IASC Bulletin 2011

IASC 2011
BULLETIN

IASC Bulletin 2011
ISSN: 1654-7594, ISBN: 978-3-9813637-1-5

INTERNATIONAL ARCTIC SCIENCE COMMITTEE
Telegrafenberg A43, DE - 14473 Potsdam, Germany
www.iasc.info

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IASC] · INTERNATIONAL ARCTIC SCIENCE COMMITTEE

The International Arctic Science Committee (IASC) is a non-governmental, international scientific organization. The IASC mission is to encourage and facilitate cooperation in all aspects of arctic research, in all countries engaged in arctic research and in all areas of the arctic region. Overall, IASC promotes and supports leading-edge multi-disciplinary research in order to foster a greater scientific understanding of the arctic region and its role in the Earth system.

TO ACHIVE THIS MISSION IASC:

- Initiates, coordinates and promotes scientific activities at a circumarctic or international level;
- Provides mechanisms and instruments to support science development;
- Provides objective and independent scientific advice on issues of science in the Arctic and communicates scientific information to the public;
- Seeks to ensure that scientific data and information from the Arctic are safeguarded, freely exchangeable and accessible;
- Promotes international access to all geographic areas and the sharing of knowledge, logistics and other resources;
- Provides for the freedom and ethical conduct of science;
- Promotes and involves the next generation of scientists working in the Arctic; and
- Promotes bipolar cooperation through interaction with relevant science organizations.

Telegrafenberg A43 - 14473 Potsdam, Germany
Phone: +49-331-2882214 | E-mail: iasc@iasc.info | www.iasc.info

[IASC] · STRUCTURE

Representatives of national scientific organizations from all 19 member countries form the IASC Council. The President of IASC is elected by Council, which also elects 4 Vice-Presidents to serve on the Executive Committee. Council usually meets once a year during the Arctic Science Summit Week (ASSW). The IASC Executive Committee operates as a board of directors and manages the activities of IASC between Council meetings. The Chair is the President of IASC.

The IASC Secretariat implements decisions of the Executive Committee and Council, manages IASC finances, conducts outreach activities and maintains international communication.

IASC MEMBER COUNTRIES

Canada	Canadian Polar Commission	www.polarcom.gc.ca
China	Chinese Arctic and Antarctic Administration	www.chinare.gov.cn
Denmark/Greenland	The Commission for Scientific Research in Greenland	www.fi.dk
Finland	Delegation of the Finnish Academies of Science and Letters	www.tsv.fi/international/akatemiat/
France	Institut Polaire Français	www.institut-polaire.fr
Germany	Deutsche Forschungsgemeinschaft	www.dfg.de
Iceland	RANNÍS, The Icelandic Centre for Research	www.rannis.is
Italy	National Research Council of Italy	www.cnr.it
Japan	Science Council of Japan, National Institute of Polar Research	www.nipr.ac.jp
The Netherlands	Netherlands Organisation for Scientific Research	www.nwo.nl
Norway	The Research Council of Norway	www.forskningsradet.no
Poland	Polish Academy of Sciences, Committee on Polar Research	www.polish.polar.pan.pl
Russia	The Russian Academy of Sciences	www.ras.ru
Republic of Korea	Korea National Committee on Polar Research	www.kopri.re.kr
Spain	Comité Polar Español	www.micinn.es
Sweden	The Swedish Research Council	www.vr.se
Switzerland	Swiss Committee on Polar Research	www.polar-research.ch
United Kingdom	Natural Environment Research Council	www.nerc.ac.uk
USA	Polar Research Board	www.dels.nas.edu/prb/

PHOTO: LAURA MORSE
A group of muskoxen on the northern slope of the Brooks Range in Alaska.

IASC 2011

BULLETIN

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IMPRINT]

International Arctic Science Committee
Telegrafenberg A43
DE-14473 Potsdam, GERMANY
Phone: +49 331 288 2214
Fax: +49 331 288 2215
E-mail: iasc@iasc.info
Website: www.iasc.info

Editors: Mare Pit, Sara Bowden and Volker Rachold,
Production and Layout: www.redpear.de
Printing: www.druckereiarnold.de

ISSN: 1654-7594
ISBN: 978-3-9813637-1-5

COVERPHOTO: MATTHIAS WIETZ
Jeff Bowman is sampling frost flowers for microbiological analysis. The research was part of the second LOMROG, Lomonosov Ridge off Greenland, expedition that was carried out in the summer of 2009 by the Danish Continental Shelf Project in cooperation with the Swedish Polar Research Secretariat and the Swedish Maritime Administration.

[CONTENT]

[PREFACE]

The purpose of the IASC Bulletin is to distribute IASC information to the arctic research community. The Bulletin was originally designed as a yearbook to cover the period between successive Arctic Science Summit Weeks (ASSW), ending with a report of the latter. Over the last years the IASC Bulletin has become more than just an annual report and it now also includes annual updates of longer-term activities and prospects for future activities. This issue is IASC Bulletin 2011, the first to be numbered by year of publication.

Though the observing period of the International Polar Year (IPY) officially ended in February 2009, the year 2010 was still much influenced by the IPY and its aftermath, culminating in the IPY Oslo Science Conference in June. The conference was the largest polar meeting ever, attracting more than 2300 participants. The IPY was formally closed on the last day of the conference and the IPY sponsors, the International Council for Science (ICSU) and the World Meteorological Organization (WMO), thanked the many thousands of researchers, technicians, students, funders, community members, and others who made the IPY a spectacular international success.

At the conclusion of the Oslo Conference, ICSU and WMO passed the baton to those who will secure the IPY legacy, including IASC, the Scientific Committee on Antarctic Research (SCAR) and the Association of Polar Early Career Scientists (APECS). At the same time, Norway handed the IPY „torch" over to Canada as the host of the next and final IPY conference in Montreal, April 2012. IASC was involved in the organization of the Oslo Conference and is contributing to the planning of the Montreal Conference.

In April 2011, the ICSU-WMO Joint Committee for the IPY, with the support of IASC and SCAR, will publish a summary of IPY activities. Comprising 38 chapters in five parts (Planning, Research, Observations, Outreach, and Legacies), the report covers almost a decade of IPY from its conception in 2001, through its development and implementation and culminating in the final IPY conference in 2010. Writing of the Report has engaged hundreds of contributing authors from all disciplines and more than 20 nations. This broad overview demonstrates the extensive and essential contribution made by participating nations and organizations, and provides a prospective blueprint for future polar research. IASC and SCAR also renewed their support for the Bipolar Action Group and two meetings of the joint SCAR/IASC Executive Committees were held to discuss legacies of IPY.

Two other major events planned for 2011 are also at least indirectly related to the IPY and its legacy. In spring 2011, the Steering Group of the Sustaining Arctic Observing Networks (SAON) initiative will present its report and recommendations to the IASC Council at the ASSW in Seoul (South Korea) and to the Arctic Council at the Ministerial Meeting in Nuuk (Greenland). The overall message is that, after the endorsement by IASC and the Arctic Council, the SAON process be transitioned from a planning phase to an operational phase. The Arctic Council and IASC will be asked to jointly establish an institutional framework for the future SAON program.

Also the final report of the Arctic Council Snow, Water, Ice and Permafrost in the Arctic (SWIPA) project, which is supported by IASC, will be released in spring 2011. The SWIPA assessment will be launched at the conference "The Arctic as a Messenger for Global Processes - Climate Change and Pollution" in May 2011 in conjunction with the 20th anniversary of the Arctic Monitoring and Assessment Programme (AMAP).

2010 was also an important year for IASC internal affairs. At its meeting during the ASSW 2010, IASC Council decided to establish five Working Groups (WG): Atmosphere WG, Cyrosphere WG, Marine WG (the former Arctic Ocean Sciences Board AOSB), Social & Human Sciences WG and Terrestrial WG. Working Group members appointed by the IASC member countries and IASC partners were invited to a first workshop bringing all five WGs together. More that 130 scientists from all 19 IASC member countries attended this kick-off workshop in Potsdam (Germany) in January 2011. Participants considered the workshop a great success. A report will be presented to the IASC Council at the ASSW 2011.

Four years after the IASC Review and Strategy Group delivered its report, most of the recommendations are now implemented. With the formation of the new Working Groups, IASC is now equipped with the appropriate instruments to advance the progressively more integrative nature of today's polar science. Over the last four years, IASC has also strengthened its relations with the Arctic Council, social science organizations representing constituencies in the North, and several other global organizations interested in the science in the arctic region.

Additionally, IASC has reorganized and revitalized the ASSW as a major cross-disciplinary venue, and the second ASSW Science Symposium will be held in Seoul, (South Korea) in March 2011. Finally, IASC expanded its functions to deal with issues such as data management, capacity building and public outreach, including a completely new website launched in early 2011.

Many have contributed to these successful developments during the past year and we would like to thank everyone involved for supporting IASC, especially members of IASC Council and Executive Committee.

David Hik | IASC President
Volker Rachold | IASC Executive Secretary

PHOTO: DIRK VAN AS
A July sunset reflected in a re-frozen melt pond at 1300 m altitude on the Greenland Ice Sheet.

PHOTO: SPENCER BROWN
Roy Ahmaogak is standing on the lookout for polar bears. Offshore winds had opened a break in the ice. The open water attracted wildlife that in turn attracted local seal hunters, who took a seal (notice the blood in the top right). As evidenced by numerous small footprints, a fox searched through the night for the seal, which wasn't left behind. The photograph was taken on the Beaufort Sea north of Barrow, Alaska by Spencer Brown while covering the international, multidisciplinary Ocean-Atmosphere-Sea Ice-Snowpack (OASIS) program.

1. IASC Internal Development

» 1 IASC Internal Development

IASC Organization

The International Arctic Science Committee (IASC) is a non-governmental organization that encourages and facilitates cooperation in all aspects of arctic research, in all countries engaged in arctic research and in all areas of the arctic region. To fulfill its mission, IASC promotes and supports leading-edge multidisciplinary research in order to foster a greater scientific understanding of the arctic region and its role in the Earth system. IASC was established in 1990, began operations in 1991, and today comprises 19 member countries. The IASC member organizations are national science organizations covering all fields of arctic Science.

Country	Organization	Representative
Canada	Canadian Polar Commission	David Hik | President
China	Chinese Arctic and Antarctic Administration	Huigeng Yang
Denmark/Greenland	The Commission for Scientific Research in Greenland	Naja Mikkelsen | Vice-President
Finland	Delegation of the Finnish Academies of Science and Letters	Kari Laine
France	Institut Polaire Français	Gérard Jugie
Germany	Deutsche Forschungsgemeinschaft	Karin Lochte
Iceland	RANNÍS, The Icelandic Centre for Research	Thorsteinn Gunnarsson
Italy	National Research Council of Italy	Carlo Barbante
Japan	Science Council of Japan, National Institute of Polar Research	Hiroshi Kanda
The Netherlands	Netherlands Organisation for Scientific Research	Louwrens Hacquebord
Norway	The Research Council of Norway	Susan Barr | Vice-President
Poland	Polish Academy of Sciences, Committee on Polar Research	Jacek Jania
Russia	The Russian Academy of Sciences	Vladimir I Pavlenko
Republic of Korea	Korea National Committee on Polar Research	Byong-Kwon Park | Vice-President
Spain	Comité Polar Español	Manuel Catalan
Sweden	The Swedish Research Council	Magnus Friberg
Switzerland	Swiss Committee on Polar Research	Martin Luethi
United Kingdom	Natural Environment Research Council	Cynan Ellis-Evans
USA	Polar Research Board	Jacqueline Grebmeier | Vice-President

IASC Council

Representatives of national scientific organizations from all IASC member countries form the IASC Council that meets once a year during the Arctic Science Summit Week (ASSW). The Council members ensure an input of a wide range of scientific and technical knowledge and provide access to a large number of scientists and administrators through their national committees.

During this reporting period, Huigeng Yang (Polar Research Institute of China) replaced Liqi Chen as the IASC Council representative for China, Karin Lochte (Alfred Wegener Institute for Polar and Marine Research) replaced Dieter Fütterer for Germany, for Italy Carlo Barbante (Department of Environmental Sciences, University of Venice) replaced Carlo-Alberto Ricci, Martin Luethi (Swiss Federal Institute of Technology) replaced Hubertus Fischer for Switzerland, for Iceland Thorsteinn Gunnarsson (Icelandic Centre for Research) replaced Kristján Kristjánsson and Cynan Ellis-Evans (Arctic Office, Natural Environment Research Council) replaced Julian Dowdeswell for the United Kingdom.

IASC Executive Committee

The Executive Committee operates as a board of directors and manages IASC's activities between Council meetings. The Executive Committee consists of five, by Council elected officials: the President and four Vice-Presidents, and the Executive Secretary.

In 2010, David Hik, Professor and Research Chair in Northern Ecology at the University of Alberta, succeeded Kristján Kristjánsson as the IASC President. Susan Barr (Norwegian Directorate for Cultural Heritage) and Naja Mikkelsen (Geological Survey of Denmark and Greenland) and Jacqueline Grebmeier (University of Maryland Center for Environmental Science) were elected and re-elected as Vice-Chairs.

The full IASC Council and the Secretariat would like to express their deep appreciation and sincere thanks to Kristján Kristjánsson (Director of Research Services at Reykjavík University) who served on the Executive Committee as President from 2006-2010 and Vice-President from 2002-2006, and Dieter Fütterer, Vice-President from 1994-1997 and 2002-2010, for all their work and highly valued input.

The current IASC Executive Committee members are:

David Hik, President
Byong-Kwon Park, Vice-President
Jacqueline Grebmeier, Vice-President
Susan Barr, Vice-President
Naja Mikkelsen, Vice-Presdient
Volker Rachold, IASC Executive Secretary

FIGURE: Diagram representing the key elements of the IASC organizational structure

IASC Working Goups

Great kick-off in 2011

The core elements of IASC are its Working Groups (WGs). IASC WGs identify and formulate science plans, set research priorities, encourage science-led programs, promote future generations of arctic scientists and act as scientific advisory boards to the Council. The first combined IASC Working Groups Workshop was held in Potsdam (Germany) on 12-14 January 2011. A summary of the workshop outcome is presented in this paragraph.

Creating, sustaining and leading international scientific efforts

Collectively, the members of IASC, in partnership with the entire arctic science community, have the capacity to create, sustain and lead international scientific efforts in the Arctic. At the very core of the IASC organization are the five Working Groups: Terrestrial, Marine, Atmosphere, Social & Human Sciences, and Cryosphere. These Working Groups were established by IASC Council in 2010 and assist IASC in the implementation of its science mission.

The Potsdam Workshop of the IASC WGs brought together, for the first time, all the members of the five IASC Working Groups. During three intense days of discussion each of the Working Groups selected a Chair and members for their respective Steering Group, summarized the state of research in their field, discussed gaps in research, and identified priority areas for short and longer-term attention. They also worked together to identify emerging cross-cutting issues which span the interests of several Working Groups. With budgeted funds in hand for the next year, members of the Working Groups left Potsdam with creative ideas and ambitious plans.

Since the founding of IASC in 1990, dramatic changes have been observed in the environmental, economic and political conditions of the Arctic region. These new challenges require timely access to high quality scientific information that can be applied appropriately at local, regional, national and global scales. The IASC Working Groups reflect the increasingly integrative nature of polar science and they will play an active role in identifying and securing the many legacies of the recently concluded International Polar Year.

PHOTO: VOLKER RACHOLD
Group photo of the IASC Working Groups kick-off workshop held in January 2011 in Potsdam, Germany.

Terrestrial Working Group

Steering Group

Chair
Terry Callaghan - Sweden

Vice Chairs
Torben Christensen - Denmark
Warwick F. Vincent - Canada
Benjamín Viñegla Pérez - Spain

The scientific scope of the Terrestrial Working Group shall include any scientific research on arctic terrestrial and freshwater environments, landscapes and biota, and their responses to, and interactions with, other components of the Earth system. The remit encompasses the dynamics of the arctic system; past, present and future.

Geographically, the main area of interest of the IASC Terrestrial Working Group encompasses lands and fresh water within the area north of the latitudinal treeline with arctic climate and arctic vegetation. Several adjacent areas are included where highly relevant for certain disciplines and projects **(a)** boreal oceanic tundra (e.g. the Aleutian Islands, North Atlantic islands), **(b)** alpine tundra that is continuous with the arctic tundra (e.g. the central highlands of Iceland, the Scandes Mountains, the Polar Urals), **(c)** the forest tundra, and **(d)** drainage basins to the south that connect with freshwater and marine areas of the Arctic.

Scientific Foci

Estimating past changes in arctic geo- and biodiversity, measuring current change and predicting future changes

The Arctic has always been changing as a result of the geological processes that form the landmasses, through the geomorphological processes that shape landscapes to ecological processes that provide an array of important ecosystem services. It is necessary to document past processes to understand the current geography, and the diversity of landscapes and biota of the Arctic. Furthermore, the current rapid changes in many arctic landscapes and ecosystems together with their importance at local to global scales require a better predictive capacity to be deployed.

Determining the net effect of the terrestrial and freshwater environmental and biosphere's processes that amplify or moderate climate warming

It is widely accepted that the Arctic's biosphere, cryosphere and land and water surfaces exchange

PHOTO: TORSTEN SACHS
A thaw slump near Middle Channel in Inuvik, Canada.

energy and greenhouse gases with the lower atmosphere in a number of feedback processes that can affect local and even global climate. Historically, these feedbacks have been dominated by processes that lead to a net cooling but there is concern that current and projected climate warming will change the balance of the feedbacks to an overall amplification of warming. Many feedbacks operate at the same time and sometimes in opposing directions: projection of their interactions is therefore difficult and determining the balance of future feedbacks is therefore essential to improving GCM projections of future climate.

Developing high spatial resolution models of terrestrial geosystems and ecosystem change, and other tools that can be used by arctic stakeholders for adaptation strategies and sustainable management of natural resources and ecosystem services

Impacts of climate change in the Arctic have global, regional and local impacts but projection of impacts at the local scale is very difficult because of methodological problems in downscaling climate. This local scale is, however, fundamental to local residents of the Arctic who need to develop strategies to mitigate adverse effects of changes in landscapes, hydrology and ecosystem services or to take advantage of new opportunities in a sustainable way. The development of high resolution models of projected climate changes and their impacts will be facilitated within a forum that involves stakeholders to ensure that the model output is relevant to the needs for producing adaptation strategies.

Developing unifying concepts, fundamental theories and computer models of the interactions among species, interactions between species and their environment, and the biology of life in extreme environments

Climate change in the Arctic is an environmental problem of such complexity and global importance that it is dominating research activities there. However, there is a danger that a dominance of activities to observe and measure impacts of climate change could eventually lead to a diminished role for "curiosity-driven science". Without the formulation of new unifying concepts and a better understanding of the complex interactions in the biosphere and physical arctic environment, it will become difficult to understand the consequences of any future perturbations to the Arctic, particularly within a global context.

Determining the role of connectivity in the functioning of arctic terrestrial systems, including connections within the arctic and the global system

The arctic system has numerous intricate and complex connections. Ecologically there are interdependencies of individuals within populations, interdependencies of species within communities and interdependencies among different layers within food chains – and all of these interdependencies are affected by, respond to or moderate various aspects of the physical environment. In addition, there are connections through biota between local and larger scales – even the global scale. There is a particular need to better understand connectivity between in general and particularly migrations at all scales including the consequences of species movement, for example transport of disease vectors and propagules of invasive species.

Cross-cutting Issues

Understanding the major issues within the wide disciplinary and geographical scope of the Terrestrial Working Group requires interaction with other Working Groups. The initial priority activities developed by the Terrestrial Working Group would benefit form interactions with all the Working Groups.

PHOTO: PIOTR BALAZY
A rocky bottom teeming with life. Sea anemone Urticina eques at 15 m deep in Isfjord, Spitsbergen.

