IASC Bulletin 2018

IASC 2018
BULLETIN

[IASC] · INTERNATIONAL ARCTIC SCIENCE COMMITTEE

The International Arctic Science Committee (IASC) is a non-governmental, international scientific organization. IASC's 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 ACHIEVE 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 polar cooperation through interaction with relevant science organizations.

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INTERNATIONAL ARCTIC SCIENCE COMMITTEE
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[IASC] · STRUCTURE

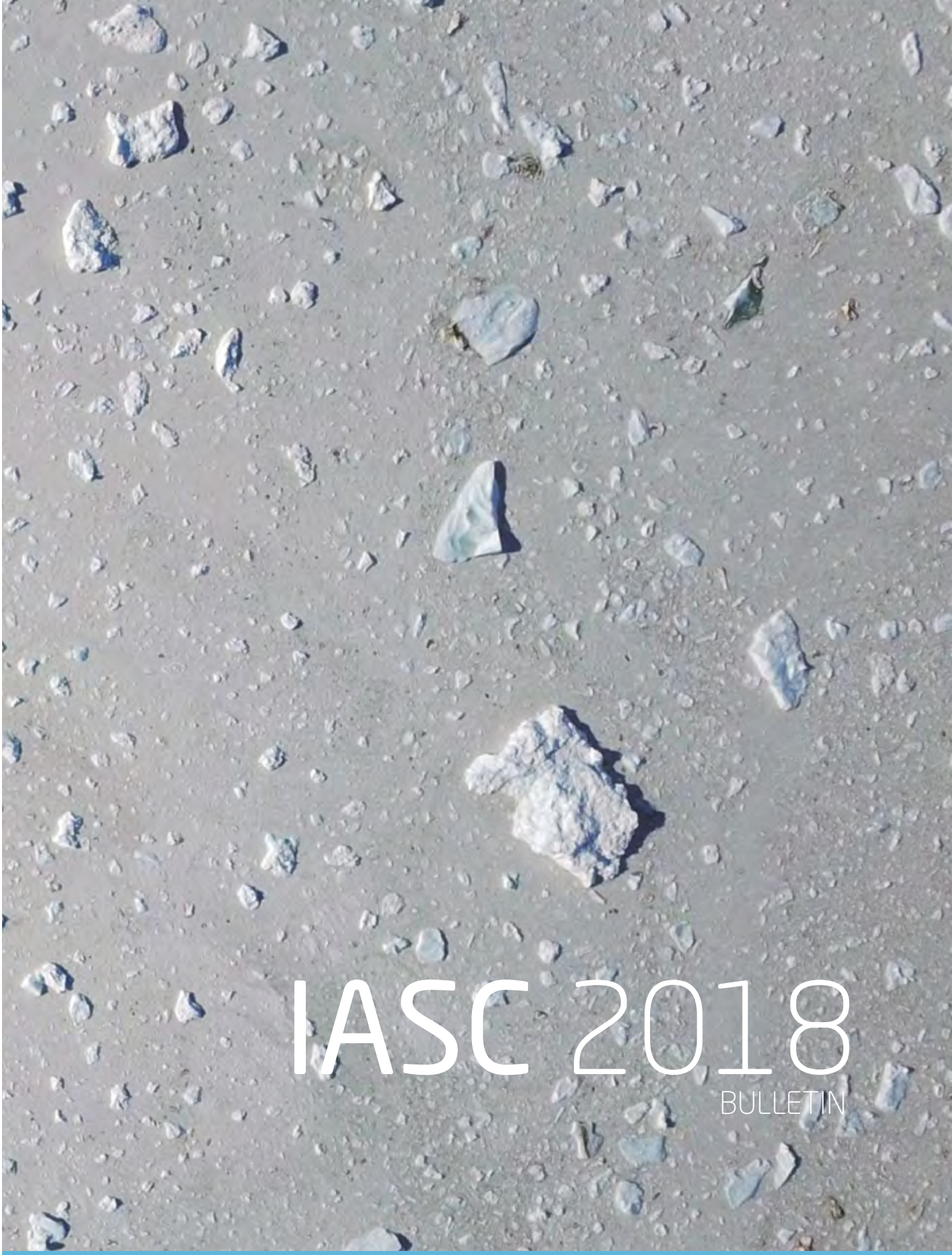
Representatives of national scientific organizations from all 23 member countries form the IASC Council. The President of IASC is elected by Council, which also elects 4 Vice-Presidents to serve on the Executive Committee. Council usually meets once a year during the Arctic Science Summit Week (ASSW). 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

