trust - P. Vitebsky; Fuchs Foundation - J.A. Dowdeswell
- Steering Committee Member, Polar Libraries Colloquy; H.E. Lane
- Steering Committee Member, EU Arctic Information Centre; H.E. Lane
- Editorial Board members: *Polar Record*, *Transactions of the Royal Society of Edinburgh*, *Archaeology*, *Energy Research and Social Science*, *Ethnology and Anthropology of Eurasia*, *Anthropology and Archaeology of Eurasia*, *Anthropology and Medicine*, *Earth's Cryosphere*, *Cultural Geographies*, *Journal of the Institute of Conservation*, *Worldviews: Environment, Culture, Religion*.

International Glaciological Society (IGS)

The International Glaciological Society (IGS) is based at SPRI. Its aim is to serve the worldwide community of glaciologists by publishing activities, organization of symposia and actively promoting the exchange of information and ideas on all aspects of snow and ice. During 2013, the IGS published six issues of the *Journal of Glaciology*, with 1205 pages in all. Three issues of *ICE*, the IGS news bulletin, and five issues of the *Annals of Glaciology*, were also produced with a total of 895 pages. The IGS is now investigating the way forward with it in mind to making its journals fully open-access. The IGS organized two international

symposia in 2013. The first was on 'Changes in glaciers and ice sheets: observations, modelling and environmental interactions', held in Beijing, China, in August. The second symposium, with the theme 'Radio-glaciology: advances in radio-frequency, microwave and digital technologies' was held in Lawrence, Kansas, USA in early September. In addition, we also co-sponsored several IGS branch meetings and other meetings by separate organizations. Details of the IGS and its activities are available from its website (www.igsoc.org), hosted by SPRI.

Magnús Már Magnússon (Secretary General)

Scientific Committee on Antarctic Research (SCAR)

The SCAR is an interdisciplinary body of the International Council of Science (ICSU) with 37 national members and 9 ICSU Union members. Its mission is to be the leading non-governmental, international facilitator and advocate of research in and from the Antarctic and Southern Ocean region, to provide objective and authoritative scientific advice to the Antarctic Treaty and other bodies such as the UNFCCC and IPCC, and to bring emerging issues to the attention of policy makers.

SCAR was awarded the Prince Albert II of Monaco Foundation's 2013 Prix Biodiversité. The Prize was awarded in recognition of SCAR's contribution to science and its work to improve our understanding of the environment. Prof. Martin Siegert was awarded the 2013 Martha T Muse Prize for Science and Policy in Antarctica, an unrestricted prize sponsored by the Tinker Foundation and coordinated by SCAR (www.museprize.org). SCAR also continued with its Fellowship awards and launched a new Visiting Professorship scheme (www.scar.org/awards/).

Although SCAR has many different groups relating to Antarctic and Southern Ocean Science (www.scar.org/about/introduction/organization/), its scientific efforts are focussed on several Scientific Research Programmes (SRPs) that address major topical issues of the day:

- Antarctic Climate Change in the 21st Century (AntClim21)
- State of the Antarctic Ecosystem (AntEco)
- Antarctic Thresholds - Ecosystem Resilience and Adaptation (AnT-ERA)
- Solid Earth Response and Cryosphere Evolution (SERCE)
- Past Antarctic Ice Sheet Dynamics (PAIS)
- Astronomy and Astrophysics from Antarctica (AAA)

A major update to the 'Antarctic Climate Change and the Environment' report was published in *Polar Record* (doi.org/10.1017/S0032247413000296). SCAR continued to work to provide independent advice to the Antarctic Treaty with papers on subjects such as biodiversity information, climate change, the human footprint in Antarctica and subglacial lake exploration (www.scar.org/treaty/atcmxxxvi). The SCAR/SCOR sponsored Southern Ocean Observing System (SOOS) continues to work to establish a multidisciplinary observing system to deliver sustained observations of the Southern Ocean (www.soos.aq). Further information on SCAR can be found at www.scar.org.

Dr Mike Sparrow (Executive Director)

Fundraising and the SPRI Appeal

Friends of the Scott Polar Research Institute

The tempo the Friends established in 2012 has continued into 2013. The closing months of the Scott Centenary were marked by several gatherings including a visit to the Cambridge headquarters of the British Antarctic Survey in May, where a hundred of our members were inspired by the activities and dedication of such professional scientists and logistical-support staff. A summer weekend in July proved to be a particularly memorable occasion when the Friends made a final Centenary commemoration at a little known statue of Scott (a Kathleen Scott sculpture) in a quiet corner of Portsmouth's Historic Dockyard. This was followed by an exceptional 'end of Centenary' annual dinner on board *HMS Victory*,

Nelson's famous flagship
at the Battle of
Trafalgar. The
Friends' Artist in



Residence programme, generously sponsored by Bonhams and supported by the Royal Navy through *HMS Protector*, saw Emma Stibbon undertake a highly successful season in Antarctica. We shall look forward to seeing her artwork in due course.

The November AGM saw a return to our *alma mater* in Cambridge, where Bob Burton's thought-provoking 21st Century perspective on the understandable shortfalls of Shackleton's expedition preparations graphically portrayed the problems of the equipment, dietary knowledge and science of the time, and simultaneously began our transition to the Shackleton Centenary commemorations. The AGM also marked the retirement of Ann Bean after many years of dedicated service to the Friends and the Institute. Ann was presented with several gifts, including a signed certificate of thanks from the Vice-Chancellor of the University. The Australian explorer Tim Jarvis' unique re-enactment of the famous boat journey from Elephant Island to South Georgia will feature strongly in our 2014 programme as will a hopefully less taxing Friends expedition cruise to similar locations in the Austral summer.

Nick Lambert (Chair, Friends of the Scott Polar Research Institute)



The Friends' Scott Centenary dinner on board HMS Victory, Historic Dockyard, Portsmouth on 13 July 2013

SPRI Appeal

The Scott Polar Research Institute is an international centre for research into the polar regions and is also home to unrivalled resources of polar information and expertise, housing the world's largest polar library, Britain's only dedicated polar museum, and a national repository for polar archives that record some of the most memorable episodes in exploration of the Arctic and Antarctic. The Institute's Archives, Museum and Library provide members of the general public, as well as scientists, government bodies, industry and polar inhabitants with important information on a variety of polar topics, including climate change, management of natural resources and historical polar expeditions. Through both the publication of our research and by public outreach, the Institute helps to educate and inform a worldwide audience about the polar regions.

Now that the project for the redesign and refurbishment of the Institute's Polar Museum is complete, we turn to further fundraising priorities. We wish to endow academic posts, and especially a Professorship in the field of Polar Environmental Science. We are also working to underpin the future

development of the Institute's Archives and Museum. Our highest priorities in these areas are to provide permanent endowment funding for the important posts of Institute Archivist and Polar Museum Curator. Funding for these positions has until now been supported by a series of short-term grants – an inherently unstable position. We also wish to build up endowment funds for the support of research students at the Institute (now initiated as the Scott Polar Scholarships Fund and the Debenham Scholars Fund), and to enable increasingly expensive polar fieldwork to continue to take place on a regular basis.

The generosity to the Institute of a number of individual donors, together with private trusts and foundations, is gratefully acknowledged. Particular thanks are due to Sir Humphry Wakefield for his continuing support of the Appeal.

Further information on the Appeal is available from the Director, Professor Julian Dowdeswell (director@spri.cam.ac.uk; 01223-336541).

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