Marine Working Group

Priority Activities

The terrestrial WG has convened sub-groups that will, over the next 12-18 months:

- Arrange a special session on microbial biodiversity and processes, particularly life in extreme environments, at an international meeting.
- Develop an action plan for research on the factors that shape biodiversity in the Arctic: a draft proposal on invasive species is already in preparation.
- Facilitate building capacity for species identification and for making a biodiversity inventory and an improved biodiversity monitoring program.
- Develop an action plan to improve measurement and monitoring of greenhouse gas emissions and other feedbacks to climate focusing initially on the lability of carbon in arctic soils and permafrost to give input to the International Permafrost Association's carbon mapping project.
- Assess and improve our current understanding of landscapes in rapid transition.
- Arrange a special session at an international meeting on implications of changes in sea ice for the adjacent terrestrial realm.

Steering Group

Chair
Savithri Narayanan - Canada

Vice Chairs
Rolf Gradinger - USA
Bert Rudels - Finland

Past Chair
Harald Loeng - Norway

The geographic scope of the Marine Working Group shall be the Arctic Ocean and the Subarctic Seas. The scientific scope of the Marine Working Group shall include but not be limited to any marine natural science or engineering research.

Scientific Foci

Arctic Ocean System: Predicting and understanding rapid changes in the Arctic

There is widespread agreement that the Arctic Ocean is now in a state of rapid transition with potentially tremendous economic, social and environmental consequences. This transition is best exemplified by the marked reduction in sea-ice cover witnessed in instrumental records over the last 30 years. Scientific

knowledge of the present status of the Arctic Ocean and process-based understanding of the mechanisms of change are required to make useful predictions of future conditions throughout the arctic region. These predictions are also urgently needed to plan for the consequences of climate change. For example, understanding the feedbacks between physical and biogeochemical components of the Arctic Ocean are extremely important not only for the arctic environment but for the global community as well. The Marine WG intends to play a leading role to further our understanding of this complex system.

Sea ice, its structure, dynamics and role in the arctic system

IPY has provided a wealth of extensive and intensive observations of the Arctic Ocean, of its hydrography, circulation and interaction with other parts of the Earth climate system. At the same time, nature exhibited a most drastic example of arctic change by creating the smallest summer ice extent observed to date; an event that defied the model projections, and whose occurrence and consequences have been analyzed and debated, without conclusive answers being found. Building on knowledge gained during the IPY and on new observational technologies the Marine WG will endeavor to better understand sea ice structure, its growth and decay and its dependence and dynamical interactions with the radiation balance, the atmosphere and the ocean within the arctic system. It will also include evaluation on the impacts of these changes on the associated sea ice biota.

Ecosystem responses to changing physical parameters in the Arctic

Although recent major changes in the physical domain of the Arctic are well documented, such as extreme retreats of summer sea ice in 2007, large uncertainties remain regarding potential responses in the biological domain. Reduction in sea ice extent in the Arctic has been seasonally asymmetric, with minimal changes until the end of June and delayed sea ice formation in late autumn. The effect of this seasonal asymmetry in sea ice loss on ocean primary production is equivocal, with satellite images showing variable chlorophyll concentrations with no secular shifts for the region as a whole. However, clear changes have occurred at higher trophic levels, including shifts in species ranges for zooplankton, benthos, and fish, and loss of sea ice as habitat and platform for marine mammal species. The Marine WG intends to play a role in increasing our understanding of potential ecosystem changes under further loss of sea ice.

Understanding geochemical processes in the Arctic Ocean and Subarctic Seas

The changes in the sea ice coverage of the Arctic Ocean, present and predicted for the future, will likely have major impacts on the fluxes of chemical constituents as well as the ventilation of deep waters. The Arctic Ocean system is moving from a state where the biological productivity mainly has been confined to the shelf areas to a situation with potentially higher activity over the deep central basins. Such a change could increase the export production that would result in a change of the biogeochemistry of the deep and bottom waters. The Marine WG will promote in-depth studies of relevant properties of the full water column of the central Arctic Ocean.

Facilitating deep sea drilling in the Arctic Ocean

The Arctic appears to be changing faster than any other region. To understand the potential extent of high latitude climate change, it is necessary to sample the history stored in the sediments filling the basins and covering the ridges of the Arctic Ocean. The Marine WG intends to support the collection of a long-term geological record of the Arctic Ocean in order to supplement current and long time series observations which are vital to improve our understanding of arctic processes.

Cross-cutting Issues

The following three general themes were identified by the Marine WG as important cross-cutting issues which should be addressed by most, if not all, the IASC Working Groups:

- How will the diminishing ice cover affect the carbon cycle in the Arctic and what are the impacts?
- How does the variability of different components of the arctic system impact the heat and momentum exchanges between ocean, ice, atmosphere and space in a changing climate?
- How will changes in the hydrological cycle impact various components of the arctic system?

Priority Activities

The Marine WG will undertake the following priority action items over the next 12-18 months:

- Support the development of the Arctic in Rapid Transitions (ART) Implementation Plan, assist with the formation of an ART senior advisory group and implementation of phase 1 of the ART plan.
- Support the development of the IPY legacy observing plan for the Arctic and Subarctic Seas. Including undertaking an internal review of the draft plan and printing and distribution of the plan.
- Support site surveys to develop an arctic deep sea drilling programm.
- Support the compellation of the moored data collected during the IPY and host a workshop to bring together Principal Investigators and data managers to undertake a synthesis of the data as a pilot project.
- Support a workshop to investigate the results of the Distributed Biological Observatory (DBO) program in the Pacific Arctic and look for ways to expand the program to make a Panarctic program.

PHOTO: GÜNTER STOOF
A thunderstorm is approaching the Samoylov Research Station on Samoylov Island, Russia.

Atmosphere Working Group

Steering Group

Chair
James Overland - USA

Vice Chairs
Hiroshi Tanaka - Japan
Michael Tjernström - Sweden

The geographic scope of the Atmosphere Working Group shall be the Arctic but will also include the Arctic´s responses to global change processes (arctic amplification) and impacts of arctic changes on the northern hemisphere atmospheric circulation.

The scientific scope of the Atmosphere Working Group includes scientific research towards understanding and prediction of arctic change, and considering the fate of perennial sea ice and the global atmospheric consequences of its disappearance. This includes past climate states, investigation of arctic processes across data sets and approaches, and climate model projections. The scope includes local and regional impacts of arctic change.

Scientific Foci and Cross-cutting Issues

The Atmosphere WG will address many of the direct large scale and regional climate change issues for IASC. We see our function as promoting science, but not focusing on monitoring or future assessments.

Support for increased tropospheric observations

The Atmosphere WG supports the integrated Arctic Ocean Observing System (iAOOS) concept of 10-20 drifting ocean/sea ice buoys. Specifically, engineering work is needed to add atmospheric radiation and temperature profiling capability to the drifting buoy plans for iAOOS. We hope that this action can be conducted jointly with the Marine and perhaps Cryosphere WGs of IASC with IASC support for joint projects. We will also supply moral support to Sustaining Arctic Observing Networks (SAON) and International Study of Arctic Change (ISAC) activities, as well as other observational coordination efforts.

Perceptions and representations of arctic change

The Atmosphere WG wants to promote joint work of the IASC Atmosphere and Social & Human Sciences WGs on this topic. The IASC Social & Human Sciences WG will be identifying the best social scientists for this topic in the next months and are planning a roundtable discussion about it at their meeting at ICASS VII in Akureyri in late June. After that, they will be ready for joint activities. A joint session at 2012 ASSW maybe a possible forum.

Priority Activities

» Large-scale Climate theme: arctic amplification, loss of sea ice, natural and forced variability, and global linkages. To advance this topic, the Atmosphere WG will promote presentations and special sessions on these topics at scientific meetings. The Atmosphere WG will work with the newly developing WCRP polar predictability project and in particular hold a joint planning workshop to further promote these IASC Atmosphere WG research topics.

» Regional Impacts theme: effects of ocean, sea ice and soil processes on regional climate, regional coupled modeling, dynamic and statistical downscaling, and coupling to the global climate system. The Atmosphere WG will encourage Regional Impacts projects at the national and international levels, such as the WCRP CORDEX effort, REKLIM- Regional Climate Change Initiative in Germany, and the DOI Alaskan Downscaling Conference in the US. To improve arctic regional science, the Atmosphere WG will bring together modelers and observationalists in a small workshop in September 2011 in Potsdam. The focus of the workshop will be to discuss the contribution of atmospheric measurements to improve arctic specific sub-grid scale parameterizations, to assess the current state and shortcomings of arctic sub-grid-scale parameterizations in Regional and Global Climate Models, and to design an Arctic Observatory and the requested measurements including satellite data with the main aim it improve the performance of RCMs and GCMs in the Arctic.

» Arctic Data Archeology: The Atmosphere WG endorsed Data Archeology, which are activities that collect as much meteorological and proxy data for the Arctic as possible for the last few hundred years, conduct related reanalysis, recalibration efforts, and specifically the activities of ACRE (Atmospheric Circulation Reconstructions over the Earth, **http://www.met-acre.org/Home**).

» Encourage publications toward the IPCC AR5 process: The Atmosphere WG decided that this area would be best accomplished through the priority science activities above.

» The Atmospheric WG will hold an abbreviated meeting at ASSW 2011 in Korea and its next full meeting immediately before the 24-28 October, 2011 - WCRP meeting in Denver, USA.

Social & Human Sciences Working Group

Steering Group

Chair
Peter Schweitzer - USA

Vice Chairs
Sylvie Blangy - France
Gail Fondahl - Canada

Past Interim Chair
Louwrens Hacquebord – Netherlands

The geographic scope of the Social und Human Sciences Working Group shall be the Arctic as defined in the map accompanying the Arctic Human Development Report (AHDR). The geographic scope can be extended south where it is appropriate for an understanding of arctic social and human processes.

The scientific scope of the Social und Human Sciences Working Group (WG) shall include all aspects of social sciences and humanities research in the Arctic, as well as their connections with other IASC Working Groups. The actual work of the Social & Human Sciences WG will be determined by a dynamic list of scientific focus areas.

Scientific Foci

The WG members agreed upon the following list of scientific foci. It is to be expected that this list will be significantly refined within the first year of the WG's existence and continually updated thereafter.

Indigenous peoples and change: adaptation and cultural and power dynamics

Exploitation of natural resources: past, present, future

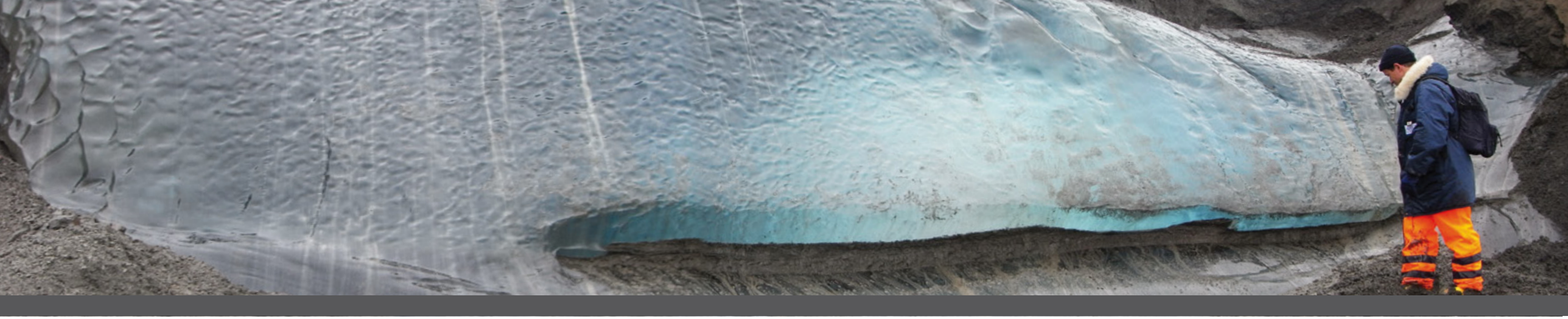
Histories and methodologies of arctic sciences and arts

Perceptions and representations of the Arctic

Human health and well-being

Security, international law and cooperation

PHOTO: BRUCE FORBES
Roza Laptander interviews Papa Serotetto during field research in the Yamal Peninsula, Russia, in the summer of 2010.



Cross-cutting Issues

Based on the scientific foci, the following list of cross-cutting issues was adopted. The list is based on WG needs as well as on opportunities provided by the focus areas of other working groups. The list of cross-cutting issues is as dynamic as the list of scientific foci; its development and refinement will depend on actual cross-working group interactions.

- Human health, wellbeing and ecosystem change
- Collaborative community research on climate change
- Competing forms of resource use in a changing environment
- People and coastal processes
- Perception and representation of arctic science

Priority Activities

The WG agreed on the following priorities and initiatives for the coming year:

- A community-based workshop on Kodiak Island, Alaska, focused on local ecosystem changes and adaptations. The WG will collaborate with the community and local industry in planning and conducting the proposed workshop.
- Inventory existing funding opportunities and further advocate the humanities and social sciences in the funding structures for international arctic research.
- Organize a roundtable on "Perceptions and Representations" of Arctic Science at the Seventh International Congress of Arctic social Sciences (ICASS VII).
- Introduce the WG and its work to the broader international social science and humanities research community, e.g., through an informational session at the ICASS VII, through the WG webpage, through session proposals for large international gatherings such as the IPY Montreal conference.
- Explore existing initiatives that are in line with the set science foci and look for ways of cooperation and creating synergies, e.g., by creating an inventory of past, existing and planned projects, looking for potential new partners, following the development of the second Arctic Human Development Report (AHDR II), etc.

The WG members have agreed to hold their next meeting during the ICASS VII – the major arctic social science gathering happening every three years – June 22-26, 2011, in Akureyri, Iceland. The WG meeting will likely be preceded or followed by a special WG session and roundtable to introduce the WG to the other conference attendees and look for new input and cooperation.

Cryosphere Working Group

Steering Group

Chair

Martin Sharp - Canada

Vice Chairs

Julian Dowdeswell - UK

Testuo Ohata - Japan

Pedro Elosegui - Spain

The geographic scope of the Cryosphere Working Group shall be those areas of the Arctic and contiguous areas of the sub-Arctic where one or more element of the cryosphere (including the Greenland Ice Sheet, mountain glaciers, ice caps, icebergs, sea ice, snow cover and snowfall, permafrost and seasonally frozen ground, and lake- or river-ice) plays an important role in surface-climate interactions and/or the fresh water budget. It will normally include the Arctic Ocean and surrounding seas (including the Baltic), Alaska, Canada's northern Territories, Greenland, Iceland, Svalbard and the Russian arctic archipelagos, and parts of Canada, Scandinavia, and northern Russia that lie polewards of the southern limit of discontinuous permafrost.

The scientific scope of the Cryosphere Working Group shall include any scientific or engineering research relating to the arctic and subarctic cryosphere, including its interactions (past, present and future) with the climate, oceans, and biosphere. It shall also include the promotion of sound practices for the management of scientific data relating to the arctic cryosphere and its interactions with other components of the arctic system.

Scientific Foci

The scientific foci of the Cryosphere Working Group shall be:

The cryosphere as an indicator of climate change

The cryosphere as a climate amplifier

The role of the cryosphere in arctic hydrology (including the relationship between arctic glaciers and global sea level change, glacier-ocean interaction, and the role of the cryosphere in the water balance of large river basins)

The biology and biogeochemistry of icy environments (including landscape and vegetation responses to climate change in regions where these responses are mediated by cryospheric change; fluxes of sediment, nutrients, and contaminants to the ocean from large river basins and coastal erosion; the effects of cryospheric change on microbial processes and the exchange of greenhouse gases between land, atmosphere and ocean)

PHOTO: HUGUES LANTUIT
Subsurface ground ice body on Herschel Island, Yukon Territory, Canada.

Cross-cutting Issues

Cross-cutting issues identified by the WG as potential foci for action in collaboration with other WGs are:

- Linking microbial processes in permafrost to greenhouse gas fluxes in a changing climate – effects of site characteristics and permafrost state, properties of organic carbon, microbial community structure and function.
- Impact of changing snow cover and permafrost characteristics on water and material fluxes (sediment, carbon, nutrients and pollutants) in arctic rivers.
- Response of tidewater glaciers to climate change in the Arctic – roles of ice-ocean interactions, terminus dynamics, and glacier hydrology; impacts of tidewater glacier change on regional scale mass balance.
- Measuring and modeling snow cover, snow water equivalent and glacier mass balance across different scales – development and validation of approaches.
- Interactions between the oceanic and atmospheric boundary layers across a broken sea ice cover – representation in models and role in polar amplification.
- Impact of the change in arctic sea ice regime (from multi-year to first year ice) on the mechanical and thermodynamic properties of the ice cover, and the role of these changes in ice properties in the long-term evolution of the ice cover.
- The surface energy balance of the Arctic.
- The future of the arctic cryosphere.

Priority Activities

Four specific activities were targeted for action over the next two years:

- Organize a workshop in collaboration with the World Climate Research Programme (WCRP) on the sea ice boundary layer and its role in arctic amplification.
- Initiate a program linked to the International Permafrost Association (IPA) on permafrost change, microbial processes, and material fluxes from river basins containing permafrost.
- Organize a workshop with the Network on Arctic Glaciology (NAG) on tidewater glacier science.
- Organize a workshop in collaboration with the SCAR Ice Sheet Mass Balance and Sea Level (ISMASS) group on glacio-isostatic adjustment corrections to estimates of ice sheet mass balance derived from satellite altimetry and GRACE satellite gravimetry (probably in 2012)

Those members of the WG attending ASSW 2011 in Seoul will meet again at that time. A full meeting of the WG will be held sometime in Fall 2011.

Arctic Science Summit Week

The Arctic Science Summit Week (ASSW) is an initiative of IASC. The purpose of the summit is to provide opportunities for coordination, collaboration and cooperation in all areas of arctic science, and to combine science and management meetings to save on travel and time. The ASSW also offers insight into arctic research undertaken by the host country.

Connecting Nuuk and Copenhagen

The circumstances for the ASSW 2010 where somewhat special considering the fact that half of the IASC delegation was present in Nuuk while the other half was detained in Copenhagen due to the volcanic eruption in Iceland. Luckily modern technology enabled the first (and hopefully last) IASC Council meeting and elections through a videoconference connecting both cities. The members of the European Polar Board, managed to improvise a meeting in the Danish capital as well.

Several of the planned business meetings were held in Nuuk. The Arctic Ocean Sciences Board: Marine Working Group and the Pacific Arctic Group held their annual meetings. In addition, a very successful Common Day was held. Common Day provided a good overview of the activities at the UNESCO world Heritage site at Ilulissat, the research activities at Zackenberg, the needs and possibilities for social scientists in Greenland, and the new Greenland Climate Research Centre in Nuuk.

The Local Organizing Committee of Najaaraq Paniula, Lone Nukaaraq Møller, Carl Christian Olsen, Daniel Thorleifsen, and Helle Siegstad organized an excellent week of events with a good mix of interesting meetings and cultural activities. Meeting participants were able to enjoy tours of Nuuk, a fishing expedition in the nearby fjord, local talent and a visit to the University of Greenland. Despite the disruption by the volcano, participants who had the pleasure of visiting Nuuk were impressed with its hospitality and culture.

PHOTO: GERLIS FUGMANN
View of Nuuk, the Greenlandic capital, and host location of the Arctic Science Summit Week 2010.

ASSW Science Symposium 2011 The Arctic: New Frontier for Global Science

A Science Symposium is organized as part of the ASSW every other year. These three-day symposia create a platform for exchanging knowledge, cross fertilization and collaboration and attracts scientists, students, policy makers and other professionals from all over the world.

The 2011 ASSW Science Symposium is the second such a symposium. The first one was held in Bergen, Norway in 2009 and attracted over 300 scientists, policymakers and other interested parties. For the 2011 symposium, ***The Arctic: New Frontier for Global Science***, the Korean organizing committee provides excellent facilities for a successful event with great opportunities to initiate and strengthen new and existing partnerships among the participants. The ASSW 2011 is supported by Korean governmental departments, the Korea Research Council of Fundamental Science & Technology (KRCF), Presidential Commmittee on Green Growth (PCGG) and the Seoul Tourism Organization.