Austria	Austrian Polar Research Institute (APRI)	www.polarresearch.at
Canada	Polar knowledge Canada (POLAR)	www.canada.ca/en/polar-knowledge.html
China	Chinese Arctic and Antarctic Administration (CHINARE)	www.chinare.gov.cn
Czech Republic	Czech Centre for Polar Research	polar.prf.jcu.cz
Denmark/ Greenland	The Agency for Science, Technology and Innovation	www.ufm.dk/en
Finland	Council of Finnish Academies	www.academies.fi
France	French Polar Institute Paul-Emile Victor (IPEV)	www.institut-polaire.fr
Germany	German Research Foundation (DFG)	www.dfg.de
Iceland	The Icelandic Centre for Research (Rannís)	www.rannis.is
India	National Centre for Antarctic and Ocean Research (NCAOR)	www.ncaor.gov.in
Italy	National Research Council of Italy (CNR)	www.cnr.it
Japan	Science Council of Japan, National Institute of Polar Research (NiPR)	www.nipr.ac.jp
The Netherlands	Netherlands Organization for Scientific Research (NWO Science)	www.nwo.nl
Norway	The Research Council of Norway	www.forskningsradet.no
Poland	The Committee on Polar Research of the Polish Academy of Sciences (CPR PAS)	www.polish.polar.pan.pl
Portugal	Portuguese Foundation for Science and Technology (FCT)	www.fct.pt
Russia	The Russian Academy of Sciences	www.ras.ru
Republic of Korea	Korea Polar Research Institute (KOPRI)	www.kopri.re.kr
Spain	Spanish Polar Committee	www.idi.mineco.gob.es
Sweden	The Swedish Research Council	www.vr.se
Switzerland	Swiss Committee on Polar and High Altitude Research	www.polar-research.ch
United Kingdom	Natural Environment Research Council (NERC)	www.nerc.ukri.org
USA	Polar Research Board (PRB)	www.dels.nas.edu/prb

PHOTO: LUCA BRACALI ©
Eqi Sermia Bay, Greenland



IASC 2018

BULLETIN

INTERNATIONAL ARCTIC SCIENCE COMMITTEE

[IMPRINT]

International Arctic Science Committee

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COVER PHOTO: JASON BRINER
University at Buffalo PhD student Avriel Schweinsberg collecting a sample from a moraine boulder for cosmogenic 10Be exposure dating, Nuussuaq, West Greenland. The samples are part of a project funded by the US National Science Foundation to reconstruct prehistoric changes of mountain glaciers fringing the Greenland Ice Sheet.

[CONTENTS]

[PREFACE]

PHOTO: COURTESY OF SUSAN BARR
Susan Barr, IASC President

As we move into 2018 the IASC organization has many highlights to look back on from 2017 and to look forward to in 2018. The Arctic Science Summit Week (ASSW2017) in Prague, Czech Republic attracted more than 700 delegates from 28 countries and included a scientific conference. During the Council meeting we renewed our Letter of Agreement with the University of the Arctic (UArctic) and the International Arctic Social Science Association (IASSA) with a public signing by the three Presidents. All three organizations are scientific observers to the Arctic Council and we make joint approaches to the Council where relevant. At the same time we signed new or renewed agreements for support for our dispersed Secretariat. We are very proud and grateful to have had 2017-2018 secretarial assistance from China, Japan, Poland, Russia and Sweden, as well as the Stefansson Arctic Institute in Iceland in addition, of course, to the main Secretariat supported by Rannís, the Icelandic Centre for Research, in Akureyri.

As the IASC Secretariat now has offices adjacent to the Secretariat for CAFF (The Conservation of Arctic Flora and Fauna) cooperation has naturally increased and the two organizations have created a joint CAFF-IASC Fellowship for 2018. The intention is to provide two Fellows with an opportunity to contribute to translating scientific outcomes for policy and decision makers, and produce at least one peer-reviewed publication and/or deliverable report to the Arctic Council Senior Arctic Officials. The selection process was organized in cooperation with the Association of Polar Early Career Scientists (APECS), and the two chosen Fellows will provide deliverables to the Arctic Biodiversity Congress in October 2018.

Each year, the IASC Fellowship Program gives five new early career Arctic scientists the opportunity to work with the scientific Working Group (WG) of their discipline, providing both extra help with the running of the WG and at the same time giving the Fellows a unique opportunity to gain expertise and a network for their future careers. The Program for 2018 received a record number of 135 applications for the 5 positions; again, APECS helped coordinate the applications.

Our annual Arctic Science Summit Week (ASSW) is this year combined with the biannual meeting of SCAR (the Scientific Committee for Antarctic Research) and the 2018 Arctic Observing Summit in Davos, Switzerland. A truly polar scientific conference – Polar2018 – is included, and it goes without saying that this will be the most important polar science event of the year! The previous IASC and SCAR joint conferences were held in connection with the International Polar Year (IPY) 2007-08 in St. Petersburg in 2008, Oslo 2010 and Montreal 2012. Attendance this time is expected to be strong, with abstract submissions exceeding 2600! Both IASC and SCAR are interested in keeping and expanding the cooperation between the two organizations and in particular in discussing polar projects that address major challenges that climate change is bringing to the world.