The science symposium features the following sessions:

Disciplinary Sessions

- Arctic Atmosphere, Climate Processes and Teleconnections
- Arctic Change and Implications for Terrestrial Ecosystem Services
- Arctic Marine Climate Change: Causes and Impacts on the Marine System
- State of Glaciers and Permafrost and Associated Feedbacks to the Climate System
- Societal Changes in the Arctic and North-South Relations

Interdisciplinary Sessions

- Ecosystem Responses to Climate Change: Past, Present and Future
- State and Fate of Sea Ice and Legal and Policy Consequences on the Global Community
- Observing, Modeling and Prediction of Arctic Change

www.assw2011.org

PHOTO: ANDREW SLATER
Matthew Sturm examines a sample during the 2009 SnowNet project

IASC SECRETARIAT

The IASC Secretariat is responsible for the daily operations of IASC including:

- Communicating with Council Members;
- Communicating with other organizations including the Arctic Council and its subsidiary bodies and ICSU;
- Publication of the IASC Bulletin and IASC material as required;
- Maintaining the IASC website, preparing the IASC newsletter Progress, and in general facilitating outreach;
- Administration of IASC finances.

Contact Information IASC Secretariat and Staff

IASC Secretariat
Telegrafenberg A43
14473 Potsdam, Germany
Phone: +49-331-2882214
Fax: +49 331 288 2215
E-mail: iasc@iasc.info
Website: www.iasc.info

Volker Rachold
Executive Secretary
Phone: +49 331 288 2212
Mobile: +49 160 90664174
E-mail: volker.rachold@iasc.info

Mare Pit
Executive Officer
Phone: +49 331 288 2213
Mobile: +49 151 14657217
E-mail: mare.pit@iasc.info

Heike Midleja
Administrative Assistant
Phone: +49 331 288 2214
E-mail: heike.midleja@iasc.info

Sara Bowden
Executive Officer
North American Office
9504 Broome Ct.
Vienna, VA 22182, USA
Phone: +1 703 272 7300
E-mail: sara.bowden@iasc.info

PHOTO: BRUCE FORBES
Alina Serotetto is selecting draught animals for hauling sledges during the summer migration on the Yamal Peninsula, Russia.

2. Major International Science Initiatives

» 2 Major International Science Initiatives

To promote arctic science at a global level, IASC is involved in science planning and the initiation and development of research programs. Although IASC is not a funding organization it does make its connections, expertise, and secretarial support available for selected major international science initiatives. All initiatives are carried out in cooperation with other arctic and international players.

PHOTO: KONSTANZE PIEL
Simone Bircher and Julia Boike are adjusting sensors of an automated measurement site in the vicinity of the Samoylov research station, on Samoylov Island, Russia.

Sustaining Arctic Observing Networks (SAON)

The Sustaining Arctic Observing Networks (SAON) process was initiated in early 2007 in direct response to a request from the Ministers of the Arctic Council (AC). An informal SAON Initiating Group (IG), consisting primarily of representatives from several international arctic organizations came together and agreed that SAON should have the purpose to support and strengthen the development of multinational engagement for sustained and coordinated panarctic observing and data sharing systems that serve societal needs, particularly related to environmental, social, economic and cultural issues. The SAON IG determined that SAON's goal should be to enhance arctic-wide observing activities by facilitating partnerships and synergies among existing observing and data networks ("building blocks"), and promoting sharing and synthesis of data and information. SAON should achieve its goal by facilitating partnerships and synergies among existing observing and data networks, and promoting sharing and synthesis of data and information.

The SAON purpose, goal and approach were agreed by the SAON IG after it consulted with hundreds of arctic scientists, managers, and residents through an initial series of three workshops. Reports from these workshops are available on the SAON website (**www.arcticobserving.org**).

Taking on formal leadership

The SAON IG submitted a final report in December 2008 that concluded that the SAON process had value and should continue, and recommended that the Arctic Council, in collaboration with partners, take on the formal leadership of SAON. The SAON IG also recommended that the Arctic Council member states sustain and enhance their arctic observing activities and create a protocol to make data and information easily accessible in a timely fashion. The SAON IG also recommended that the arctic states improve their internal coordination of observing activities and thereby be in a better position to engage in intergovernmental coordination and cooperation. Finally the SAON IG recommended that the arctic states welcome non-arctic states and international organizations as partners in the continuation of SAON.

In response to the SAON IG report, the Arctic Council in spring 2009 agreed to lead further development of SAON and established the SAON Steering Group (SG), composed of representatives from the Arctic Council, IASC and the World Meteorological Organization. In its initial meeting the SG agreed on a few priorities:

- Improve awareness of the SAON process by improving the website and developing an informative brochure;
- Develop an inventory of existing observing networks supported by the arctic countries;
- Consider how to improve data access and sharing;
- Consider how to improve the linkage between community-based monitoring and scientific observations; and
- Engage with funding and implementing agencies to improve multinational collaboration.

The creation of the new website and brochure helped sharpen the concept of SAON and its purpose. Interactions with experts on community-based monitoring and on data management provided insight on desirable tasks for SAON. A workshop for government agency officials provided encouragement that SAON would be of value to the governments, and provided examples of specific things that SAON could do. The agency officials recommended a task-based approach, starting with high payoff tasks of modest scope to demonstrate early success.

Identifying gaps and priorities

As an outgrowth of the workshop with agency officials, the SAON SG determined that the scope of SAON could be better specified so that roles and responsibilities of SAON and of the existing monitoring networks and government agencies would be clearer. Hence the SG has agreed that SAON will not undertake observations, conduct research, perform scientific analysis or assessment, nor be a source of funding for these activities. SAON will identify issues, gaps and opportunities related to arctic observing and data sharing and take a multi-national approach to demonstrate improvements to the current situation. SAON will work with a broadly defined arctic observing community and with national and multi-national organizations and non-governmental partners to define and undertake its tasks.

Following these activities, the SAON SG arrived at the conclusion that the consultation and planning processes for SAON had gone as far as needed, and that transitioning to an implementation phase was the next logical step. The SAON SG reported to the Arctic Council that an implementation phase was needed, and indicated it would adopt the task-based approach, and seek voluntary participation by any

country or organization that could make a contribution to the work of SAON. The Arctic Council endorsed these views and called for an implementation plan, to include an "institutional framework" and an initial list of tasks to be undertaken. This report is the implementation plan for the operational phase of SAON.

Initiating the operational phase

The SAON SG proposes that the Arctic Council and IASC jointly establish the SAON Council, with each organization providing a permanent co-chair of the SAON Council. The SAON Council would be composed of representatives of participating countries, and of the Arctic Council and IASC and would be supported by a Secretariat drawn from the existing Secretariats of the AC's Arctic Monitoring and Assessment Programme and IASC. The SAON Council would report to both the AC and the IASC. A key feature of the SAON Council is that it would establish its own rules of operation and not be bound by either the AC or IASC rules. In this way, both arctic and non-arctic countries may participate on an equal basis, and work of interest to a subset of the SAON Council can go forward without the need for unanimous consent.

The core work of SAON would be undertaken by a number of Task Teams, established by voluntary agreement to define and implement a task that advances the goal of SAON. Members of each Task Team are responsible for providing the resources needed for the task. Task Teams may have as partners any organization that wishes to contribute to the advancement of SAON.

To provide an initial focus for the operational phase of SAON, the SAON SG has asked its members and some of the existing observing networks to propose tasks that could be undertaken during the next few years. If the AC and the IASC agree to this plan and establish the SAON Council, the initial meeting of the SAON Council should occur in summer/fall of 2011. The SAON SG will provide a draft Terms of Reference to the SAON Council, but leave it to the SAON Council to complete and adopt the Terms of Reference that meets their needs.

Contact information
SAON Secretariat
Odd Rogne (AMAP)
Lars-Otto Reiersen (AMAP)
Volker Rachold (IASC)
Email: info@arcticobserving.org
Phone: +47 23241635 (AMAP) or +49 3312882214 (IASC)

www.arcticobserving.org

Climate Change and the Cryosphere: Snow, Water, Ice and Permafrost in the Arctic (SWIPA)

SWIPA is a project of the Arctic Council and is coordinated by the Arctic Monitoring and Assessment Programme (AMAP) in cooperation with IASC, the World Climate Research Programme/Climate and Cryosphere project (WCRP/CliC), the International Polar Year International Programme Office (IPY IPO) and the International Arctic Social Sciences Association (IASSA).

The SWIPA project was approved by the Arctic Council in April 2008 as a follow-up to the 2005 Arctic Climate Impact Assessment (ACIA). The project has brought together arctic scientists to compile and evaluate information from arctic monitoring networks and recent international research activities, such as those carried out during the IPY, to better quantify and understand recent changes to the cryosphere and their impacts that have occurred since the ACIA report was published.

Presenting the outcomes

The SWIPA project is based on peer-reviewed publications and work accepted for publication in respected scientific journals and has itself been subject of scientific scrutiny. Approximately 200 scientists have contributed to the work either as authors or as reviewers. The main product of the work will be a 550 page report bringing forward the results of the work and scientific recommendations stemming from the SWIPA assessment. Building on the scientific report, a shorter version of the findings will be presented in layman-style language for a non-scientific audience. The layman's version will include a summary of the key messages from the scientific report and recommendations for policy- and decision-makers.

In addition, 3 short films have been produced based on the scientific report. The films are targeted at the lay audience and describe **1)** the physical changes in different components of the arctic cryosphere, **2)** how changes affect people in the Arctic, and **3)** a film about the Greenland Ice Sheet. All SWIPA projects will be delivered to the Arctic Council at the meeting in Nuuk, Greenland, on May 12th, 2011. The scientific results of the SWIPA work, however, will be presented at a scientific conference organized by AMAP, Aarhus University and University of Copenhagen in Copenhagen 4-6 May, 2011.

The Arctic as a Messenger for Global Processes - Climate Change and Pollution

Time and Venue: 4-6 May, 2011,
University of Copenhagen
Organized by: Arctic Monitoring and Assessment Programme (AMAP) University of Copenhagen
Aarhus University

www.AMAP.no

Further, the SWIPA scientific report will constitute an arctic contribution to the Fifth Assessment Report of the UN Intergovernmental Panel on Climate Change (UN IPCC) scheduled for completion in 2013/2014. A preliminary report on "The Greenland Ice Sheet in a Changing Climate", one component of SWIPA, was delivered to the Fifteenth Conference of Parties (COP 15) of the United Nations Framework Convention on Climate Change (UNFCCC) in December 2009.

PHOTO: JEFF BOWMAN
Sampling sea ice during the second expedition on the Lomonosov Ridge off Greenland (LOMROGII).

Trustworthy and understandable information

Since the ACIA report was released in 2005, changes in the arctic cryosphere have been very pronounced and local, regional and global impacts have been noticeable and noted in the press. The SWIPA reports put together and synthesize the latest scientific findings. Based on peer-reviewed scientific publications and having undergone rigorous scientific quality control, SWIPA will provide updated and reliable information that users can trust and understand.

Headed by AMAP, the SWIPA project has been guided by an integration team consisting of lead authors of the assessment and representatives from the participating organization including IASC, and representatives from indigenous people permanently participating the work of the Arctic Council. It has been a challenge for scientists contributing to SWIPA and seeing their contribution in a context beyond their own specialty, not to mention meeting deadlines as a project (or a puzzle) of this magnitude requires all bits to fall in place before you can make a reliable synthesis. On the other hand, SWIPA has offered scientists the possibly of the shortest distance in time from scientific findings to making them known to users, including decision-makers

SWIPA publications and films will become available on the SWIPA website.

Contact information
AMAP Secretariat
Morten Skovgård Olsen (Danish Energy Agency, Ministry of Climate and Energy)
Lars-Otto Reiersen (AMAP)
Phone: +47 23241635

Volker Rachold (IASC)
Phone: +49 3312882214

Email: amap@amap.no
www.amap.no/swipa

State of the Arctic Coast 2010

Scientific review and outlook

The arctic coastal interface is a sensitive and important zone of interaction between land and sea: a region that provides essential ecosystem services and supports indigenous human lifestyles; a zone of expanding infrastructure investment and growing security concerns; and an area in which climate warming is expected to trigger landscape instability, rapid responses to change, and increased hazard exposure.

In 2007, the Land-Ocean Interactions in the Coastal Zone (LOICZ) project, the International Permafrost Association (IPA) and IASC organized a joint workshop entitled "Arctic Coastal Zones at Risk" (Flöser et al. 2007), building on the experience of their joint Arctic Coastal Dynamics (ACD) project (http://acd.arcticportal.org) and the Science Plan of the Coastal Working Group of the Second International Conference on Arctic Research Planning (ICARP II 2005). The workshop was hosted by the Norwegian Institute for Air Research in Tromsø (Norway), and co-sponsored by the Arctic Monitoring and Assessment Programme (AMAP) and the International Human Dimensions Programme (IHDP). Through a number of thematic and cross-cutting working groups, the workshop concluded with a call for an assessment of the state of the arctic coast.

The report titled "State of the Arctic Coast 2010: Scientific Review and Outlook" is the outcome of this collaborative effort. The goal is to draw on initial findings regarding climate change and human dimensions for the Arctic as a whole provided by the Arctic Climate Impact Assessment (ACIA 2004) and Arctic Human Development Report (AHDR) to develop a comprehensive picture of the status and current and anticipated changes in the most sensitive arctic coastal areas. The assessment takes a social-ecological approach that explores the implications of change for the interaction of humans with nature. It is organized in three parts:

1. An assessment of the state of arctic coastal systems under three broad disciplinary themes: physical systems, ecological systems, and human concerns in the coastal zone;
2. An examination of progress in integrative approaches to monitoring, understanding, and managing change in arctic coastal systems; and
3. Identification of data gaps and research priorities over the coming decade. This aims to be a first step towards a continuously updated coastal assessment and to identify key issues seeking future scientific concern in an international Earth system research agenda.

The document was prepared by an international writing team, including 15 Lead Authors and 27 Contributing Authors. The editorial board includes Donald L. Forbes (Bedford Institute of Oceanography, Dartmouth, Canada – General Editor), Hugues Lantuit (IPA), Volker Rachold (IASC) and Hartwig Kremer (LOICZ). The report which is published by IASC, LOICZ, IPA and AMAP is available at www.arcticcoasts.org.

PHOTO: KUNO LYNGE
Panoramic view of the Greenlandic coast

References

Flöser, G., Kremer, H. and Rachold, V. (2007) Proceeding of the Workshop Arctic Coastal Zones at Risk – Tromsø, Norway, 1-3 October 2007 http://coast.gkss.de/events/arctic07/docs/proceedings.pdf.

ICARP II (2005) Arctic Research A Global Responsibility – An Overview of the Second International Conference on Arctic Research Planning.

ACIA (2005) Arctic Climate Impact Assessment. Cambridge University Press, 1042 pp.

AHDR (2004) Arctic Human Development Report. Akureyri: Stefansson Arctic Institute

International Study of Arctic Change (ISAC)

The International Study of Arctic Change (ISAC) is an open-ended, international, interdisciplinary science program. The goal of ISAC is to provide scientific information on rapid arctic change to society and decision makers so they can respond with informed strategies. This requires observation and tracking of arctic changes and understanding their nature, causes, feedbacks and connections among them. ISAC encompasses panarctic, system-scale, multidisciplinary observations, synthesis and modeling to provide an integrated understanding of arctic change and projections of future change.

The ISAC Science Plan provides a vision for integrating research among diverse fields and varied users and stakeholders. ISAC facilitates international cooperative efforts to understand the arctic system and all its components on a panarctic scale. ISAC is positioned

to sustain research and coordination activities relevant to environmental arctic change largely initiated during the International Polar Year (IPY). As an active science program ISAC stimulates and provides guidance to develop, maintain and evolve observational activities and scientific understanding. This approach ensures a legacy of relevant high-quality science in the Arctic for decades to come.

ISAC is motivated by environmental changes that are already large enough to affect life in the Arctic. The changes illustrated in the ISAC science program focus on the last decade noting shrinking sea ice cover, rising atmospheric temperature, thawing permafrost, shifts in ecosystems, and linkages to human systems. Substantial future changes are projected to have profound impacts on humankind. Ecosystems are changing, species distributions shifting, and wildlife populations and fisheries are experiencing extraordinary pressures – both natural and anthropogenic.

Recent changes in the Arctic have already had significant impacts on infrastructure, on food security, on human health, and on industrial development, and they are influencing domestic responses and international relations. These changes can be measured in economic, social, political and cultural risks and costs and are reflected in human decision-making from the level of the individual to the nation-state, at the international scale, and in feedbacks to the system as a whole. Future system states are uncertain and the lack of predictability hinders efforts to develop strategies for adapting to and managing a changing Arctic.

The ISAC science program is structured around three concepts: Observing, Understanding and Responding to arctic change. All the components of the arctic system must be observed across time and space to understand the scope and evolution of change. Understanding how the system functions and projecting future changes requires models using data that flow from the comprehensive arctic observing system. Moving beyond description to understanding change in the past, present, and future is critical. In the integrated ISAC program the observing, understanding and responding components have been developed in concert around a set of objectives. These are:

- Observing the arctic system covering all domains including the anthroposphere, the atmosphere, the biosphere, the cryosphere, and the hydrosphere. This is based on existing and new long-term observing sites and networks as well as new observing methods. (observing)
- Quantifying the anthropogenically-driven component of arctic change within the context of natural variability. (observing)
- Understanding the causes of panarctic changes, including changes in the human component, in the context of global change. (understanding)
- Improving models to project future changes in the arctic system, including impact assessment models for responding to change. (understanding)
- Exploring options for adaptation to and mitigation of arctic change and suggesting ways that will lead to a path of sustainable use and development. (responding)
- Disseminating data and results from ISAC activities to the scientific community, stakeholders and the general public. (cross-cuts observing, understanding, responding)

Implementation of ISAC is underway, with activities designed to collect specific information relevant to addressing ISAC science questions. Among numerous programs endorsed by IPY and that have contributed to ISAC are the recently sunsetted European Commission funded DAMOCLES Integrated Project (**www.damocles-eu.org**), and the ongoing United States Interagency SEARCH Program (**www. arcus.org/search/index.php**). These two initiatives were formally linked through the EU/US SEARCH FOR DAMOCLES initiative (**www.arcus.org/search/internationalsearch/damocles.php**). They provide an example of how partnerships within ISAC may work. Partnerships within ISAC continue to expand and program building activities are planned in concert with participating programs.

An integrated observing system that is designed for panarctic coverage is being developed, with much progress on this initiative made during the International Polar Year. This evolving observing system will constitute the ISAC Observing component; it will ultimately cover the atmosphere, ocean and sea ice, hydrology, cyrosphere, marine and terrestrial ecosystems, and aspects of the human dimensions of the arctic system. The data flow within each of the ISAC program elements is coordinated by dedicated data information systems following standard data policies operated by participating organizations, programs and projects. Efforts are underway within the ISAC Program Office to coordinate the data management functions among these program elements.

Development of the ISAC Understanding component is also underway as modeling is increasingly coordinated among operational ISAC program elements. These activities include model comparisons, as well as coordination of new modeling initiatives, and in the longer-term, expansion of these activities to specifically address societal needs for understanding. The Responding to Change component of ISAC drives the program with an emphasis on societally relevant science. Implementation of the Responding to Change piece began with planning efforts during the IPY, and is one of the major foci for the near future activities of ISAC.

Contact information

ISAC International Program Office (IPO)
Maribeth Murray, Executive Director
Martin Biuw, Project Manager IPO
Peter Schlosser, Co-Chair SSG
Jean Claude Gascard, Co-Chair SSG
PO 50003, SE 104-05
Stockholm, Sweden
Tel: +46 (0)8 67 39 607
E-mail: info@arcticchange.org

www.arcticchange.org

PHOTO: LAURA MORSE
A polar bear is wandering along the coast of the Beaufort Sea.

International Polar Year 2007/2008 (IPY)

The International Polar Year 2007-2008 (IPY), the largest polar research and education venture ever undertaken, formally came to an end at the official closing ceremony in Oslo (Norway) on Saturday 12 June 2010 – the final day of the IPY Oslo Science Conference.

Professor Jeronimo Lopez-Martinez, co-Chair of the IPY Joint Committee (JC) concluded: *„The overall scope of IPY is hard to overestimate and its total „footprint" may not be fully known for many years. However, only one year after the conclusion of IPY field activities there are clear early indicators of the success of the program."* Professor Lopez-Martinez mentioned a number of examples, including a surge in multidisciplinary polar scientific activities; extensive new circumpolar data baselines and improved observing systems; enhanced international collaboration and stronger links between the arctic and Antarctic science communities; an enthusiastic new generation of polar scientists; the active engagement of arctic residents in IPY activities; and the unprecedented involvement of educators and increase public awareness about polar regions.

The official IPY report "Understanding Earth's Polar Challenges: International Polar Year 2007-2008" is now being finalized. The report tells the story from the perspective of the Joint Committee, with the help of more than 100 contributors; from the earliest planning almost a decade ago to the current challenge of ensuring a robust IPY legacy. It involves tens of thousands of participants, and highlights the global influence of the polar regions. It will cover the planning and implementation of IPY over a 10-year period and present some preliminary results. The list of authors and reviewers of the report includes over 250 people.

IPY 2012 Conference: From Knowledge to Action

At the conclusion of the IPY Oslo Science Conference, the conference Chair, Olav Orheim handed over a traditional Viking buddstikke, used in medieval times to deliver messages, to the organizers of the third and final International Polar Year conference to be held in Montréal, Canada from April 22-27, 2012. The "From Knowledge to Action Conference" will highlight the latest polar research results, including the findings of International Polar Year 2007 – 2008. As many as 2,500 participants are expected to attend the IPY 2012 Conference from around the world.

The IPY 2012 Montréal Conference, endorsed by the International Joint Committee for IPY will be hosted by Canada in conjunction with the international polar science community. The Conference will feature the most recent scientific findings on climate and permafrost changes, weather hazards, sea ice and glacier melt, coastal erosion, biodiversity, invasive species and other topics critical to the polar regions.

These topics will be discussed in conjunction with important challenges of sustainable development and adaptation to climate change. The "From Knowledge to Action Conference" builds on earlier major IPY scientific conferences hosted by IASC and SCAR in Russia (2008) and the Research Council of Norway (2010).

This will not only be a forum to present the latest results of IPY research, but will also be an opportunity to discuss key findings from polar research and the policy implications with a range of participants. Scientists, residents of the circumpolar North, policy and decision makers, representatives of business and industry, educators, media and others who draw upon the science of the polar regions to understand the many changes that are occurring in these areas will be brought together to discuss the application of the knowledge and new information including actions to be taken.

The IPY 2012 "From Knowledge to Action Conference" will include presentations from world leaders in polar science. There will be poster and oral presentations on the integration and synthesis of the interdisciplinary science, along with opportunities to discuss how the findings are being applied. The poster sessions will be an important part of the Conference program – to both present the scientific findings of IPY and polar research and demonstrate the application of knowledge along with a wide range of technologies and programs.

Opportunity to link science and society

While first and foremost a science conference, participants will be invited to address the implications of IPY findings and how this new knowledge can be used to advance various programs, policies and actions on global issues. The Conference will bring together current understandings of the state of the polar regions, as well as create an opportunity for scientists and arctic peoples to discuss the implications of changing conditions in their regions.

"The IPY 2012 Conference will apply the new knowledge from polar science," says conference chair Peter Harrison, Director of the School of Policy Studies at Queen's University in Kingston, Canada. *"This Conference will provide a unique opportunity for researchers, policy makers and the many participants at the conference to have the conversations needed to move forward on key polar issues. By the close of the Conference, we hope to have identified a number of specific actions that need to take place in a global context."*

According to the Conference co-chair, Karl Erb, Director of the Office of Polar Programs at the United States National Science Foundation, the IPY Conference will be an opportunity to highlight outstanding research accomplishments, discoveries and understandings emerging from IPY and the latest polar science. A special aspect of the Conference will be its focus on linking science and society to address critical issues facing the polar regions. Scientists will interact with public decision makers to gain a better understanding of how they can better inform public policy decisions.

PHOTO: MARE PIT
IPY Closing Ceremony at the IPY Oslo Science Conference (left to right):
David Carlson (IPY IPO Director), Jerónimo López-Martínez (Co-Chair of the IPY JC), Jenny Baeseman (APECS Director),
Volker Rachold (IASC Executive Secretary) and Mike Sparrow (SCAR Executive Director)

Key areas of the Conference

The IPY 2012 Montréal Conference From Knowledge to Action is being organized around four key areas. You can participate in sessions on: **1)** the latest polar research findings on a broad range of interdisciplinary science themes, **2)** an assessment and synthesis of this knowledge into conclusions about polar regions and global systems. The Conference program will also allow participants to **3)** discuss the application of scientific results and how to link knowledge to policies, programs, services and other actions, including new data applications. Finally, the Conference will **4)** highlight the role of public engagement and education activities in bringing polar knowledge to action.

Networking opportunity

Like the previous IPY conferences, the 2012 Montréal Conference will create a venue to share knowledge amongst scientific disciplines, countries and polar regions. It will provide the opportunity to meet colleagues, share results and plan the future directions for polar science. Workshops and other events planned as part of IPY 2012 Conference will allow the many individuals and organizations involved in the application of polar science to connect and share their ideas and actions.

Drawing on the expertise from other fields, sessions will be held on how polar science can enhance the flow of information between researchers and those interested in applying the information. Using case studies and best practices, the Montréal Conference will seek opportunities to increase the application of polar research to benefit, not only the Poles, but the planet.

Conference program

Consultations to develop the conference program are well underway and input is being requested on the first circular currently posted on the IPY 2012 website at **www.IPY2012Montreal.ca**

When the first circular was issued in mid-November 2010, we asked for feedback on the four main areas of the conference, as well as on specific session topics. A second circular, to be published at the time of this bulletin, will outline potential session topics and presentations that are being organized. Further ideas and suggestions from arctic and Antarctic researchers and the many other stakeholders are most welcome, and will continue to help shape the conference. A call for abstracts will go out in June, with a submission deadline of October 2011.

To learn more about the conference, and to sign up for the IPY 2012 newsletter, visit the website at **www.ipy2012Montréal.ca** .

April 22-27, 2012 | Montréal, Québec, Canada

Chair, Dr. Peter Harrison, Director of the School of Policy Studies, Queen's University, Canada and

Co-chair, Dr. Karl Erb, Director, Office of Polar Programs, US National Science Foundation, Washington, D.C.

On behalf of the IPY 2012 Conference International Steering Committee and the IPY 2012 Secretariat – Kathleen Fischer, Jennifer Bellman, Natalie Labonté, Laurier Forget and Pierre Lamoureux

PHOTO: MARC CRAMER
Interior of Palais des Congrès in Montreal Canada; the venue for the IPY 2012 Conference.

PHOTO: ANDREW SOLE
Catie Butler and Marek Stibal of the University of Bristol are using tracers to determine the character of subglacial hydrology on Leverett Glacier, West Greenland.

3. IASC NETWORKS AND WORKSHOPS

» 3 IASC Networks and Workshops

IASC provides seed money and in-kind support for the founding and development of thematic networks and the organization of workshops that assist the organization in fulfilling its scientific mission. In general IASC supported activities are international, encourage circumarctic activities and strive to involve early career scientists.

Network on Arctic Glaciology (NAG)

The winter 2009-2010 was characterized by an exceptional weather pattern causing dramatic positive temperature anomalies in the Arctic. The arctic ice masses were thus set for a record melt year in 2010, as a warm winter implies an early beginning of the melt season on the glaciers and ice caps. The total melt extent of the Greenland Ice Sheet was reported in the Arctic Report Card to be 8% larger in 2010 than the previous record of 2007 and 38% above the 1979-2007 average (data available until mid-September). Thus we see a continuation of the trend of the last decade in the Arctic towards warmer temperatures, less sea ice, larger ice sheet melt extent and accelerated mass loss from the Greenland Ice Sheet and from arctic glaciers and ice caps in general.

The Arctic Climate Impact Assessment concluded in 2004 that the Arctic is warming rapidly in an amplification of the global rise in temperature. Obviously this conclusion leads to an immediate concern for the huge ice masses stored in the Arctic, in the Greenland Ice Sheet, and in the circumpolar ice caps and glaciers. The IASC Network on Arctic Glaciology (NAG) aims to address these rapid changes in the arctic ice masses by initiating scientific programs and facilitating international cooperation between glaciologists and climate modellers in order to develop an understanding of arctic land ice and its role in global climatic and environmental change.

The NAG strives to achieve this aim by providing a forum for:

- Rapid and timely exchange of recent developments in arctic glaciology
- Initiation of relevant symposia and workshops
- Providing input for future research strategies in the Arctic
- Evaluation of existing and planned research programs
- Expert advice to IASC on glaciological matters

The NAG has a relatively simple organizational structure that was last revised during the NAG workshop in 2009. Each year the network will hold an Open Forum Meeting, with participation of the national points of contact as well as anyone who wants to participate from the glaciological scientific community. This type of meeting is believed to best utilize the combined expertise of the arctic glaciological community in addressing the aims of the Network on Arctic Glaciology. Connected to this Open Forum Meeting is a two-day workshop on the mass budget of arctic glaciers, which is likewise open to all scientists.

Brief presentations and posters provide an overview of recent results and ongoing activities. Extended abstracts are collected and printed as a report that is available for free through the NAG website. The last workshop took place 7 - 10 March, 2010, at the Universitätszentrum Obergurgl, University of Innsbruck, Obergurgl, Austria. The next workshop is scheduled for 2 – 4 February, 2011, at Winter Park in Colorado, USA, honouring the new principle of alternating the workshop location between Europe and Northern America. The 2012 workshop is tentatively planned to take place in Poland.

PHOTO: ALLEN POPE
The calving front of the recently surged Tunabreen, Svalbard, locked in by winter sea ice.

The annual workshop also serves as a place where more practical plans are made to share costs and logistics for field work. In the past, very fruitful international collaboration has been initiated at the annual workshops. Occasionally the NAG also organizes events on a larger scale, like the Symposium on Arctic Glaciology that was held in Geilo, Norway (August 2004). This symposium was co-sponsored by the International Glaciological Society. The NAG has had a small budget made available by IASC on an annual basis. The budget enables the NAG to support the participation of early-career scientists and graduate students in the annual workshop.

Results and achievements

A successful idea proposed at the 2009 Open Forum Meeting of the NAG was the initiation of an International Summer School in Glaciology held in the US, to offer to US students the same opportunities given by the long-standing Karthaus Summer School to European students. This US summer school was held at the University of Alaska, Fairbanks (UAF) and Wrangell Mountains Center, McCarthy, Alaska on 7-17 June, 2010, and was co-sponsored by IASC, along with the International Arctic Research Center (University of Alaska, Fairbanks), International Glaciological Society, NASA and the International Union of Geodesy and Geophysics.

The course provided glaciology graduate students with a comprehensive overview of the physics of glaciers and current research frontiers in glaciology. Thirteen students participated from the US while Europe was represented by eleven students. Key topics included:

- Glacier mass balance and glacier meteorology
- Response of glaciers to climate change
- Glacier dynamics, surging and tidewater glaciers, ice streams
- Ice-ocean interactions
- Ice-sheet modelling, inverse modelling
- Glacier hydrology
- Remote sensing in glaciology
- Role of glaciers in the arctic system
- Current research frontiers in glaciology

The focus was on quantitative glaciology, modelling, and remote sensing. The scope was broadened by including some related topics relevant to the Arctic and especially Alaska, such as glacier-volcano interactions, permafrost, sea ice and isostatic rebound.

An important achievement of the Network for Arctic Glaciology has been the significant contributions of members as lead authors, chapter leads and contributors to the IASC effort to assess the climate change impact on the cryosphere (abbreviated SWIPA, for Snow, Water, Ice and Permafrost in the Arctic) in collaboration with the Arctic Council, Climate and Cryosphere (under WCRP) and the IPY International Programme Office. This effort aims to provide timely, up-to-date and synthesized scientific knowledge on arctic cryospheric changes, a review of key processes, a summary of predictions from models, an analysis of impacts on ecosystems and an analysis of socio-economic impacts. The first SWIPA report termed 'The Greenland Ice Sheet in a Changing Climate' was published in time for the COP15 meeting in Copenhagen, Denmark, in December 2009, with contributions from the NAG. Other parts of the SWIPA report series also have significant contribution from the NAG, e.g., as leads on the 'Mountain glaciers and ice caps' and 'Cryo-interactions: antagonistic/synergistic effects of the various cryosphere components' modules.

Members of the NAG successfully initiated a new Nordic Centre of Excellence (NcoE) to investigate the interaction between climate change and the cryosphere: SVALI – Stability and Variations of Arctic Land Ice. SVALI is supported by the Nordic Council of Ministers under the Top-level Research Initiative in 2010-2015 and is led by former NAG Chairman, Prof. Jon Ove Hagen, Oslo University.

The NCoE SVALI aims to answer these key questions:

How fast is land ice volume in the Arctic and North-Atlantic area changing, and why?

Will these processes continue to accelerate?

What are the consequences for sea-level and ocean circulation?

What are the implications for society?

NCoE SVALI will constitute a platform for joint process studies, analyses, sharing of methods, researcher training and outreach activities to spread information about scientific results. The researchers will study basic processes using remote sensing, airborne and in-situ measurements, and carry out advanced Earth System Modelling with emphasis on glaciers in the arctic/North-Atlantic area. Most of the funding is channeled into a common Graduate Programme, mobility of established scientists between institutions, an extensive range of postdoc stipends and outreach activities.

NAG members completed the initiation of a Programme for Monitoring of the Greenland Ice Sheet (PROMICE) sponsored by the Danish government with the aim to monitor the mass loss through a comprehensive network of automatic weather stations measuring climate and melt directly and through calculation of the calving mass loss using repeated airborne surveys in conjunction with radar satellite data and in-situ GPS-instruments. PROMICE is presented on the outreach and data website **www.promice.dk**. NAG members also maintain a monitoring programme of the A.P. Olsen Ice Cap at the Zackenberg Research Station in Northeast Greenland, as part of the Greenland Ecosystem Monitoring.

A number of projects have been conducted as a result of the Network proposal activities. As part of the project on Mass Balance of Arctic Glaciers and Ice Sheets (MAGICS), two significant contributions were made: **(1)** A compilation of existing in situ mass-balance observations on arctic glaciers and, **(2)** an estimate of the contribution of arctic glaciers to sea-level change in the next 100 years (a contribution to the Arctic Climate Impact Assessment, ACIA). As a direct result of the NAG, a number of projects have been funded on national and international basis for different groups, for example, the Response of Arctic Ice Masses to Climate Change (EU-ICEMASS) 1998-2001, and Space-borne Measurements of Arctic Glaciers and Implications for Sea Level (EU-SPICE) 2002-2005. The ongoing IPY-project GLACIODYN 2007-2008 is the latest in a series of successful collaborations.

The EU-project ice2sea 2009-2013, is aimed at determining the contribution to sea-level rise from land ice masses over the next 200 years. It also has significant participation from NAG members. The NAG members are represented in a host of advisory bodies such as the United Nations Intergovernmental Panel on Climate Change (IPCC), the Climate Expert Group of the Arctic Monitoring and Assessment Programme (AMAP) under the Arctic Council, the Climate and Cryosphere (CliC)

PHOTO: ANNA HOGG
Taking field measurements on the Steinholtsjokull glacier on Iceland as part of the University of Edinburgh 2009 Physical Geography field trip.

project of the World Climate Research Programme (WCRP), which ensures a cohesive and informed Network.

Field activities conducted as part of the national and international projects all over the Arctic are reported at the annual IASC NAG meeting and published in the annual Book of Extended Abstracts.

List of Publications

Peer-reviewed publications

Members of the network have published a large number of publications over the years. A few select publications representative to the work of the NAG are:

Dowdeswell, J.A., Benham, T.J., Strozzi, T. and Hagen, J.O., 2008. Iceberg calving flux and mass balance of the Austfonna ice cap on Nordaustlandet, Svalbard. Journal of Geophysical Research, v. 113, F03022, doi:10.1029/2007JF000905.

Oerlemans, J., R.P. Bassford, W. Chapman, J.A., Dowdeswell, A.F. Glazovsky, J.-O. Hagen, K. Melvold, M. de Ruyter de Wildt, R.S.W. van de Wal, 2005. Estimating the contribution from Arctic glciers to sea-level change in the next hundred years. Annals of Glaciology, 42, 230-236.

Koerner, R.M. 2005. Mass Balance of glaciers in the Queen Elizabeth Islands, Nunavut Canada. Annals of Glaciology, 42, p.417-423.

Navarro, F., A.F. Glazovsky, Yu.Ya. Macheret, E.V. Vasilenko, M.I. Corcuera and M.L. Cuadrado. 2005. Structure, dynamics and ice volume changes of Aldegondabreen (Spitsbergen) during 1936-1990. Annals of Glaciology, 42, p.158-162.

Holmlund, P., Jansson, P., Pettersson, R. 2005. A re-analysis of the 58 year mass-balance record of Storglaciären, Sweden. Annals of Glaciology, 42, p.389-394.

Hagen, J.O., Melvold, K., Pinglot, F. and Dowdeswell, J.A., 2003. On the net mass balance of the glaciers and ice caps in Svalbard, Norwegian Arctic. Arctic,Antarctic and Alpine Research, v. 35, p. 264-270.

Dowdeswell, J.A., Hagen, J.O., Björnsson, H., Glazovsky, A.F., Harrison, W.D., Holmlund, P., Jania, J., Koerner, R.M., Lefauconnier, B., Ommanney, C.S.L. and Thomas, R.H., 1997. The mass balance of circum-Arctic glaciers and recent climate change. Quaternary Research, v. 48, p. 1-14.

Project workshop reports

Every year since the establishment of the NAG a two to four days workshop has been arranged in connection with the annual national representatives meeting. The workshops are called: Workshop on the mass budget of arctic glaciers. Often a book of extended abstracts has been published from the workshop. The workshop reports can be downloaded from the website, see below. Hard copies of books prior published up to 2008 are available on request by contacting the secretariat of the Institute for Marine and Atmospheric research Utrecht (IMAU): **imau@phys.uu.nl**. The book of extended abstracts published from the 2009 workshop is available from the Geological Survey of Denmark and Greenland (GEUS) or in electronic version through the NAG website **http://www.iasc-nag.org/**.

Reports

Workshop on the dynamics and mass budget of Arctic glaciers, Kanaskis, Canada. 16 – 19 February 2009. Book of extended abstracts 2009.

Workshop on the dynamics and mass budget of Arctic glaciers, Obergurgl, Austria. 29 – 31 January 2008. Book of extended abstracts 2008.

Workshop on the dynamics and mass budget of Arctic glaciers, Pontresina, Switzerland. 15 – 18 January 2007. Book of extended abstracts 2007.

Workshop on the mass budget of Arctic glaciers, Obergurgl, Austria. 30 January – 3 February 2006. Book of extended abstracts 2006.

Updated Mass balance data 2002, tables.

Jania, J., Hagen, J.O. (editors) 1996. Mass balance review of Arctic Glaciers. IASC-report no 5. 95 pp.
MAGICS Science Plan 1996.

All reports are available and can be downloaded from the website **www.iasc-nag.org**.

PHOTO: SPENCER BROWN
Highly saline frost flowers growing on fresh sea ice. Frost flowers can absorb molecules from the atmosphere, such as mercury. Scientists are exploring whether they can also absorb organic pollutants, such as pesticides and industrial chemicals.