Last year we announced that work had begun on producing a Strategic Plan for IASC's work for the coming five years. The Plan is built on the results

of the ICARP III process, and with new input from, amongst others, the Working Groups which have defined their strategic aims for the coming period both for their own disciplines and not least also with inter-disciplinary projects in mind. IASC allocates funds each year for "cross-cutting" activities that are supported by at least two of the five Working Groups in order to encourage the WGs to explore interdisciplinary activities, in particular across the natural and social sciences. The Strategic Plan will be presented to the Council during the Polar2018 meeting in June.

Work with IASC's strategy has also resulted in the formation of two Action Groups: one for Communicating Arctic Science to Policymakers (CASP) and one for discussing how to facilitate Arctic Science and Business/Industry Cooperation (ASBIC). CASP is expecting to be able to fulfill one of its own recommendations by presenting the current state of Arctic science knowledge at the upcoming Arctic Science Ministerial in Berlin in October 2018, while ASBIC convened successful sessions at the 2017 Arctic Circle Assembly in Reykjavik in October 2017. IASC was also actively represented at several others sessions during the Assembly.

In addition to these two Action Groups the IASC Council approved in Prague the formation of a Scoping Group on Indigenous Involvement with the aim of advising IASC on better involvement of Indigenous people and incorporating Traditional Knowledge into the full breadth of IASC activities. This group is currently working to develop Terms of Reference for a full Action Group.

The Sustaining Arctic Observing Network (SAON) is a joint activity of IASC and the Arctic Council through the Arctic Monitoring and Assessment Programme (AMAP). The purpose of SAON is to support and strengthen the development of multinational engagement for sustained and coordinated pan-Arctic observing and data sharing systems. IASC Vice President Larry Hinzman has been Vice Chair since 2015 and in September 2017 AMAP appointed Þorsteinn Gunnarsson of The Icelandic Centre for Research (Rannís) and IASC Council Member for Iceland as the new Chair after Christine Daae Olseng of the Research Council of Norway.

We come and go in our positions as the terms of office draw to a close. In 2018 both Vice President Naja Mikkelsen and President Susan Barr come to the end of their allotted terms. Naja has served on the Executive Committee of IASC for two 4-year terms as Vice President and we are extremely grateful for all the work and inspiration she has brought to the organization in this position. I myself moved in 2014 from four years as Vice President to the 4-year term as President. This has been an exciting time for me, coming as I do from the Humanities to lead an organization that is weighted more heavily on the natural science side. This is naturally so, but I am pleased to have experienced the growth of incorporation of the Humanities and Social Sciences in IASC's work during these years. In fact, the integration of the human aspects of Arctic science can be said to be on an irreversible wave throughout the international scientific community. I take this opportunity to thank the two amazing Secretariats – in Potsdam and Akureyri – who have done most of the work for me during these years, as well as all the other ExCom members with whom I have served, and not least the whole community of IASC that has inspired me throughout my presidential period. I am proud to have been considered worthy to lead such an important organization!

Susan Barr | IASC President

PHOTO: JULIA YORK
Edge of a small creek on the north slope of Atigun Pass

PHOTO: LUCA BRACALI ©
During summer months, several whale species migrate toward the cool water of Disko Bay
in North West Greenland.

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 and began operations in 1991. It currently comprises 23 member countries. IASC member organizations are national science organizations that cover all fields of Arctic research.

PHOTO: ALLEN POPE
Juneau Icefield Research Program student Kiana Zola looks over the Gilkey Trench, Southeast Alaska.

COUNTRY	MEMBER ORGANIZATION	IASC COUNCIL MEMBER
Austria	Austrian Polar Research Institute (APRI)	Wolfgang Schöner
Canada	Polar Knowledge Canada (POLAR)	Wayne Pollard
China	Chinese Arctic and Antarctic Administration (CHINARE)	Huigen Yang, IASC Vice-President
Czech Republic	Czech Centre for Polar Research	Josef Elster
Denmark/Greenland	The Agency for Science, Technology and Innovation	Naja Mikkelsen, IASC Vice-President
Finland	Council of Finnish Academies	Paula Kankaanpää
France	French Polar Institute Paul-Emile Victor (IPEV)	Jérôme Chappellaz
Germany	German Research Foundation (DFG)	Karin Lochte
Iceland	The Icelandic Centre for Research (Rannís)	Þorsteinn Gunnarsson
India	National Centre for Antarctic and Ocean Research (NCAOR)	M. Ravichandran
Italy	National Research Council of Italy (CNR)	Carlo Barbante
Japan	Science Council of Japan, National Institute of Polar Research (NiPR)	Hiroyuki Enomoto
The Netherlands	Netherlands Organization for Scientific Research (NWO Science)	Peter Jordan
Norway	The Research Council of Norway	Susan Barr, IASC President
Poland	The Committee on Polar Research of the Polish Academy of Sciences (CPR PAS)	Michał Łuszczuk
Portugal	Portuguese Foundation for Science and Technology (FCT)	João Canario
Russia	The Russian Academy of Sciences	Vladimir Pavlenko, IASC Vice-President
Republic of Korea	Korea Polar Research Institute (KOPRI)	Yeadong Kim
Spain	Spanish Polar Committee	Antonio Quesada
Sweden	The Swedish Research Council	Magnus Friberg
Switzerland	Swiss Committee on Polar and High Altitude Research	Martin Schneebeli
United Kingdom	Natural Environment Research Council (NERC)	Henry Burgess
USA	Polar Research Board (PRB)	Larry Hinzman, IASC Vice-President

TABLE: An overview of the IASC countries, organizations, and Council members

IASC Council

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

The IASC Council is responsible for:

- Developing policies and guidelines for cooperative Arctic research;
- Establishing Working Groups (WGs) and Action Groups (AGs) that address and act on timely topics in Arctic science;
- Recommending, in cooperation with the WGs, implementation plans for IASC programs and activities;
- Making decisions regarding the participation of national scientific organizations from non-Arctic countries; and,
- Organizing Arctic science conferences.

IASC Executive Committee

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

The current IASC Executive Committee members are:

Susan Barr, President

Vladimir Pavlenko, Vice-President

Huigen Yang, Vice President

Larry Hinzman, Vice-President

Naja Mikkelsen, Vice-President

Allen Pope, IASC Executive Secretary

PHOTO: IASC FILE PHOTO
The IASC Council Meeting at ASSW 2017 in Prague, Czech Republic

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 the International Council for Science (ICSU);
- Providing support for the IASC Working Groups;
- Publishing the IASC Bulletin and IASC communication materials as required;
- Maintaining the IASC website, preparing the IASC newsletter and facilitating outreach; and,
- Administering IASC finances.

In recent years, the IASC Secretariat has received growing international support from IASC member countries, especially addressing the support for the growing number of activities undertaken by the IASC Working Groups and early career researcher development.

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Federica Scarpa Communications Manager
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Tetsuo Sueyoshi
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Japanese National Institute of Polar Research (NIPR)
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Contact: **jeanette.axelsson@polar.se**

Gunnar Gunnarsson
Secretary, Social and Human Working Group,
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Galina Antonovskaya
Secretary, Terrestrial Working Group,
N. Laverov Federal Center for Integrated Arctic Research
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IASC Fellowship & Early Career Support:

Maja Lisowska, affiliated with the Polish Centre for Polar Research and the PPC
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ISIRA

ISIRA (IASC's International Science Initiative in the Russian Arctic) is a Russian and international cooperative initiative which provides a forum for linking on-going or planned bilateral projects, facilitates improved scientific cooperation and access in the Russian Arctic, and more.

ISIRA's objectives include:

- Initiating planning of multinational research programs that address specific key problems in the Russian Arctic,
- Providing a forum for linking on-going or planned bilateral projects,
- Facilitating improved scientific access to the Russian Arctic, and
- Advising on funding and implementation of projects.

ISIRA activities include:

- Reporting on international science activities and initiatives in the Russian Arctic,
- Providing up-to-date information on policies, regulations and logistics within the Russian Arctic, and
- Supporting Russian and international early career scientists.

PHOTO: TATIANA MATVEEVA
Installation of atmospheric and oceanic measurement systems on sea ice. NABOS-2015 cruise, East Siberian Sea, September, 2015.

On 7-8 November 2017, ISIRA convened a workshop at the Presidium of the Russian Academy of Sciences in Moscow to build the ISIRA network, revisit challenges facing international and interdisciplinary Arctic science, and provide suggestions as to how IASC, through ISIRA, could help overcome some of these issues. Over 50 participants (half Russian, half representing 12 other countries) participated, including a number of Indigenous participants (from RAIPON and other groups), as well as early career researchers.

Workshop participants highlighted bureaucracy, institutional silos, lack of communication regarding ongoing projects, and logistical issues as some of the largest challenges facing science in the Russian Arctic.

Suggestions for IASC actions include:

- A mechanism for IASC to help implement the recently signed 'Arctic Science Agreement',
- Letters of support from ISIRA, to endorse projects at the governmental level,
- Making education and research opportunities for indigenous and local people possible,
- Increased reporting and (bilingual) communication within IASC of scientific activities in the Russian Arctic, and
- Support for capacity building and mobility activities.

If you are interested in receiving the full workshop outcomes or future ISIRA communications, please contact the IASC Secretariat.

IASC Medal 2018

The IASC Medal is awarded in recognition of exceptional and sustained contributions to the understanding of the Arctic. This year, IASC recognizes **Dr. Oran Young's Outstanding Achievement to Understand Arctic Institutional Dynamics, International Regimes, and Environmental Policy**.