Members of the Steering Committee – National representatives per 2009

Prof. Helgi Björnsson (Iceland)
hb@raunvis.hi.is

Dr. Martin Lüthi (Switzerland)
luethi@vaw.baug.ethz.ch

Prof. Julian A. Dowdeswell (United Kingdom)
jd16@cam.ac.uk

Contact information
Project/Network Leaders

Chairman | Andreas Peter Ahlstrøm
Dept. of Marine Geology & Glaciology
Geological Survey of Denmark and Greenland
Øster Voldgade 10
DK-1350 Copenhagen K, Denmark
Phone: +45 38142000
E-mail: apa@geus.dk

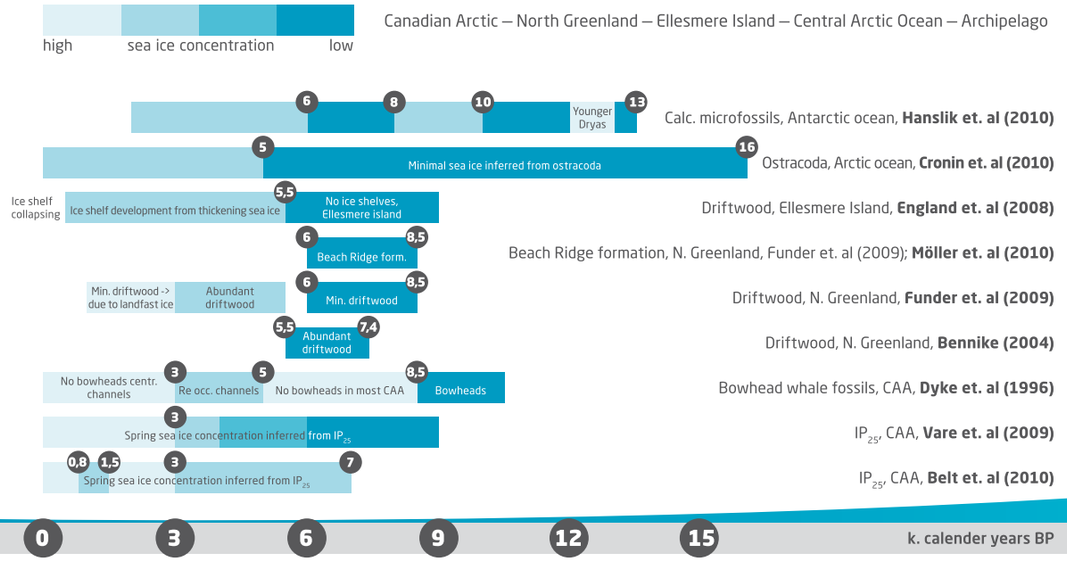
Vice-Chairman | Martin Sharp
Dept. of Earth & Atmospheric Sciences
1-26 Earth Sciences Building
University of Alberta
T6G 2E3 Edmonton, Alberta, Canada
Phone: (780) 492-5249
E-mail: Martin.Sharp@ualberta.ca

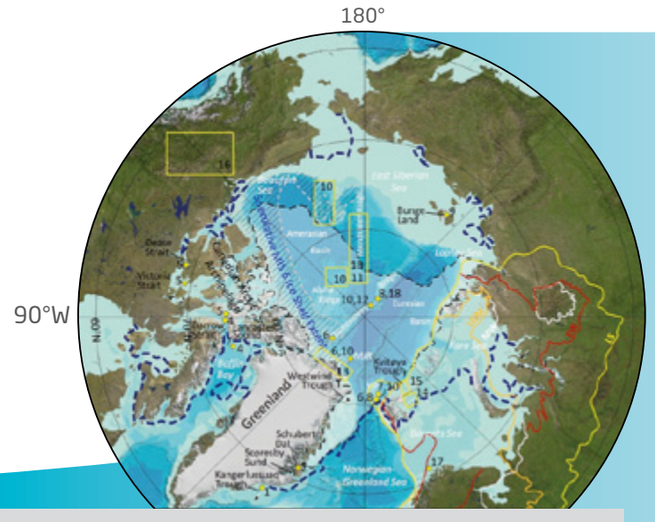
www.iasc-nag.org

Arctic Palaeoclimate and its Extremes (APEX)

The scientific network on Arctic Palaeoclimate and its Extremes (APEX) organized its first International Workshop and Conference in late March 2007 at the Royal Swedish Academy of Sciences in Stockholm, Sweden. The APEX Workshop and Conference has since become a yearly event where the network's scientists come together to discuss new results, initiate new collaborative projects and scientific publications. During the second Workshop and Conference held 2008 at Durham University, UK, it was decided to focus on three main themes for the following APEX meeting to be held in 2009 at the Natural History Museum in Copenhagen, Denmark. These three themes comprised the palaeo-records and natural variability of **1)** the Greenland Ice Sheet, **2)** Arctic Ocean sea ice, and **3)** arctic ice shelves.

It was also decided that these themes would form the basis of a proposal for a special APEX issue in the journal Quaternary Science Reviews (QSR). Our proposal was accepted by QSR and the deadline for submission of contributions was set to December 2009. Altogether 23 articles, involving the main three themes decided in Durham as well as other APEX topics, are now, one year later, included in the





Reference	Number on Map
(Dowdeswell et al., 2010a)	1
(Hall et al., 2010)	2
(Möller et al., 2010)	3
(Ledu et al., 2010)	4
(Belt et al., 2010)	5
(Jakobsson et al., 2010b)	6
(Dowdeswell et al., 2010b)	7
(O'Regan et al., 2010)	8
(Schirrmeister et al., 2010)	9
(Sellén et al., 2010)	10
(Not and Hillaire-Marcel, 2010)	11
(Hanslik et al., 2010)	12
(Larsen et al., 2010)	13
(Hogan et al., 2010a)	14
(Hogan et al., 2010b)	15
(Stroeven et al., 2010)	16
(Aagaard-Sørensen et al., 2010)	17
(Strand and Immonen, 2010)	18
Articles not included on the map in Figure 1 (numerical modelling experiments and field studies comprising large spatial areas)	
(Astakhov and Nazarov, 2010)	
(Colleoni et al., 2010)	
(Cronin et al., 2010)	
(Dyck et al., 2010)	

December issue (25-26) of QSR. A brief summary highlighting some scientific results of the APEX QSR contributions is provided in this report, as well as a summary of the last APEX Conference and Workshop held jointly with the MOCA (Meltwater routing and Ocean-Cryosphere-Atmosphere response) project in Höfn, Hornafjördur, Southeast Iceland, 26th-30th of May 2010.

APEX Special Issue of Quaternary Scientific Reviews, December 2010

Field activities from the entire circumpolar region form the base of the APEX program and several projects present their results in the 2010 special APEX issue of QSR **(Figure 1)**. APEX builds on the legacy from the two previous programs PONAM (Polar North Atlantic Margin: Late Cenozoic Evolution) and QUEEN (Quaternary Environments of the Eurasian North), which, with their fieldwork located mainly in northern Eurasia, Svalbard and Greenland, covered smaller regions of the Arctic than APEX.

PONAM concluded that while the eastern portion of the Greenland Ice Sheet has gone through relatively moderate changes in size between stadials and interstadials, the Barents and Kara Ice Sheet across the Fram Strait nearly completely disintegrated during interstadials in order to grow again to reach the shelf edge during stadials. This picture is now being further refined from recent field work in Greenland. Results presented in the APEX QSR issue suggest that the Greenland Ice Sheet may have expanded out to the shelf break during the Last Glacial Maximum (LGM) in some areas; one such area being outside of the Kangerlussuaq Trough at about 65°N in southeast Greenland **(Figure 1)**. However, most of the Greenland papers in the APEX QSR issue focus on the behaviour of the Greenland Ice Sheet since the LGM.

Several of the sea ice proxies published in the APEX QSR issue suggest, together with results from other recent studies, that the seasonal arctic sea ice cover was likely strongly reduced during periods of the early Holocene between approximately 9000 and 6000 years ago **(Figure 1)**. Some of these studies even indicate periods of ice free summers in the central Arctic Ocean. This paleo-information on the Arctic Ocean sea ice has been brought together from a broad range of proxies, i.e. parameters commonly measured in natural archives, for example ice cores or marine sediment cores, providing information on past environmental conditions.

The sea ice paleo-proxies used in the APEX QSR issue include mapped beach ridges indicating wave action and ice free conditions during summers along the northernmost coast of Greenland, assemblage and/or abundance of dinoflagellate cysts, ostracods and foraminifera as well as biomarkers from sea ice living diatoms studied in various marine records retrieved from the Canadian Arctic Archipelago and the central Arctic Ocean. These new results have important consequences for our understanding of the recent trend of declining sea ice, and call for further research on causal links between arctic climate and sea ice.

QUEEN included an effort to reconstruct maps of maximum ice sheet extents over Eurasia for the Late Saalian (>140 ka), the Early Weichselian (100–80 ka), the Middle Weichselian (60–50 ka) and the Late Weichselian (25–15 ka) glacial maxima **(Figure 1)**. A similar effort of synthesizing all field work into maps of past ice sheet extents was not carried out during PONAM. Within APEX there are numerous marine activities including geophysical mapping and geological coring which begin to complement our view from QUEEN and PONAM on the Late Quaternary ice sheets' marine extensions. For example, swath bathymetric images from the Yermak Plateau north of Svalbard, the Morris Jesup Rise north of Greenland and the Lomonosov Ridge in the central Arctic Ocean show evidence of extensive glacial erosion down to water depth of more than 1000 m below present sea level. These results once again bring our attention to the hypothesis developed by glaciologist John Hainsworth Mercer of a huge thick ice shelf covering large parts, if not all, of the central Arctic Ocean

Fourth International Conference and Workshop

Höfn is a small fishing village in southeast Iceland, known for its beautiful location with magnificent view towards the Vatnajökull ice cap and its outlet glaciers. During a two-day pre-meeting excursion, the participants experienced the dynamic glacial

FIGURE 1. A map and the summary figure showing a generalized view of variations in sea ice concentration over time are modified from the introductory article by Jakobsson et al. (2010a) in the APEX QSR special issue. The map shows the locations of the field based studies included in the APEX QSR issue. Numbers on the map refer to Table 1, which contains the references to the respective study.

and volcanic landscapes/environments of southern Iceland, including a visit to the active Eyjafjallajökull volcano. The meeting in Höfn was attended by 85 participants, representing about 30 different research groups and institutions from 10 different countries. There was a strong attendance by Russian scientists, with 14 participants representing five different universities and institutes.

The conference was hosted by the University of Iceland and held at the excellent conference centre of Nýheimar, at the Höfn-Hornafjörður research centre of the University of Iceland. The theme of the meeting was "Arctic paleoclimate proxies and chronologies", highlighted by about 80 presentations given during the meeting. The abstract volume can be downloaded from the APEX home page: **http://www.apex.geo.su.se/meetings/apex-2010.html**. The APEX Fourth International Conference and Workshop was generously supported by the University of Iceland, IASC, Bert Bolin Centre for Climate Research at Stockholm University, and the International Union for Quaternary Research (INQUA).

Fifth Conference and Workshop

At a meeting of the APEX Steering Committee in Iceland it was decided to accept an offer by the University Centre in Svalbard (UNIS) to host the Fifth International Conference and Workshop, to be held in early June 2011. The theme for the meeting will be: "Late Quaternary Extreme Events", with the ambition of evaluating the achievements of APEX over the past four years by compiling state-of-the-art overviews of the APEX research fields. An organizing committee for the conference, headed by Riko Noormets (**riko.noormets@unis.no**) and Maria Jensen (**maria.jensen@unis.no**), will shortly present a preliminary meeting schedule and open up for registrations at the APEX web page (**http://www.apex.geo.su.se/index.php**).

References

Aagaard-Sørensen, S., Husum, K., Hald, M., and Knies, J., 2010, Paleoceanographic development in the SW Barents Sea during the Late Weichselian - Early Holocene transition: Quaternary Science Reviews, v. 29, p. 3442-3456.

Astakhov, V., and Nazarov, D., 2010, Correlation of Upper Pleistocene sediments in northern West Siberia: Quaternary Science Reviews, v. 29, p. 3615-3629.

Belt, S.T., Vare, L.L., Massé, G., Manners, H.R., Price, J.C., MacLachlan, S.E., Andrews, J.T., and Schmidt, S., 2010, Striking similarities in temporal changes to spring sea ice occurrence across the central Canadian Arctic Archipelago over the last 7,000 years: Quaternary Science Reviews, v. 29, p. 3489-3504.

Colleoni, F., Krinner, G., and Jakobsson, M., 2010, The role of an Arctic ice shelf in the climate of the last glacial maximum of MIS 6 (140 ka): Quaternary Science Reviews, v. 29, p. 3590-3597.

Cronin, T.M., Gemery, L., Briggs Jr, W.M., Jakobsson, M., Polyak, L., and Brouwers, E.M., 2010, Quaternary Sea-ice history in the Arctic Ocean based on a new Ostracode sea-ice proxy: Quaternary Science Reviews, v. 29, p. 3415-3429.

Dowdeswell, J.A., Evans, J., and Cofaigh, C.Ó., 2010a, Submarine landforms and shallow acoustic stratigraphy of a 400 km-long fjord-shelf-slope transect, Kangerlussuaq margin, East Greenland: Quaternary Science Reviews, v. 29, p. 3359-3369.

Dowdeswell, J.A., Jakobsson, M., Hogan, K.A., O'Regan, M., Antony, D., Backman, J., Darby, D., Eriksson, B., Evans, D.J.A., Hell, B., Janzen, T., Löwemark, L., Marcussen, C., Noormets, R., Ó Cofaig, C., Polyak, L., Sellén, E., and Sölvsten, M., 2010b, High-resolution geophysical observations from the Yermak Plateau and northern Svalbard margin: implications for ice-sheet grounding and deep-keeled icebergs: Quaternary Science Reviews, v. 29, p. 3518-3531.

Dyck, S., Tremblay, L.B., and de Vernal, A., 2010, Arctic sea-ice cover from the early Holocene: the role of atmospheric circulation patterns: Quaternary Science Reviews, v. 29, p. 3457-3467.

Hall, B.L., Baroni, C., and Denton, G.H., 2010, Relative sea-level changes, Schuchert Dal, East Greenland, with implications for ice extent in late-glacial and Holocene times: Quaternary Science Reviews, v. 29, p. 3370-3378.

Hanslik, D., Jakobsson, M., Backman, J., Björck, S., Sellén, E., O'Regan, M., Fornaciari, E., and Skog, G., 2010, Quaternary Arctic Ocean sea ice variations and radiocarbon reservoir age corrections: Quaternary Science Reviews, v. 29, p. 3430-3441.

Hogan, K.A., Dowdeswell, J.A., Noormets, R., Evans, J., and Cofaigh, C.Ó., 2010a, Evidence for full-glacial flow and retreat of the Late Weichselian Ice Sheet from the waters around Kong Karls Land, eastern Svalbard: Quaternary Science Reviews, v. 29, p. 3563-3582.

Hogan, K.A., Dowdeswell, J.A., Noormets, R., Evans, J., Ó Cofaigh, C., and Jakobsson, M., 2010b, Submarine landforms and ice-sheet flow in the Kvitøya Trough, northwestern Barents Sea Quaternary Science Reviews, v. 29, p. 3545-3562.

Jakobsson, M., Long, A., Ingólfsson, Ó., Kjær, K.H., and Spielhagen, R.F., 2010a, New insights on Arctic Quaternary climate variability from palaeo-records and numerical modelling: Quaternary Science Reviews, v. 29, p. 3349-3358.

Jakobsson, M., Nilsson, J., O'Regan, M., Backman, J., Löwemark, L., Dowdeswell, J.A., Mayer, L., Polyak, L., Colleoni, F., Anderson, L., Björk, G., Darby, D., Eriksson, B., Hanslik, D., Hell, B., Marcussen, C., Sellén, E., and Wallin, Å., 2010b, An Arctic Ocean ice shelf during MIS 6 constrained by new geophysical and geological data: Quaternary Science Reviews, v. 29, p. 3505-3517.

Larsen, N.K., Kjær, K.H., Funder, S., Möller, P., van der Meer, J.J., Schomacker, A., Linge, H., and Darby, D., 2010, Late Quaternary glaciation history of northernmost Greenland – Evidence of shelf-based ice: Quaternary Science Reviews, v. 29, p. 3399-3414.

Ledu, D., Rochon, A., de Vernal, A., and St-Onge, G., 2010, Holocene paleoceanography of the northwest passage, Canadian Arctic Archipelago: Quaternary Science Reviews, v. 29, p. 3468-3488.

Möller, P., Larsen, N.K., Kjær, K.H., Funder, S., Schomacker, A., Linge, H., and Fabel, D., 2010, Early to middle Holocene valley glaciations on northernmost Greenland: Quaternary Science Reviews, v. 29, p. 3379-3398.

Not, C., and Hillaire-Marcel, C., 2010, Time constraints from 230Th and 231Pa data in late Quaternary, low sedimentation rate sequences from the Arctic Ocean: an example from the northern Mendeleev Ridge: Quaternary Science Reviews, v. 26, p. 3665-3676.

O'Regan, M., Jakobsson, M., and Kirchner, N., 2010, Glacial geological implications of overconsolidated sediments on the Lomonosov Ridge and Yermak Plateau: Quaternary Science Reviews, v. 29, p. 3532-3544.

Schirrmeister, L., Grosse, G., Kunitsky, V.V., Fuchs, M.C., Krbetschek, M., Andreev, A.A., Herzschuh, U., Babyi, O., Siegert, C., Meyer, H., Derevyagin, A.Y., and Wetterich, S., 2010, The mystery of Bunge Land (New Siberian Archipelago): implications for its formation based on palaeoenvironmental records, geomorphology, and remote sensing: Quaternary Science Reviews, v. 29, p. 3598-3614.

Sellén, E., O'Regan, M., and Jakobsson, M., 2010, Spatial and temporal Arctic Ocean depositional regimes: a key to the evolution of ice drift and current patterns: Quaternary Science Reviews, v. 29, p. 3644-3664.

Strand, K., and Immonen, N., 2010, Dynamics of the Barents-Kara Ice Sheet as revealed by quartz sand grain microtextures of the Late Pleistocene Arctic Ocean sediments: Quaternary Science Reviews, v. 29, p. 3583-3589.

Stroeven, A.P., Fabel, D., Codilean, A.T., Kleman, J., Clague, J.J., Miguens-Rodriguez, M., and Xu, S., 2010, Investigating the glacial history of the northern sector of the Cordilleran Ice Sheet with cosmogenic 10Be concentrations in quartz: Quaternary Science Reviews, v. 29, p. 3630-3643.

Svendsen, J.I., Alexanderson, H., Astakhov, V.I., Demidov, I., Dowdeswell, J.A., Henriksen, M., Hjort, C., Houmark-Nielsen, M., Hubberten, H.W., Ingólfson, O., Jakobsson, M., Kjær, K., Larsen, E., Lokrantz, H., Lunkka, J.P., Lyså, A., Mangerud, J., Maslenikova, O., Matioushkov, A., Murray, A., Möller, P., Niessen, F., Saarnisto, M., Siegert, C., Stein, R., Siegert, M.J., and Spielhagen, R., 2004, Late Quaternary ice sheet history of northern Eurasia: Quaternary Science Reviews, v. 23, p. 1229-1271.

Contact information

Project/Network Leaders

Chairman | Martin Jakobsson
Dep. of Geology and Geochemistry
Stockholm University
Sweden
Tel.(+46)-8-164719
E-mail: martin.jakobsson@geo.su.se

www.apex.geo.su.se

PHOTO: MARTIN JAKOBSSON
The magnificent Skaftafellsjökull close to Höfn, Iceland.

Polar Archeology Network (PAN)

The Polar Archaeology Network (PAN) is an international network based on voluntary efforts of a steering committee and different working groups. Institutions, organizations, individual researchers, and students dealing with arctic and Antarctic archaeology and early history are encouraged to participate.

The Polar Archaeology Network organized a first workshop on "Global Climate Change and the Polar Archaeological Record," in February 2011 at the Institute of Archaeology and Social Anthropology, University of Tromsø, Norway. This workshop was supported by IASC and had purpose to begin formulating a coordinated, international approach for responding to and alleviating the detrimental effects of global climate change on the polar archaeological record.