Dr. Young is professor emeritus and co-director of the Program on Governance for Sustainable Development at the Bren School of Environmental Science & Management at the University of California (Santa Barbara). He has an outstanding record of oral and written contributions in Arctic governance and international collaboration, with over 100 articles, multiple dozens of books and book chapters in outlets such as Science, Nature, Foreign Policy, International Organization, World Politics, and Global Environmental Politics. Dr. Young has maintained broad community service including participation as an IASC vice-president from 1994-2000 and sustained advocacy for inclusion of social sciences in multiple organizations towards a holistic approach to Arctic studies. During his esteemed career he facilitated the development of the Arctic Council, the University of the Arctic, and other Arctic governance groups. Oran´s work has had high-level impacts in the Arctic Council, especially through the Sustainable Development Working Group, as well as through involvement in a range of Arctic stakeholders collaborations, communities, and the scientific community. Dr. Young has also mentored over 50 graduate students, including 25 PhD students, and seven post-doctoral scholars. Based on his continuous and extremely productive career focus on Arctic environmental affairs, resource management and international regimes, and the human dimensions of Arctic change, IASC is honored to award Dr. Oran Young the 2018 IASC Medal.

Dr. Young will receive the Medal and deliver a keynote lecture at **Polar2018 in Davos, Switzerland**.

IASC would like to thank this year's Medal Commitee for their service: Jackie Grebmeier (Chair), Joan Nymand Larsen, Tetsuo Ohata, Allison Fong, and Josef Elster.

PHOTO: STIG BRØNDBO, UiT THE ARCTIC UNIVERSITY OF NORWAY
2018 IASC Medallist, Professor Oran Young

PHOTO: MICHAEL FRITZ, ALFRED WEGENER INSTITUTE (AWI)
Drilling of permafrost cores in the Arctic tundra landscape of Herschel Island, Canada

2. IASC Working Groups

2 IASC Working Groups

Encouraging and supporting international science-led programs

IASC is engaged in all fields of Arctic research. Its main scientific working bodies consist of five Working Groups (WGs): Atmosphere, Cryosphere, Marine, Social & Human and Terrestrial. The primary function of the WGs is to encourage and support science-led international programs by offering opportunities for planning and coordination, and by facilitating communication and access to facilities. Each WG is composed of up to two scientists from each IASC member country, appointed by the national adhering bodies.

In 2017, all five IASC WGs drafted new scientific Work Plans to concisely articulate, with scientifically-driven high-level specifics not programmatic detail, how they will achieve IASC's vision over the next 5 years. These plans are meant to help Arctic scientists get involved in IASC activities, and it is expected that they will evolve in the coming years as the WGs continue with their work. These scientific foci are included in the WG sections which follow, and the full plans are on the IASC website.

The WG members are experts in their field that have an international reputation and are from different scientific disciplines so that the full range of Arctic research is represented within the WGs. Though the WGs are disciplinary, they also address crosscutting science questions by initiating activities that involve at least two WGs. 2017 was the last year an IASC crosscutting funding call will be held; moving forward, WGs have had their budgets expanded but will be required to use 40% of their funds in collaboration with paired funds from at least one other WG. IASC hopes that this procedural change will lead to closer cooperation, coordination, and teamwork across disciplines within IASC.

Cross-Cutting Activities

BEPSII: Biogeochemical Exchange Processes at Sea Ice Interfaces

When: April 2017 | Where: La Jolla (California, USA)
Working Groups: AWG, CWG, MWG

Highlights:

- First annual meeting of the new SCOR WG ECV-ice
- Planning BEPSII's future: Drafting of a 5-year science plan
- Science talks & Poster presentations related to sea-ice biogeochemistry

The BEPSII research community is a global community of researchers linked to sea-ice biogeochemistry. BEPSII had been initiated as SCOR WG 140 which addressed fundamental issues in communication and methods. BEPSII was then approved by SOLAS (Surface Ocean Lower Atmosphere Study), CliC (Climate and Cryosphere), and SCAR (Scientific Committee of Antarctic Science) as a longer-lived activity. With additional support from IASC, a Workshop was held in La Jolla, April 2017, discussing updates of activities including science talks and poster presentations.

BEPSII is now in its 2nd phase which focuses on developing the tools to tackle big-picture questions of global relevance and feedbacks. A set of objectives has been compiled with specific task groups which comprises the base for a 5 year -science plan. As a BEPSII subgroup, the new SCOR Working Group 152 was established: Measuring Essential Climate Variables in Sea Ice (ECV-Ice) which had its first meeting within the BEPSII workshop. Current and upcoming tasks include several method intercalibration projects, support for the MOSAiC field program, 1-D and 3-D model intercomparisons, a student field school and various experimental and modelling approaches enhancing our understanding of biogeochemical exchange processes at sea -ice interfaces (BEPSII).

Website: https://sites.google.com/site/bepsiiwg140/home
Contact: **Nadja Steiner** · Nadja.Steiner@dfo-mpo.gc.ca

PHOTO: TATIANA MATVEEVA
Ice from on board RV Akademik Tryoshnikov while in the Kara Sea

The Frozen-Ground Cartoon

Working Groups: CWG, TWG

Highlights

- Disseminating scientific information about permafrost among younger public
- Educating the general public about climate change impacts in permafrost regions (ecosystems, infrastructures);
- Presenting international research on permafrost (specifically fieldwork) in a casual and different way.

A bumpy road, reindeer herders and a frozen turkey: they are all featured in the 'Frozen-Ground Cartoons', an international outreach and education project led by permafrost early-career scientists. Supported by several organizations including IASC (through TWG and CWG), the project aims to present and promote permafrost research to the general public, specifically school children. The comic strip series was released in late 2017, initially in English. Translations into other languages are under way, along with the production of augmented reality material (e.g., 3D sketches, maps, videos). The latest progress will be reported at EUCOP5 in June 2018.

Website: https://frozengroundcartoon.com/cartoons/
Contacts: **Frédéric Bouchard** · frederic.bouchard@cen.ulaval.ca
Michael Fritz · Michael.Fritz@awi.de

The Importance of Arctic Glaciers for the Arctic Marine Ecosystem

Where: Obergurgl, Austria | When: 22-24 January 2018
Working Groups: CWG, MWG

Highlights:

- Presented and discussed new results on observations and modelling of the dynamics and mass budget of Arctic glaciers, including the Greenland ice sheet
- Provided a forum for glaciologists and marine biologists to present and discuss their work and to stimulate future collaborations,
- Planned and coordinated field work with the aim of using available infrastructure and logistics in the most efficient way.

This CWG and MWG cross-cutting activity was integrated in the Network on Arctic Glaciology annual meeting held in Obergurgl, Austria, 22-24 January 2018. The meeting attracted 42 participants from 16 different countries; the activity brought together experts in glaciology and marine biology/ecology addressing a wide range of topics, including glacier freshwater discharge (meltwater runoff and frontal ablation) and nutrient delivery to downstream (marine) ecosystems, as well as marine proglacial environments as a habitat

for seabirds and mammals and their importance for plankton and benthic communities.

Thanks to the diversity of the topics, glaciologists and marine biologists/ecologists gained insight into many of the key questions and concepts addressed by the involved communities. Furthermore, participants were exposed to each other's scientific jargon and learned to understand each other better, a prerequisite for successful interdisciplinary collaboration.

The activity concluded with a discussion session addressing open questions and potential collaboration across the glaciology and marine ecology communities. There was strong interest within both communities elaborate in the initiative and in organizing follow-up activities in the coming years. The next workshop on the dynamics and mass balance of Arctic glaciers and Network on Arctic Glaciology annual meeting will be held at Bardøla Hotel in Geilo, Norway, 20-24 January 2019.

Website: http://nag.iasc.info
Contact: **Thorben Dunse** · thorben.dunse@geo.uio.no

Long-Term Perspectives on Arctic Change: Implications for Archaeology, Palaeoenvironments and Cultural Heritage

When: 4 April 2017 | Where: Prague
Working Groups: AWG, MWG, SHWG, TWG

Highlights:

- The ASSW 2017 'palaeo' session launched the SHWGs new theme of 'Long-Term Perspectives on Arctic Social Ecological Systems'
- The goal was to integrate archaeological, historical, and ecological datasets to investigate Arctic SESs from a 'palaeo' perspective, and to better understand what contributes to their long-term fragility, resilience, and long-term sustainability
- Papers in the session provided wide temporal and full circumpolar geographic coverage, with participation by several Russian colleagues. The special issue also enjoys full thematic and comparative coverage of the Circumpolar Arctic and Sub-Arctic, with additional case-studies drawn from the (sub)Polar regions of South America.

A long-term, interdisciplinary perspective is needed to better understand past human responses to changing Arctic environments and present transformations and in turn strengthen the knowledge base for future sustainability strategies. The use of complimentary chronological perspectives (palaeo, contemporary and future) can provide mutually-reinforcing insights into factors that contribute to vulnerability and resilience within the closely interconnected social-ecological systems (SESs) of the Arctic.

A conference session was convened by the Polar Archaeology Network (PAN) during ASSW 2017 to assist in integrating historical, archaeological and long-term environmental and climatic records in order to improve understanding of the 'palaeo' aspects of Arctic SESs. Papers from the session are currently being converted into a special themed issue of Quaternary International, and a review paper will

follow on 'Culture and Arctic Climate Change' for Annual Review of Anthropology. Preparations are underway to build on the successes of the ASSW 2017 'palaeo' session by running follow-on sessions at Polar2018 in Davos and ASSW 2019 in Archangelsk and are planned to explore developments affecting contemporary Arctic SESs and to examine opportunities to support future sustainability.