Among the covered topics were the means by which to identify and evaluate present and future risk to archaeological sites, especially those with excellent preservation of organic materials necessary for advancing arctic change research; and the development of programs for sampling well preserved organic material for future use (joint proxies), including facilities that may need to be developed for their (eternal) storage. Given the threats to the arctic terrestrial environment, this is an urgent priority. The possibility of loosing key-elements of the human and environmental heritage of the Arctic is very real and it is of significant cultural, political, and scientific concern.

The workshop was designed to be interdisciplinary, drawing on expertise from within the archaeological, cryospheric, hydrologic, coastal geomorphological and predictive modeling communities. It included the participation of young scientists. The workshop was organized around 4 themes designed to reveal the scope of relevant problems, better define these problems, and point the way to state-of-the-art approaches to solving them. The thematic areas for discussion were:

1. Identification and evaluation of present and future risks to arctic archaeological sites, including most threatened locations.
2. Documentation of the effects of global climate change, including monitoring programs.
3. Cross-PAN GIS and predictive modeling for identification of future threatened areas.
4. Operational programs and plans for site preservation, data rescue, and data archive, and their implementation.

Results of the workshop will be published in a report for the scientific community and for interested stakeholder groups. It is hoped that this workshop will form the foundation for an integrated, collaborative research program that will contribute to building and maintaining an international circumpolar archaeological observing network, to better integration of diverse data streams into archaeological research, and to the merging of relevant archaeological data and archaeological approaches into larger arctic change research programs.

Contact information

Project/Network Leaders

Chairman | Hans Peter Blankholm
Institute of Archaeology
E-mail: Hanspb@sv.uit.no
University of Tromsø
Norway

Deputy Chair | Maribeth Murray
Dept. of Anthropology
E-mail: Ffmsm@uaf.edu
University of Alaska-Fairbanks
USA

http://polararchaeologynetwork.blogg.no

Circum-Arctic Lithosphere Evolution (CALE)

A new network that is co-sponsored by IASC as of 2010 is the Circum-Arctic Lithosphere Evolution (CALE). CALE is a multinational and multi-disciplinary research program investigating the most important questions currently associated with understanding circumarctic lithosphere evolution. CALE identifies seven regions where these questions can best be addressed. CALE's regional teams include senior and junior geophysicists and geologists, with on-shore and off-shore expertise. Combining geological and geophysical data across each swath within CALE allows the Network to integrate its knowledge of on-shore geology with the off-shore (shelf and basin) environment.

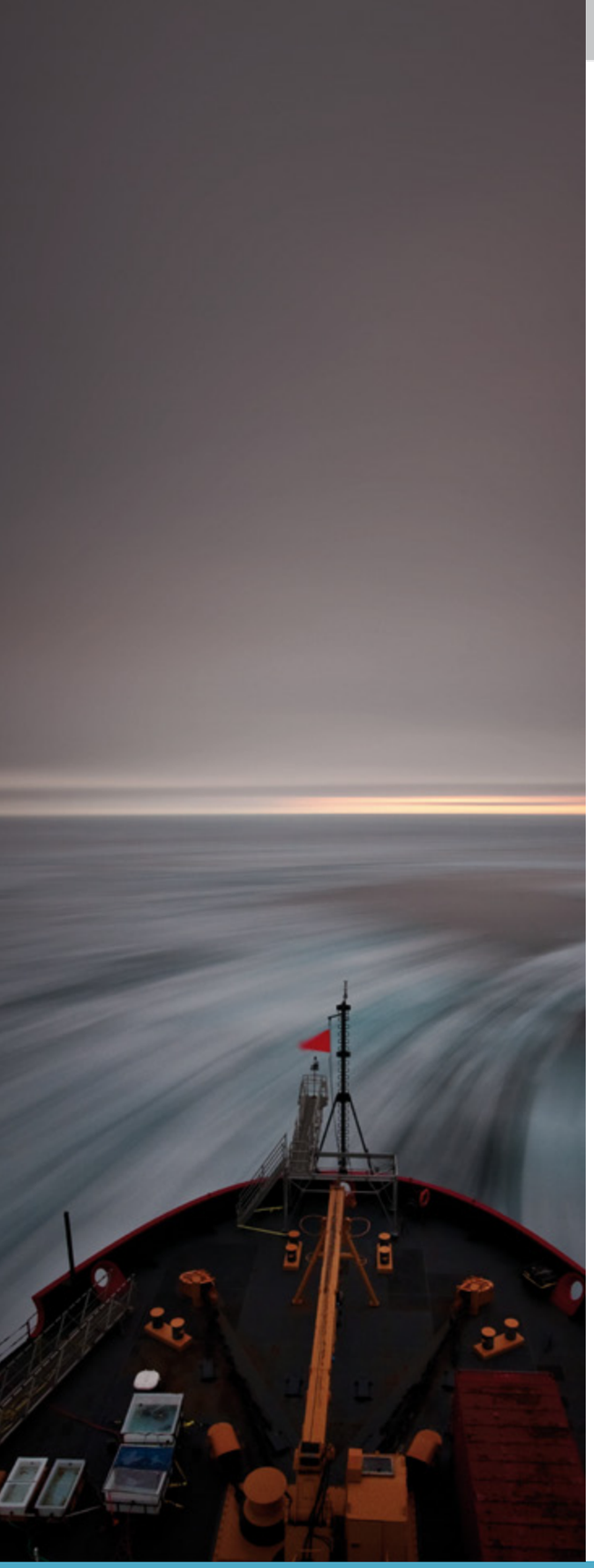
In some regions data from both the marine and land environments already exist and need only to be (re) interpreted and integrated; in other regions additional data needs to be collected. Thus CALE teams will begin at varying levels of maturity and have unique perspectives for their own development. Each team, organized by the team co-leaders, will work independently on a day-to-day basis and will have internal annual meetings. In addition, all teams will join together for annual CALE Network project meetings in order to share regional results, address larger-scale issues, and to develop an integrated synthesis for the tectonic development of circumarctic lithosphere.

Understanding the tectonic evolution of Arctic lithosphere encompasses the following themes of global relevance:

1. Circum-Arctic continental dynamics and deep processes

Tectonic activity created the arctic basins and modified their internal structure and architecture over time. Tectonic motion between crustal blocks has influenced the physiography of the polar basins. With drilling on Lomonosov Ridge (Shipboard Scientific Party, 2005) there is now an observational record spanning large parts of the Cenozoic history of the Eurasia Basin. A pronounced hiatus provided a lot of freedom to describe the transition from a warm to a cold Arctic Ocean. However, far less is known about the oldest

PHOTO: GEORG SCHWAMBORN
Summer surface drainage in the coastal lowland permafrost west of the Mackenzie Delta, Northwest Territories, Canada.



arctic basin, the Amerasian Basin, partly due to lack of recognized plate boundaries. These boundaries must exist and their locations are critical to explain the basin history. CALE seeks to identify these structures in order to reconstruct the development of the basin, substantially improving how the geological history of the surrounding continents is understood.

2. Circum-Arctic continental lithosphere

The sedimentary basins of the circumarctic land areas and continental shelves are important for understanding crustal rheology, for inferring basin modeling parameters, and for testing hypotheses for the evolution of arctic lithosphere. It is also necessary to understand the structure and composition of the basement beneath these mostly late Paleozoic and younger basins, and to understand their relationships to the deeper ocean basins. This is directly relevant to a number of key contemporary issues related to continental mantle lithosphere including: **a)** compositional and structural heterogeneity, its nature and origin; **b)** mechanical anisotropy, its nature and origin; **c)** the role of tectonic processes in the formation of modern topography of continents; and **d)** the long-term mechanical strength of continental lithospheric mantle (mantle rheology) and its sustainability through geologically long periods of time. CALE, in combining **i)** bathymetry, potential field data, seismic reflection data, and cores with **ii)** geologic mapping and field studies to understand the sedimentary, structural, thermal, and magmatic histories, will provide an integrated record of the tectonic evolution of arctic continental lithosphere.

3. Arctic Ocean lithosphere.

Mapping the deep Arctic Ocean basins, collecting multi-channel seismic reflection data, and sampling the sedimentary record by drilling are the primary means to determine the strength, evolution, deformation and response to surface processes, etc., of Arctic Ocean lithosphere. Several geophysical expeditions have been successfully conducted over the last decades. The resulting data provide a first insight into sediment distribution and the tectonic evolution of the Arctic Ocean's basins and ridges, but continued acquisition of these data is necessary to realize a unifying tectonic model. For example, over 1000 sediment cores have been raised from the deep basin, but only a few are longer than 10 m (Kristoffersen and Mikkelsen, 2004) and few have sampled 'basement'. CALE seeks to initiate new geological and geophysical data acquisition campaigns in order to make the necessary advances required for understanding the tectonic development of the Amerasian Basin.

4. Geoscience of global change

All observations indicate that a complex suite of interrelated atmospheric, oceanic, and terrestrial changes are now underway in the Arctic, affecting every part of the polar environment. Understanding and quantifying these changes is complicated by sparse oceanographic and geophysical data from the circumarctic region. While numerous consortia exist to address the effects of global warming on the arctic region (e.g., APEX), without oceanographic and geophysical data it is not possible to understand contemporary processes, or to predict future change and the consequences of change. A full understanding of climate change requires an integrated and comprehensive geological and geophysical study of seafloor and northern continents. CALE emphasizes understanding the tectonic development of the basins, ridges, plateau, and shelves of the Arctic Ocean and its seas, which influenced and controlled ocean circulation in the past.

Contact Information

Project/Network Leaders

Project leader | Victoria Pease
Dept. Geology and Geochemistry
Stockholm University
E-mail: Vicky.pease@geo.su.se

www.cale.geo.su.se

PHOTO: LUKE TRUSSEL
The USCGC Healy approaches an opening in the sea ice in the Chukchi Sea. During this first NASA Arctic research expedition, ICESCAPE 2010, oceanographic measurements were taken, sampling the biogeochemistry and optical properties of the Arctic Ocean.

IASC Sponsored Workshops 2010

Annual Workshop of the IASC Network on Arctic Glaciology Obergurgl, Austria, March 2010	Travel Support	www.iasc-nag.org/activities.html
Circumpolar Vegetation Mapping Workshop Toronto, Canada, May 2010	Travel Support	http://arcticportal.org/en/projects/cbvm
Fourth International APEX Conference and Workshop Höfn, Iceland, May 2010	Travel Support	www.apex.geo.su.se/meetings/apex-2010.html
Summer School on Glaciology Fairbanks, USA, June 2010	Travel Support	www2.gi.alaska.edu/snowice/glaciers/events/summer_school/
The Future of Arctic Humanities and Social Science Research Oslo, Norway, June 2010	Travel Support	
Arctic Social Indicators Workshop Roskilde, Denmark, June 2010	Travel Support	www.svs.is/asi/asi.htm
Snow, Water, Ice and Permafrost in the Arctic Workshop Potsdam, Germany, January 2010	Workshop Logistics	www.amap.no/swipa/
Sustaining Arctic Observing Networks Workshop Miami, USA, March 2010	Workshop Logistics	www.arcticobserving.org
integrated Arctic Ocean Observing System Workshop Woods Hole, USA, October 2010	Travel Support	http://aosb.arcticportal.org/programs.html
Arctic in Rapid Transition Workshop Winnipeg, Canada, October 2010	Travel Support	http://aosb.arcticportal.org/art.html

* All IASC supported workshops must include the participation of early career scientists. More detailed information on IASC support for scientists in the early stages of their careers can be found in chapter 5. Early Career Development, Education & Outreach.

PHOTO: ANDREW SOLE
Ice sheet meltwater emerging from beneath Leverett Glacier thunders down a waterfall near Kangerlussuaq, West Greenland.

4. Relationship to other Organizations

» 4 Relationship to other Organizations

IASC has worked towards strengthening its relationship with other polar and global organization through the years. The goal is to develop and stimulate shared initiatives that are of high priority for the broader arctic research community. Different organizations are strong recurring partners in promoting arctic and bi-polar science. For the IASC Bulletin some of these organizations were asked to highlight past, present and current activities. Organizations highlighted in this chapter include: the International Arctic Social Sciences Association (IASSA), the World Climate Research Programme (WCRP) and the Scientific Committee on Antarctic Research (SCAR).

International Arctic Social Sciences Association (IASSA)

Written by: Joan Nymand Larsen
President, International Arctic Social Sciences Association

AHDR-II: Regional Processes and Global Linkages (2011-2014)

The work on the second volume of the Arctic Human Development Report (AHDR) is in the early start-up phase. This second volume – scheduled for completion in 2014 – will present a new cross-cutting theme on global change impacts including climate change, regional processes and global linkages.

The purpose of the AHDR-II project – "Arctic Human Development Report II: Regional Processes and Global Linkages" – is to move the study of human development in the Arctic beyond the AHDR baseline, to provide the second assessment and synthesis report on the state of human development in the Arctic, and to contribute to our increased knowledge and understanding of the consequences and interplay of physical and social global change processes for human living conditions and adaptability in the Arctic.

The work of organizing and preparing the AHDR-II report will be carried out by an international and circumpolar steering group of leading researchers in the field, including participants from the indigenous community, and supported by an executive and advisory committee. The project will be led by two project leaders: Joan Nymand Larsen and Gail Fondahl.

Participants in the project will include representation from a broad range of disciplines. Representation on the project committees is expected to include, among others, representation from IASSA, IASC, and the Sustainable Development Working Group (SDWG). Iceland has the role of lead country, with the secretariat to be located at the Stefansson Arctic Institute (SAI).

The AHDR-II will seek to provide a comprehensive overview of human development in the Arctic in a time of rapid global change processes; provide an instrument that can be used in assessing progress toward sustainable human development; a tool to educate the public and provide valuable material for educational instruction in the University of the Arctic (UArctic), northern universities and colleges; be a handbook for policy makers engaged in international cooperation in the Arctic; and provide a circumpolar assessment of human development and quality of life in the Arctic which the Arctic Council can use to assist in identifying major issues relating to sustainable human development in the Arctic, and in providing a basis for the development of policies and actions to address these issues. As in the case of the first AHDR, the AHDR-II project will seek the endorsement of the Arctic Council – to be completed under the auspices of the SDWG.

A profile of the arctic region

The first AHDR was completed and launched in November 2004. The AHDR presented the first baseline report of the state of human development in the Arctic. It presented a broad overview of the state of human development or social well-being in the circumpolar Arctic as of the early years of the 21st century. It was unique in the sense that it treats the Arctic as a single, integrated region, despite the fact that this region encompasses lands and marine areas under the jurisdiction of eight states as well as marine areas that extend beyond the jurisdiction of any individual state. The result was a profile of the Arctic as a distinct region that makes it possible to compare and contrast the Arctic and other regions in terms of a host of factors ranging from demographic conditions through cultural, economic, political, and legal systems and on to matters of education, human health, and gender.

The report described the unprecedented combination of rapid and stressful changes confronting arctic societies today including environmental processes, cultural developments, economic changes, industrial developments and political changes. It also called for the development of indicators to track and monitor these changes, and to help facilitate the evaluation

PHOTO: RICHARD WALLER
A small heard of caribou wanders through the oil extraction infrastructure in Deadhorse, Prudhoe Bay, Alaska.

and assessment of the impact of change, including helping facilitate the setting of priorities by policy makers and the Arctic Council. In response to this recommendation, the Arctic Social Indicators (ASI 2006-2009) project was launched, and since then also ASI-II (2009-2011). Both projects address critical gaps in knowledge identified in the AHDR (2004) on indicator development and human development monitoring.

Monitoring the quality of life

The ASI-II (Arctic Social Indicators Implementation) project (2009-2011) is still ongoing. Guided by the AHDR results, the first phase of ASI identified a set of arctic-specific indicators to monitor arctic human development and quality of life in the Arctic. The next step, which constitutes the ASI-II Implementation project, aims to implement the identified indicators, through testing, validating and refining the indicators across the Arctic, and then measuring and performing analyses of select cases, with the ultimate goal of moving toward to adoption by arctic governments and the Arctic Council of the indicators for the purpose of long-term monitoring of human development.

The focus on indicators and monitoring contributes to our increased knowledge and understanding of the consequences of global change for human living conditions in the Arctic.

The development and periodic updating of the Arctic Human Development Report serves a number of related purposes, and these can be summarized as follows: to provide an update to the comprehensive baseline in terms of which to evaluate trends that affect sustainable human development among residents of the circumpolar world over time; to make it possible to better compare and contrast cultural, economic, political, and social conditions throughout the Arctic with similar conditions in other parts of the eight arctic countries and in the world at large, between 2004 and 2014; to facilitate comparisons across the Arctic regarding key elements of sustainable human development and, in the process, make it possible to identify innovative policies and institutions in specific areas that might offer lessons applicable to other parts of the Arctic; to provide a circumpolar assessment of human development and quality of life in the Arctic that the SDWG can use to identify priorities and to evaluate the relevance of proposals for projects submitted to it for endorsement; to assist the Arctic Council in identifying major issues relating to sustainable human development in the Arctic and in providing a basis for the development of policies and actions to address these issues; to develop further the results achieved during IPY with the goal to improve living conditions in the North and quality of life based on long-term monitoring and periodic assessments; and to contribute to our increased knowledge and understanding of the consequences and interplay of physical and social global change processes for human living conditions and adaptability in the Arctic.

Among new topics – since the first AHDR - to be covered in more depth and integrated into the broader assessment of human development and quality of life are: Globalization and the Arctic; Climate Change in the Arctic; Migration and Urbanization in the Arctic; Language Change and Revitalization; and Issues of Inequality. Other preliminary topics and chapters (to be further discussed and confirmed at first discussion of AHDR-II steering group) include: Arctic Demography; Arctic Societies and Cultures; Economic Systems; Political Systems; Legal Systems; Environments and Resource Governance in the Arctic, Community Viability, Human Health and Well-being, Education, Gender Issues, Circumpolar International Relations and Geopolitics, Arctic Social Indicators in the Arctic

Contact information
Joan Nymand Larsen
Stefansson Arctic Institute, Iceland
E-mail: jnl@unak.is
Tel: (+354) 460 8984.

Gail Fondahl
University of Northern British Columbia, Canada

www.iassa.org

World Climate Research Programme (WCRP)

Written by: Vladimir Ryabinin
Senior Scientific Officer, World Climate Research Programme

The Third World Climate Conference (WCC-3, Geneva, Switzerland, 31 August – 4 September 2009) agreed to establish a Global Framework for Climate Services. The Statement, which was adopted by the Expert Segment of WCC-3, highlights the key role of scientific research and observations in developing the modern climate services. The WCRP Strategic Framework 2005-2015 "Coordinated Observation and Prediction of the Earth System" (COPES) aims the Programme at addressing fundamental aspects of climate knowledge and integrating the science achievements on several directions of highest practical value, such as seasonal and decadal prediction, sea-level variability and change, atmospheric chemistry and climate, extreme climate events, monsoons, polar issues, and anthropogenic climate change. These avenues for delivery of WCRP science results are key for the establishment of climate services. In 2009 WCRP published its Implementation Plan 2005-2015 and an Achievement Report for the first half of the COPES time frame. These publications are available online from the renovated WCRP website at **http://www.wcrp-climate.org**.

Predictions and projections of climate

The WCRP Project ***Stratospheric processes and their role in climate*** (SPARC) completed the second phase of its initiative "Climate – chemistry model validation" (CCMVal-2). It supplied coordinated projections of the

PHOTO: BRUCE FORBES
Nenets reindeer herders take a break to inspect a bird's nest on the tundra during their summer 2010 migration on the Yamal Peninsula, Russia.

atmospheric ozone to the 2010 WMO/UNEP scientific assessment of ozone depletion. The Southern Hemisphere stratospheric ozone is expected to recover around the middle of this century. The CCMVal-2 results have been stored and will be used to provide the ozone forcing data for another WCRP initiative, the ***Coupled Model Intercomparison, Phase 5*** (CMIP5). This set of experiments is already underway. It includes long-term multi-model predictions and projections of climate at decadal scale, centennial scale, and up to the year 2300. In the WCRP ***White Paper on the Rapid Loss of Arctic Sea Ice*** (Kattsov et al., 2010) a recommendation is made to use the CMIP5 output, which will be made openly available to the whole science community, and undertake a diagnostic project on the future of arctic sea-ice. The CMIP5 archive of model projections will constitute a key input to scientific analysis and subsequent publications, which will be reviewed in the Fifth Assessment report of the Intergovernmental Panel on Climate Change (IPCC).