Contact: **Peter Jordan** · p.d.jordan@rug.nl

MOSAiC Science Workshop

When: 4-5 April 2017 | Where: Prague, Czech Republic
Working Groups: AWG, CWG, MWG, SHWG, TWG

Highlights:

- Announcement officially confirming that MOSAiC will take place
- First time that MOSAiC interdisciplinary work was formally addressed
- Establishing further teams that are responsible for observational platforms and systems, and synthesis group for development of improved sub-grid scale parameterizations by connecting large scale eddy simulation and regional climate modelling with in-situ measurements and observations

MOSAiC (Multidisciplinary drifting Observatory for the Study of the Arctic Climate) is a vibrant international project involving more than 60 institutes from 16 nations. IASC and especially the AWG support MOSAiC since the beginning of planning and sell the project as their flagship initiative. MOSAiC is the first year-around expedition (from September 2019 to September 2020) with the focus to explore the coupled climate system in the central Arctic under melting sea ice conditions. The focus of MOSAiC lies on in-situ observations of the climate processes that couple the atmosphere, ocean, sea ice, biogeochemistry and ecosystem (scientific teams).

The coordination of such complex observations and the implementation of measurement concepts is a great challenge to ensure the quality and continuity of critical measurements and to maximize the impact of these observations for coupled system studies. This includes the coordination of the modelling activities to improve the sea ice forecast, numerical weather prediction and the climate models. Therefore, regular workshops and meetings are important for the planning of MOSAiC. The first workshop addressing the whole MOSAiC community was held during the ASSW in Prague. Approximately 90 participants representing both MOSAiC scientific teams and the logistics and funding agencies joined the workshop. The workshop provided an overview of the ongoing scientific work in the Arctic and the gaps in Arctic science that hopefully will be filled during MOSAiC. Additionally, the opportunity was used to develop a strategy for the interdisciplinarity between the scientific team in MOSAiC.

Website: http://www.mosaic-expedition.org
Contacts: **Anja Sommerfeld** · Anja.Sommerfeld@awi.de

MOSAiC Implementation Workshop

When: 13-16 November 2017 | Where: St. Petersburg (Russia)
Working Groups: AWG, CWG, MWG, TWG

Highlights:

- All MOSAiC teams made great progress in organizing and implementing the scientific work, including the interdisciplinary work and the modelling activity
- Development of the schedule of the MOSAiC expedition, definition of the legs and the resupply schedule with the icebreakers from MOSAiC partners
- Presentation of the new MOSAiC Logos

After the Science Workshop hold in Prague in April 2017, all MOSAiC partners put all their efforts in further proceeding with organizing this huge project. The outcome was presented during the 4-day MOSAiC Implementation at AARI in St. Petersburg. Around 120 scientists from dozens of nations worldwide participated in the workshop. All MOSAiC teams, including those that were newly established during the Science Workshop in Prague, were well represented. Since the Science Workshop dealt with the scientific ideas, the Implementation Workshop went further into the organization of the scientific work during the expedition.

The modelling team started to organize the work that need to be done to make MOSAiC successful in the beginning and during the drift by using sea ice and weather forecasts and to plan the modelling work after the expedition to fulfil the overarching goal of MOSAiC, a better representation of Arctic key process in models to improve the sea ice and weather forecasts and the climate predictions.

Additionally, the status of the logistical planning become much more concrete. The potential starting position of the MOSAiC expedition is around 85° N and 120° E. The legs and the schedule of resupply and exchange of crew and scientists was adjusted; the expedition will be split into six legs that range from 1.5 to 3 months long. MOSAiC will be supported by Russian, Chinese, and Swedish icebreakers to enable the resupply of the RV Polarstern.

Website: http://www.mosaic-expedition.org
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Anja Sommerfeld · Anja.Sommerfeld@awi.de

RATIC Sustainable Arctic Infrastructure Forum (SAIF)

When: 3 April 2017 | Where: Prague (Czech Republic)
Working Groups: CWG, SHWG, TWG

Highlights:

- Promote the topic of sustainable infrastructure development as a key research theme of the next five-years of international Arctic research
- Involve scientists, local communities, governments, industry and the general public inside and outside the Arctic in this research
- Publish a synthesis of sustainable Arctic infrastructure research findings in peer-reviewed scientific journals and more publicly accessible platforms

Eleven related scientific papers and six posters were presented during the Science Session 17.3 "Rapid Arctic Transitions due to Infrastructure and Climate (RATIC)". SAIF is an activity of the IASC RATIC initiative. Thirty-nine individuals participated in the SAIF workshop. The program consisted of: (1) a series of introductory talks, (2) a keynote student presentation by Will Tyson, (3) breakout sessions to address scientific and policy issues related to major types of infrastructure, and (4) discussion to address a journal publication and a RATIC strategy document. The major task of SAIF was to address the cumulative effects of four major types of infrastructure systems: Indigenous infrastructure (e.g., camps, trails, corrals, migration corridors, etc.); onshore oil & gas fields (networks of roads, drilling and facility pads, pipelines, etc.); remote communities (village infrastructure); and urban infrastructure (cities).