The WCRP/IASC/SCAR Climate and Cryosphere (CliC) Project held the Sixth Session of its Scientific Steering Group (SSG) in Valdivia, Chile, in February 2010, following the successful Conference ***Ice and Climate Change: A View from the South*** (1-3 February 2010), which was co-sponsored by CliC and the International Glaciological Society. The session reviewed the progress of project activities and brainstormed on their future directions. Since the completion of the Arctic Climate System Study (ACSYS) at the end of 2003, the CliC Project:

- was successful in facilitating the explosive growth of the cryospheric research and observations;
- has completed the IGOS-Theme on Cryosphere that provides consensus-based guidance on the development of cryospheric observations;
- initiated and completed many important IPY projects, setting the stage for several significant IPY legacies; and
- initiated or was instrumental in establishing national, regional and global communities and activities in the cryospheric research.

Long-term objectives

Rapid developments in the WCRP, new requirements for climate science, such as the need to provide a foundation for the development of climate services, require that CliC moves ahead on several new directions. The Scientific Steering Group (SSG) meeting in Valdivia has agreed that the following major long-term objectives should be set for the project enabling:

- prediction of the arctic climate system;
- prediction of the Antarctic climate system and Southern Ocean;
- prediction of terrestrial cryosphere; and
- improved assessment of the past, current and future sea-level variability and change.

CliC will focus the project activities and will work with partners within and outside WCRP towards achieving these objectives, which are seen by the CliC community as key milestones in studying the predictability of the climate system and understanding the human effects on climate. The view of the CliC SSG was that it is on these directions that the input of CliC would be necessary and unique. The 31st Session of the WCRP Joint Scientific Committee (Antalya, Turkey, 15-19 February 2010) endorsed these objectives and called for phased approach to their implementation.

A range of shorter-term CliC activities that will contribute to the achievement of the long-term objectives has been reviewed and endorsed. They include all the five initiatives that the CliC SSG formulated at its Fifth SSG session in Geneva in December 2008, namely:

- Freshwater budget of the Arctic Ocean and Southern Ocean;
- Carbon and permafrost;
- Cryospheric input to sea level;
- Hemispheric differences in sea-ice; and
- Regional climate modelling as forcing cryospheric models.

In addition to the planned and ongoing activities, several new initiatives were formulated and endorsed, including:

- a review of passive microwave sea ice products and community-generated sea ice concentrations and ice extent products;
- extension of permafrost studies in continental shelf areas;
- improvement of sea-ice parameterization for the Arctic- and Southern- Ocean models; and
- support for the Arctic System Reanalysis.

CliC-affiliated scientists keep working on the SWIPA Assessment, which is nearing its completion.

Mobilizing the research community

WCRP does not fund scientific research. It provides a forum for discussion of needs and ideas, and by that, along with its outreach activities, it mobilizes the research community on achieving new results. High expectations are now connected with the progress in studies of polar regions. A recent WCRP Workshop ***Seasonal to multi-decadal predictability of polar climate*** (Bergen, Norway, 25-29 October 2010), which was supported by the Norwegian Research Council and Bjerknes Centre for climate research, reviewed the current state of knowledge of feedbacks and teleconnections that may be governing polar climate change and lead to predictable elements of the polar climate. The follow-on research in the Antarctic region and Southern Ocean will from now on encompass the whole system "stratosphere – troposphere – ice and ice shelves – ocean" and will be focused on explaining the reasons for observed trends and variability in the region.

In the Arctic, a coordinated attempt will be made to analyze the forthcoming CMIP5 projections, and it is quite possible that more detailed analysis will help to identify the reasons why the WCRP CMIP3 runs, used in the IPCC AR4, failed, as an ensemble, to reproduce the marked decline of the sea-ice extent in the early 21st century. In addition, the discussions made a solid input into the efforts of the community to develop a road map for Arctic Climate Prediction and design prediction experiments, data assimilation systems and models that will lead to eventual practical predictions of the arctic climate on seasonal, inter-annual, and decadal scale.

On 24-28 October 2011, WCRP is organizing a major Open Science Conference in Denver, USA. Between 1500 and 2000 attendees will take stock of all major achievements in climate science and will discuss ways of its future development. The Conference website is at http://conference2011.wcrp-climate.org

http://wcrp.wmo.int

PHOTO: ALLEN POPE
Inside an ice cave underneath the Mendenhall Glacier near Juneau, Alaska.

Scientific Committee on Antarctic Research (SCAR)

Written by: Mike Sparrow
Executive Director, and
Mahlon "Chuck" Kennicutt II
President, Scientific Committee
on Antarctic Research

The study of Antarctica and the Southern Ocean, and their role in the Earth system, has never been more important as the region experiences change that has global implications. The Antarctic is a "natural laboratory" for scientific research of importance in its own right and impossible to achieve elsewhere on the planet. The Scientific Committee on Antarctic Research (SCAR) strategic vision is for a world where the science of the Antarctic region benefits all, excellence in science is valued and scientific knowledge informs policy making. SCAR's mission is to be the leading non-governmental, international facilitator and advocate of research in and from the Antarctic region, to provide objective and authoritative scientific advice to the Antarctic Treaty and other bodies, and to bring emerging issues to the attention of policy makers.

In August 2010 SCAR held its Business Meetings, Open Science Conference and Delegates' Meeting in Buenos Aires, Argentina. The Open Science Conference attendance was over 800 and it was particularly gratifying to see a large number of students and early career researchers attending. Early career scientist attendance was facilitated by the generous financial support of Argentina and SCAR travel grants. SCAR and IASC jointly co-sponsor the Association of Early Career Scientists (APECS), a relationship that is highly beneficial to all three organisations. APECS members were actively involved in all aspects of the SCAR meetings and in the spirit of continued cooperation, the IASC Executive Secretary attended the SCAR Delegates' meeting.

Next generation of research programmes

During the SCAR meetings, the new Scientific Research Programme (SRP), Astronomy and Astrophysics in Antarctica (AAA) officially started. AAA will provide a focus for this growing scientific community within SCAR. Four Program Planning Groups were also approved with the aim of producing proposals for the next generation of SCAR SRPs:

- Solid Earth Responses and Influences on Cryospheric Evolution (SERCE), which will synthesize and interpret the extensive new data sets obtained during IPY by the international Polar Earth Observing Network (POLENET) geophysical sensor deployments. SERCE plans to promote communication and coordination with other international groups investigating polar ice mass change, glacial isostatic adjustment, and ice sheet contributions to global sea level rise;
- Antarctic Ecosystems: Adaptations, Thresholds and Resilience (AntETR), which will examine the current biological processes in Antarctic ecosystems, to define their tolerance limits and thereby determine resistance and resilience to change;
- State of the Antarctic Ecosystem (AntEco), which is designed to focus on patterns of biodiversity across terrestrial, limnological, glacial and marine environments within the Antarctic, sub-Antarctic and Southern Ocean regions and to provide the scientific knowledge on biodiversity that can be also used for conservation and management; and
- Past and Future Change of the Antarctic Environment (PACE) that would address important questions about the evolution of of how the Antarctic climate system will evolve over the next century in the light of our knowledge of past climate as determined from the in-situ data and paleoclimate record.

Antarctic Climate Change and the Environment

During 2010 SCAR continued to work on its commitment to produce annual updates of the Antarctic Climate Change and the Environment (ACCE, **http://www.scar.org/publications/occasionals/acce.html**) to be provided to the Antarctic Treaty Parties and other policy makers. The Ice Sheet Mass Balance and Sea Level: A Science Plan (ISMASS, **http://www.scar.org/publications/reports/Report_38.pdf**) was finalised. The ISMASS leadership will include an IASC representative to ensure that ISMASS is developed with a fully a bipolar perspective. As part of its commitment to the IPY legacy, SCAR in partnership with the Scientific Committee on Oceanic Research (SCOR), finalised the draft Southern Ocean Observing System Science and Implementation Plan (**http://www.scar.org/soos**). The final version of the SOOS plan will be published by the end of 2010. A SOOS Secretariat is also being established in Hobart, with financial support from Australia. Another major contribution to the IPY has been the Census of Antarctic Marine Life (CAML, **www.caml.aq**), which has identified more that 1000 new species, one quarter of which are common to the Arctic.

SCAR and IASC are recognized by the International Council for Science (ICSU) as the main source of information and guidance on polar issues, and are jointly representing ICSU on the organising committee of the 3rd International Polar Year (IPY) Conference. The Conference, will take place on the 22-27th of April 2012 in Montreal, Canada. Both SCAR and IASC also serve as ICSU's Observers at the IPCC to ensure that polar issues are fully considered.

SCAR promotes cooperation in research that is of interest to both the Antarctic and arctic scientific communities. Areas of current and future collaboration include studies related to the cryosphere and to the roles of the polar regions in the climate system. SCAR will continue to increase bipolar cooperation with IASC through the joint Bipolar Action Group (BiPAG) that is charged with identifying areas for scientific cooperation. SCAR and IASC are also jointly considering how best to preserve and build-on their stewardship responsibilities for the legacies of the IPY in observing systems, data and information management, and mentoring of students and early career scientists. Issues regarding the IPY legacies are being addressed as a joint activity of the SCAR/IASC Executive Committees.

www.scar.org.

PHOTO: LAURA MORSE
Ice floes in the Beaufort Sea.

PHOTO: ALLEN POPE
Windy slopes above Tellbreen, Svalbard. Researchers use this rugged area as an analogue for the harsh conditions in central Greenland.

5. Early Career Development, Education and Outreach

» 5 Early Career Development, Education and Outreach

Fostering a new generation of researchers

IASC recognizes that new and next generations of researchers will be faced with increasingly critical challenges due to the impacts of climate change on these regions and their global significance. The Committee therefore believes that it is of great importance to foster these young researchers and promotes and involves early career scientists working in the Arctic by:

- Striving for representation of early career researchers in the organization;
- Providing endorsement, support and dissemination of information on activities, projects and request for participation; and
- Providing travel grants to early career scientist for selected conferences.

With these instruments IASC aims to include more young researchers from the starting phase in the organization of workshops, science planning activities and research programs.

The biennial Science Symposia during the Arctic Science Summit Weeks (ASSWs) are successful examples of the inclusion of early career scientists in the development of a science program and compounding the different sessions in cooperation with more experienced researchers. Providing travel support for these and other selected conferences provides scientists in the early stages of their careers with a perfect opportunity to present their ideas and exchange information with an international and renowned group of arctic scientists; giving both parties a chance to learn from each other.

For the IPY Oslo Science Conference, IASC awarded over fifty travel stipends to early career scientists, enabling many to attend the largest IPY conference so far. But IASC also sponsors early career representation in smaller workshops and new network initiatives. Amongst the supported activities in 2009/2010 were an Arctic System Modeling Workshop and Arctic in Rapid Transition (ART) workshop, both held in Fairbanks, USA, an ART workshop in Winnipeg, Canada, a workshop on Circum-Boreal Vegetation Mapping in Helsinki, Finland, a workshop of the Network on Arctic Glaciology in Obergurgl, Austria, an Arctic Palaeoclimate and its Extremes workshop in Iceland, a workshop on Arctic Social Indicators in Roskilde, Denmark, a workshop on the Future of Arctic Humanities and Social Sciences in Oslo, Norway, a summer school in Fairbanks, USA, and an integrated Arctic Ocean Observing System (iAOOS) workshop in Woods Hole, USA.

Here are some of the experiences from sponsored attendees that show how travel support can make a difference.

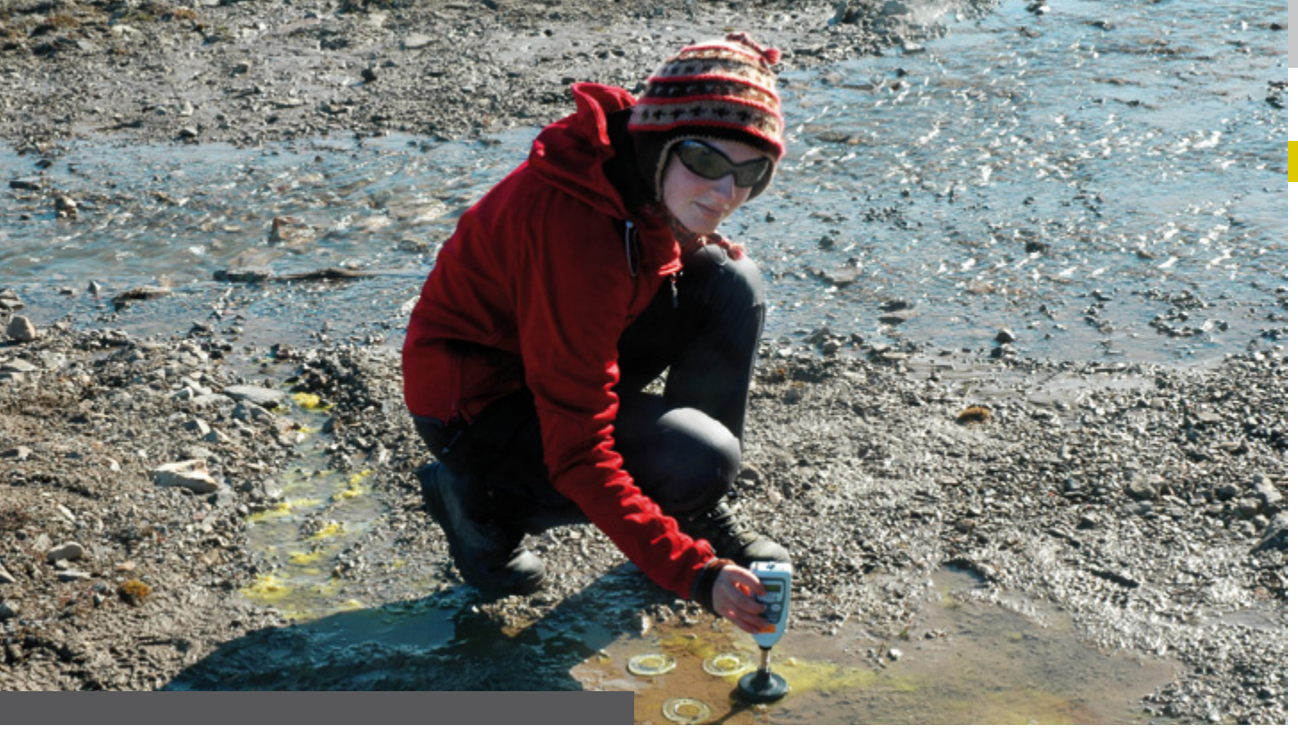
ART Workshop 2010, Alexandre Forest, University of Quebec

"As an early career scientist (post-doc), I have learned a lot by being involved in the Arctic in Rapid Transition (ART) Initiative since the Arctic Science Summit Week 2009 in Bergen. Over the last year, I have been deeply involved in the ART Science Plan Workshop in Fairbanks and in the writing of the ART Science Plan, two things that led naturally to the ART Implementation Workshop of Winnipeg. Indeed, the challenge of ART is now to apply the ART science questions and issues into an actual action plan and I feel truly privileged to participate in such an international scientific planning process over a long-term period, together with other early career scientists as well as with the ongoing support from a number of dedicated senior scientists. Such a 'real world' training is more than useful to my career, it is vital to my future as an active arctic researcher."

IPY Oslo Science Conference 2010, Matt Strzelecki, Durham University

"I'm more than sure that IPY OSC was one of the most important events in my scientific career. I will never forget the joyful atmosphere of "Polar Street", meetings and time for discussion with my scientific heroes, known only from papers and textbooks, chance to chair a session as well as brainstorms during APECS Council meeting and a bit of polar wilderness during evening parties.

PHOTO: ALLEN POPE
Students on the Juneau Icefield Research Program take a break as they traverse the Icefield, learning and conducting research along the way. They overlook the Lemon Creek Glacier, a benchmark glacier designated during the International Geophysical Year.



I'm also happy that I was able to motivate so many young researchers from Poland to get more engaged in shaping the future of polar research and see how they interact with foreign friends. Personally I tried to be everywhere and gain as much as possible."

Arctic Social Indicators II Workshop 2010, Natalia Loukacheva, University of Toronto and University of Akureyri

"I found that this workshop was very productive and useful for further collaboration and research between legal and other social sciences. I've learned a lot and hope that my engagement was helpful, at least I was told so by several project participants. I also came back with several ideas regarding prospects for further involvement and contribution to part II of the ASI report. I was able to communicate with several arctic researchers and gained valuable experience for my professional development and got unique opportunities for further cooperation with young scientists and well-known experts."

It is because of this range of opportunities – learning platforms stimulating the exchange of knowledge, cross fertilization and collaboration – that opens up by attending these meetings, that IASC strives to keep supporting early career scientists in the future.

2009

Meeting	Name	Insitution	Country
Arctic System Modeling Workshop Montreal, July 2009	A. Slater	University of Alaska	USA
	N. Steiner	University of Alaska	USA
ART Workshop Fairbanks, November 2009	I. Ellingsen	SINTEF Fisheries and Aquaculture	Norway
	A. Forest	University of Quebec	Canada
	S. Hendricks	Alfed Wegener Institute for Polar and Marine Research, Bremerhaven	Germany
	T. Klagge	IFM-Geomar	Germany

2010

Meeting	Name	Insitution	Country
NAG Workshop Obergurgl, March 2010	A. Adamek	Warsaw University of Technology	Poland
	A. Banwell	University of Cambridge, Scott Polar Research Institute	UK
	I. Bartholomew	Edinburgh University	UK
	B. Danielson	University of Alberta	Canada
	D. Ignatiuk	University of Silesia, Faculty of Earth Sciences	Poland
	B. Luks	Institute of Geophysics Polish Academy of Sciences	Poland
	F. Wyatt	University of Alberta	Canada
	W. van Wychen	University of Ottawa	Canada

PHOTO: JOSEF ELSTER
A young researcher is taking field measurements to study the ecology and ecophysiology of cyanobacteria and algae in polar ecosystems.

2010

Meeting	Name	Insitution	Country
Circum-Boreal Vegeation Mapping Workshop Helsinki, March 2010	M. Raynolds	University of Alaska, Alaska Geobotany Center ,Inst. of Arctic Biology	USA
APEX Workshop | Iceland, May 2010	O. Kokin	Murmansk Biological Institute, Moscow State Univerity	Russia
	D. Nazarov	St. Petersburg University	Russia
	E. Bazhenova	Alfed Wegener Institute for Polar and Marine Research, Bremerhaven	Russia
	I. Litvinenko	VNIIOkeangeologiya, St. Petersburg University	Russia
IPY Oslo Conference | Oslo, June 2010	A. Aubert	University of Tromso	Norway
	R. Bertelsen	United Nations University, Institute of Advanced Studies	Japan
	D. Avango	University of Groningen, Arctic Centre	Neth./Sweden
	M. Björkman	Norsk Polarinstitutt	Norway
	S. Blangly	Montpellier III University	France
	S. Bokhorst	University of Sheffield	UK/Netherl.
	H. Borlase	University of Akureyri	Iceland/Finl.
	A. Buchwal	Adam Mickiewicz University	Poland
	N. Couture	Geological Survey of Canada - Natural Resources Canada	Canada
	S. Fietz	Inst. de Ciència i Tecnologia Ambientals, Univ. Autonoma de Barcelona	Spain
	L. Filippusdóttir	Teikn á lofti / Teikn design, Landslagsarkitekt FÍLA	Iceland
	J. Fisher	Harvard University	USA
	M. Fritz	Alfed Wegener Institute for Polar and Marine Research, Potsdam	Germany
	G. Fugmann	Justus Liebig University Gießen	Germany
	A. Gaden	University of Manitoba	Canada
	H. de Haas	Arctic Centre, University of Gronigen	Netherlands
	M. Hallinger	University of Greifswald	Germany
	S. Harper	University of Guelph	Canada
	M. Heikkilä	University of Helsinki, University of Waterloo	Finland
	D. Henri	University of Oxford	UK
	T. Iida	National Institute of Polar Research	Japan
	M. Jiminez	University Centre in Svalbard	Norway
	K. Jochum	University of Alaska Anchorage , University of Fairbanks	USA
	U. Jonsell	ETSI de Telecomunicación, Universidad Politécnica de Madrid	Spain
	A. Kaczmarska	National Oceanography Centre	UK
	M. Kalentchenko	Modern University of Humanties	Russia
	J. Karlsson	Stockholm University	Sweden
	J. Kinney	US Naval Postgraduate School	USA
	J. Kleinteich	University of Konstanz	Germany
	M. Klunder	Royal NIOZ	Netherlands
	N. Lappalainen	Univeristy of Oulu	Finland
	C. Larose	Laboratoire Ampere, Ecole Centrale de Lyon	France
	M. Long	School of Public Health, University of Aarhus	Denmark
	M. Makhotin	Arctic and Antarctic Research Institute	Russia
	C. Malagón	IDAEA-CSIC	Spain
	J. Malecki	Adam Mickiewicz University	Poland
	M. Maslowska	Jagiellonian University, Institute of Botany	Poland
	I. May	Ludwig-Maximilians University of Munich	Germany
	T. Opel	Alfed Wegener Institute for Polar and Marine Research, Potsdam	Germany
	A. Pope	Scott Polar Research Institute, University of Cambridge	UK
	P. Pulsifer	University of Colorado	Canada
	B. Quennehen	Laboratoire de Météorologie Physique	France
	H. Reay	University of London	UK
	J. Rhemann	University of Akureyri	Iceland/USA
	T. Sachs	GFZ German Research Centre for Geosciences	Germany
	M. Strzelecki	Durham University & UK Faculty of Geosciences, AMU Poznan	Poland/UK
	H. Swanson	University of Alberta, University of New Brunswick	Canada
	I. Myers-Smith	University of Alberta	Canada
	A. Taylor	Stockholm University	Sweden
	N. Tilinina	P.P. Shirshov Institute of Oceanology RAS	Russia
	K. Timm	Arctic Research Consortium of the US	USA
	A. Tomczyk	Adam Mickiewicz University	Poland
	J. Soreide	The University of Svalbard, Department of Arctic Biology	Norway
	J. Vonk	Stockholm University	Sweden
ASI Workshop | Roskilde, June 2010	N. Loukacheva	University of Toronto	Canada
	A. Petrov	University of Northern Iowa	USA
	T. Terpstra	Arctic Centre, University of Gronigen	Netherlands
Future of Arctic Humanities and Social Sciences | Oslo, June 2010	K. Kondracka	Institute of Art of the Polish Academy of Science	Poland
Summer School | Fairbanks, June 2010	G. Babonis	SUNY at Buffalo	USA
	R. Becker	University of Wisconsin-Madison	USA
	A. Campbell	University of Washington	USA
	M. Kunz	Newcastle University	UK
	S. Marchenko	Moscow State University	Russia
	G. Peterson	Stockholm University	Sweden
ART Workshop | Winnipeg, October 2010	M. O'Regan	Cardiff University	UK
	A. Forest	University of Quebec, Inst. Nat. de la Recherche Scientifique	Canada
iAOOS Workshop | Woods Hole, October 2010	A. Jahn	National Center for Atmospheric Research	USA
ISAR-2 | Tokyo, December 2010	Y. Kim	Korea Polar Research Institute	Korea
	D. Alexeev	Russian State Hydrometeorological University	Russia

FIGURE: Overview of IASC sponsored early career scientists between July 2009 and December 2010

Association of Polar Early Career Scientists (APECS)

Written by: Allen Pope, APECS President, and Jenny Baeseman, APECS Director

The Association of Polar Early Career Scientists (APECS) has been recognized as one of the major legacies of the International Polar Year 2007-2009. As an international and interdisciplinary organization for early career scientists with interests in Polar Regions and the wider cryosphere, APECS was founded and flourished as part of the IPY. In concluding this unprecedented international collaborative scientific effort, APECS joined IASC and the Scientific Committee on Antarctic Research (SCAR) to share what the three organizations together would do to carry forward the IPY legacy. During the IPY closing ceremony at the IPY Oslo Science Conference in June 2010 — which was moderated by the APECS president — WMO and ICSU, the main sponsors of IPY, handed over the IPY flag to APECS as a symbol that the next generation of researchers must take responsibility for continuing the momentum of IPY and polar research.

APECS had a very busy 2010, the largest events being held in conjunction with the IPY Oslo Science Conference. Over 550 early career researchers attended the conference and participated in many activities and leadership roles. APECS coordinated the Oslo Stipend program, which supported accommodation and reduced registration fees for over 400 young researchers. Thanks to many of APECS' partner organizations, including IASC and SCAR, travel support was also available to help assure a large presence of future polar leaders at the conference. In addition, APECS coordinated the early career researcher poster and presentation awards, a two-day career development workshop, launching the Polar Resource Book for education and outreach activities, 26 APECS-related presentations in the conference program, meetings between APECS members and the Crown Prince Haakon of Norway and Prince Albert of Monaco, and an APECS speed-networking reception which united fun and work as it brought together early-career researchers and senior scientists from many disciplines from around the world.

Aside from the IPY Conference, there were many other opportunities for early career scientists created by APECS. Workshops, mentor panels, and networking events were held at numerous national and international conferences around the world, including the International Symposium on Arctic Research (Tokyo, Japan), European Science Open Forum (Torino, Italy), the Young Researchers Council of VNII-Okeangeologia (Russia), the SCAR Open Science Conference (Buenos Aires, Argentina), the MicroPerm Workshop (Potsdam, Germany), II PAGES International Symposium (Valdivia, Chile), the 7th International Penguin Conference (Boston, USA), and the International Circumpolar Remote Sensing Symposium (Cambridge, UK), just to name a few.

2010 has seen APECS build on its crucial partnership with IASC and SCAR through collaboration at meetings, representation on committees, and work together on the ICSU funded IPY Education and Outreach Assessment, which is lead by APECS. APECS has also signed memoranda of understanding with the University of the Arctic (UArctic), the International Antarctic Institute (IAI), the Arctic Frontiers Conference, the International Arctic Social Sciences Association (IASSA), and the Social Sciences and Humanities Antarctic Research Exchange (SHARE). These new collaborations will help to create many exciting opportunities in the coming years to advance the academic and professional development of early career polar researchers in all aspects of the physical and social sciences.

Within APECS, a contingent of active working groups keeps our exciting projects moving forwards. Our Mentorship Program has an active and searchable database that brings together mentors and mentees from all disciplines and countries around the world. For those newer to Polar science, our "Who's Who in Polar Science" group is actively putting together a searchable list of organizations, institutions, and research projects whose acronyms might be initially daunting; this database will be complete in early 2011 and includes information about the 'who' that is relevant to young scientists. Other working groups are building education and outreach resources related to climate change in many languages as well as information for new researchers on field sites where members are working in both the Arctic and Antarctic. Two APECS working groups were just recently established – one to build a database of funding resources available to young polar researchers and another to bring together a network of young researchers interest in the sediments budgets of cold environments; we are looking forward to more activity from these initiatives in 2011.

Increasingly, APECS is harnessing a diversity of web tools to communicate about career opportunities, education and outreach activities, cutting edge research, and polar news and discussions. The APECS website has Twitter, Facebook, and RSS feeds that are freely available, and our monthly newsletters are quite popular. The Virtual Poster Session initiative continues to grow and focuses on bringing the concept of the poster presentation beyond the four walls of the conference hall by not only creating an online database of user-submitted polar research poster publications but also hosting monthly online conference calls where APECS members and mentors present and discuss their work. Building upon these activities, newly established email discussion lists are helping APECS members share and discuss the latest news, research and events in topics such as Glaciology, Polar Microbial Ecology, Atmosphere and Climate, Polar Heritage, and Polar Policy.

PHOTO: LAURA MORSE
A caribou herd underway on the snow-covered tundra.

An exciting new initiative, developed in collaboration with the US NSF Arctic System Science Thermokarst Project and the University of Canterbury, is the APECS webinar series. Aimed at assisting APECS members with their career development goals, online seminars addressing topics such as fieldwork planning/logistics, scientific writing, working with Northern communities, and how to get the most out of a poster session can be joined live or viewed on an online archive. In Fall 2010, more than 1500 people have enjoyed the 10 webinars and subsequent archived videos. This series will continue through at least May 2011.

In addition to already active working groups, discussion lists, webinars, and virtual poster sessions, APECS already has an array of exciting events coming up for 2011! APECS panels and workshops will be held at the Arctic Frontiers Conference (January 2011; Tromsø, Norway), the Gordon Research Conference for Polar Marine Science (March 2011; Ventura, California, USA), Arctic Science Summit Week (March 2011; Seoul, South Korea), the 7th International Congress of Arctic Social Sciences (June 2011; Akureyri, Iceland), International Union of Geodesy and Geophysics Conference (June 2011; Melbourne, Australia), and the International Symposium on Antarctic Earth Science (July 2011; Edinburgh, UK). In addition, building off both arctic and Antarctic field schools in 2010, APECS will be collaborating with a Students on Ice Antarctic University Cruise in February as well as an Interdisciplinary Polar Field School at UNIS, Svalbard in June.

APECS continues to look forward to working with IASC and our many partners as we 'Shape the Future of Polar Research' together.

ww.apecs.is

Education and Outreach

IASC does not only stimulate and support research that will help increase our understanding of the Arctic, but also initiates activities that enable the research outcomes to reach a broad public, attempting to close the gap between science an society.

ICSU Grant for Education and Outreach Lessons from IPY

The International Council for Science (ICSU) awarded APECS, SCAR and IASC with a grant to carry out the project "Education and Outreach Lessons from IPY". The project aims to conduct an initial assessment of effective science communication based on IPY Education, Outreach and Communication (IPY EOC) activities, experience and networks.

The IPY brought together teachers, museum education coordinators, students, media officers, journalists, artists, filmmakers, expedition leaders, radio producers, book publishers, program managers and researchers (especially young and early career researchers) in a burst of international and coordinated energy. Jenny Baeseman, Director of APECS and initiator of the new project, believes that their accomplishments will show that existing and perceived barriers to broad science education, including language, age and culture, can all be overcome by cooperation, communication, and enthusiasm. Baeseman: *"Thanks to innovative ideas, creative and user-friendly tools, extensive partnerships, and, always, care and support of volunteers, the IPY education, outreach and communication teams helped IPY achieve the goal: Polar Science with Global Impact."*

Baeseman is confident that the outcomes of the "Education and Outreach Lessons from IPY" - an inventory, preliminary assessment and plans for a more substantive assessment, as well as recommendations for future activities in polar science education and in science education generally - will prove immensely valuable to the ICSU community and science educators around the world. The main coordination of the project is carried out by APECS and is lead by Jennifer Provencher, with assistance from SCAR, IASC and IPY EOC committee members. An IPY EOC survey is now available online and everybody who integrated education and outreach in their IPY projects in one way or another is encouraged to visit the website at **http://apecs.is/outreach/2529-ipy-eoc-survey** and help complete the inventory.

http://apecs.is/education-outreach/ipy-outreach-assessment

Medal for arctic science and inspiring mentorship

The first IASC Medal has been awarded to Patrick Webber. Webber, who is Professor Emeritus of Plant Biology at Michigan State University, has been recognized for his life-long scientific contribution as well as for the promotion of arctic research in general through inspiring mentorship and leadership. IASC Medals are awarded in recognition of exceptional and sustained contributions to the understanding of the Arctic.

The medal was presented by the IASC President, David Hik, at the IPY Science Conference in Oslo. Webber received an unusual award. The botanist's old herbarium box from the 1960s was found during a recent field trip, and colleagues had framed the lid to return to him with the award.

In his plenary talk, Webber highlighted the role of mentors and the importance of the chance encounters of life. He talked about the influence of his father, who was a school teacher and an avid naturalist, and who was to be his first mentor. His quest to become a polar scientist began at the age of eleven after he saw a movie about polar exploration. *„I was bitten by the polar bug,"* Patrick Webber recalled.

His choice of PhD topic was also in part determined by coincidence, as he stepped in for another botanist on a field trip to Baffin Island in northern Canada. *„A lot of this is serendipity,"* he said. Webber struck an optimistic note when addressing the young scientists in the audience. *„In spite of the dire predictions these days, I remain optimistic. We have such fine scholars. You young scientists can leave a legacy,"* he stated.

Cover of a brochure for students and early career scientists interested in pursuing a career in arctic research.

PHOTO: VOLKER RACHOLD
Patrick Webber holds a special lecture after he accepted the first IASC Medal Award for his life-long scientific contribution to arctic research and his inspiring mentorship.

He also addressed the more established scientists. Webber: *„Your mentoring will be appreciated. We do not know who our mentors are until we look back. And often mentors are not aware that they are being mentors, they are just being themselves."* His final message was to the young scientists: *„May you have excellent mentors. You have unprecedented opportunities. Life is full of surprises - may some of them be serendipitous."*

Connecting to the Poles

At the COP15 in Copenhagen 2009 IASC and SCAR opened up a live connection to the poles and gave the media and public the chance to directly ask polar scientist how they were witnessing climate change. Two researchers from the British Antarctic Survey and joined French-German arctic research base, AWIPEV, informed the public about what they saw happening in the Arctic and Antarctic first hand.

In the south we connected to Tamsin Gray, a meteorologist based at Rothera on the Antarctic Peninsula. Gray: *"In climate change research the link between collecting an air sample and monitoring global warming is refreshingly direct. The consequences of the results immediately reach way beyond the scope of academic interest straight into the lives of everyone around us."*

In the north we connected to Marcus Schumacher, researcher in environmental sciences and station manager based in Ny-Ålesund, Svalbard. Schumacher: *"The real challenge mankind has to face in the future are the challenges due to changes in the complex natural system. I hope that our work provides a contribution to set the course for the necessary political, social and economic actions."*

PolarCINEMA

During the IPY 2007-2008 film proved a strong instrument to explore new frontiers of polar science and mesmerized and informed the public. Fiction films, documentaries, TV-series and Internet broadcasts; they all helped translate polar science to the screen, portrayed a rich history of exploration, culture and contemporary life and investigated peoples' and natures' response and adaptation to a changing climate. The PolarCINEMA held during the IPY Science Conference in Oslo, Norway, showcased and celebrated for the first time on such a huge scale media productions that were inspired by, and increased the awareness of the Polar Regions. The film festival was chaired by the IASC secretariat and turned out to be a successful mix of screenings, lectures and discussions with filmmakers, educators and scientists.

IASC Publications

The internal and external developments and initiatives of IASC are shared with the international arctic community by publications of the IASC Newsletter, Progress, and the IASC yearbook. General information on IASC can be found in a more general brochure on the organization. A new information flyer is available for students and young researchers who are interested in a career in polar science. The flyer introduces some of the major players in polar research and offers contact information. The publication was initiated by APECS and IASC and was realized in cooperation with the University of the Arctic, SCAR and the International Arctic Institute. All publications are widely circulated by mail, e-mail and downloadable as electronic versions on the renewed IASC website. With this updated website IASC has created a virtual information base with more room for the new Working Groups and international science initiatives.

www.iasc.info

Press invitation for "Connecting to the Poles" at the Arctic Venue during the COP15 (2009) in Copenhagen, Denmark.

PHOTO: GRAHAM SIMPKINS
Identifying plants during the 2010 IPY Polar Field School at Svalbard.

List of Acronyms and Abbreviations Bulletin 2011

Acronym	Full name
A	
AAA	Astronomy and Astrophysics in Antarctica
AC	Arctic Council
ACCE	Antarctic Climate Change and the Environment
ACD	Arctic Coastal Dynamics
ACIA	Arctic Climate Impact Assessment
ACSYS	Arctic Climate System Study
AHDR	Arctic Human Development Report
AMAP	Arctic Monitoring and Assessment Programme
AntEco	State of the Antarctic Ecosystem
AntETR	Antarctic Ecosystems: Adaptations, Thresholds and Resilience
AOSB	Arctic Ocean Sciences Board
APECS	Association of Polar Early Career Scientists
APEX	Arctic Palaeoclimate and its Extremes
ART	Arctic in Rapid Transition
ASI	Arctic Social Indicators
ASSW	Arctic Science Summit Week
AWI	Alfred Wegener Institute for Polar and Marine Research
B	
BipAG	Bipolar Action Group
C	
CAML	Census of Antarctic Marine Life
CCMVal	Climate – chemistry model validation
CliC	Climate and Cryosphere Project
CMIP	Coupled Model Intercomparison Project
COP15	Fifteenth Conference of Parties
COPES	Coordinated Observation and Prediction of the Earth System
D	
DBO	Distributed Biological Observatory
E	
EOC	Education, Outreach and Communication
EPB	European Polar Board
ESF	European Science Foundation
G	
GLACIODYN	Dynamic Response of Arctic Glaciers to Global Warming

Acronym	Full name
IACS	International Association of Cryospheric Sciences
IAI	International Antarctic Institute
iAOOS	integrated Arctic Ocean Observing System
IASC	International Arctic Science Committee
IASSA	International Arctic Social Sciences Association
ICARP	International Conference on Arctic Research Planning
ICASS	International Congress of Arctic Social Sciences
ICEMASS	Response of Arctic Ice Masses to Climate Change
ICSU	International Council for Science
IG	Initiating Group
IODP	Integrated Ocean Drilling Program
IPA	International Permafrost Association
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
IPY IPO	International Polar Year International Programme Office
ICEMASS	Response of Arctic Ice Masses to Climate Change
ISAC	International Study of Arctic Change
ISMASS	Ice Sheet Mass Balance and Sea Level
J	
JC	Joint Committee
L	
LGM	Last Glacial Maximum
LOICZ	Land-Ocean-Interactions in the Coastal Zone
M	
MAGICS	Mass balance of Arctic Glaciers and Ice sheets in relation to the Climate and Sea level changes
MOCA	Meltwater routing and Ocean-Cryosphere-Atmosphere response project
N	
NcoE	Nordic Centre of Excellence
NAG	Network on Arctic Glaciology
P	
PACE	Past and Future Change of the Antarctic Environment
PAG	Pacific Arctic Group
PAN	Polar Archeology Network
PAR	Pacific Arctic Region
POLENET	Polar Earth Observing Network
PONAM	Polar North Atlantic Margin
PROMICE	Programme for Monitoring of the Greenland Ice Sheet

Acronym	Full name
Q	
QSR	Quaternary Science Reviews
QUEEN	Quaternary Environment of the Eurasian North
S	
SAC	State of the Arctic Coast
SAI	Stefansson Arctic Institute
SAON	Sustaining Arctic Observing Networks
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SDWG	Sustainable Development Working Group
SEARCH	Study of Environmental Arctic Change
SERCE	Solid Earth Responses and Influences on Cryospheric Evolution
SG	Steering Group
SHARE	Social Sciences and Humanities Antarctic Research Exchange
SOOS	Southern Ocean Observing System
SPARC	Stratospheric processes and their role in climate
SPICE	Space-borne Measurements of Arctic Glaciers and Implications for Sea Level
SRP	Scientific Research Programme
SSG	Scientific Steering Group
SVALI	Stability and Variations of Arctic Land Ice
SWIPA	Snow, Water, Ice and Permafrost in the Arctic
U	
UArctic	University of the Arctic
UNFCCC	United Nations Framework Convention on Climate Change
UNIS	The University Centre in Svalbard
W	
WCC-3	Third World Climate Conference
WCRP	World Climate Research Programme
WG	Working Group
WMO	World Meteorological Organization