Contact: **Donald A. (Skip) Walker** · dawalker@alaska.edu

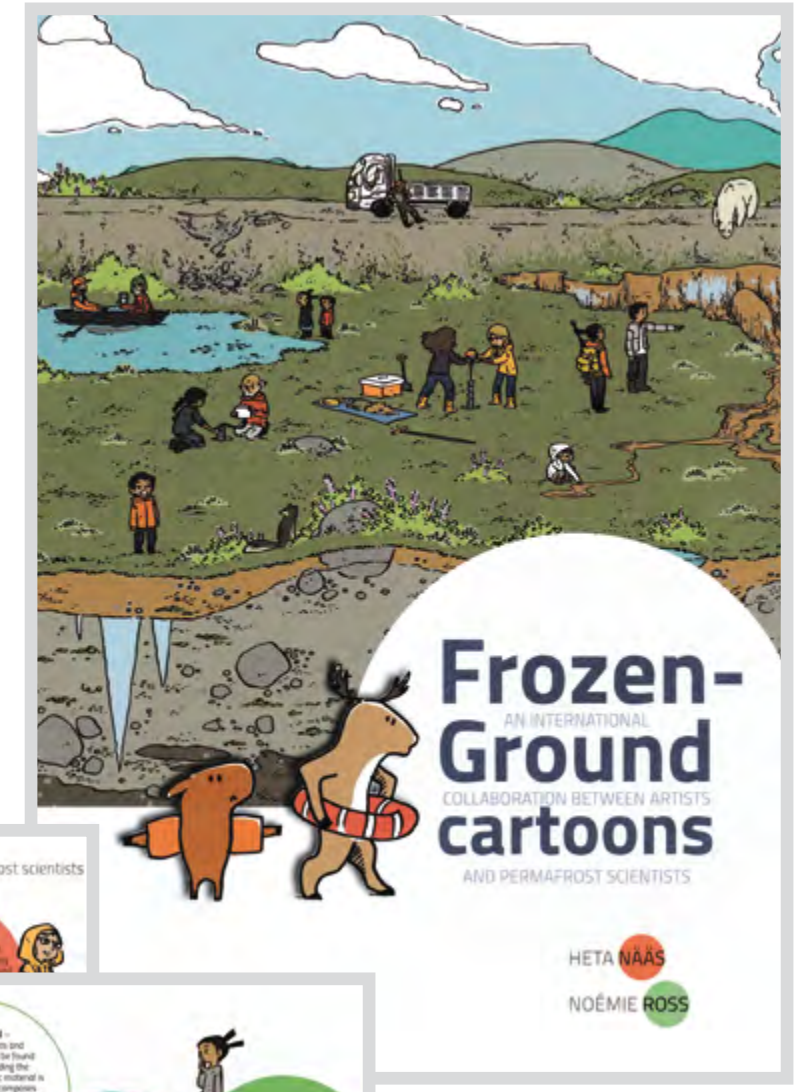

PHOTO: THE FROZEN-GROUND CARTOON

Atmosphere Working Group (AWG)

Scientific Foci:

- Cloud, Water Vapor, Aerosols, Fluxes
- Arctic Air Pollution
- Coupled Arctic Climate System
- Arctic Weather Extremes
- Linkages: Role of the Arctic in the Global Climate System

The scientific scope of the Atmosphere Working Group (AWG) includes research towards understanding and prediction of Arctic change. Arctic air pollution is a key priority, which has key influences on Arctic climate through trace gas and aerosol forcing, is harmful to Arctic communities and ecosystems, and may mediate important high latitude climate feedbacks. Other key priorities are snow, Arctic paleoclimates, and aerosol-cloud interactions in the Arctic including their controls on the aerosol population. Several of these priorities are cutting across several IASC Working Groups.

These topics have been put under the three pillars of 1) MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate), 2) PACES (air Pollution in the Arctic: Climate, Environment and Societies), and 3) YOPP/PPP (Year of Polar Prediction/Polar Prediction Project).Two of the main pillars of the AWG, MOSAiC and PACES, are firmly rooted in the AWG and MOSAiC was in fact born out of the AWG. More recently, the AWG has started to engage with PPP's YOPP. The AWG established a task force for this new venture, which had several exchanges with the PPP office over the recent months. The main idea for AWG was to facilitate exchange among the many science projects that are endorsed by YOPP. Hence, the AWG, together with the PPP office, is now organizing a YOPP Arctic science workshop, which will be held in January 2019 in Helsinki, Finland

PHOTO: IASC FILE PHOTO
IASC AWG during ASSW 2017 in Prague (Czech Republic)

Membership

NAME	COUNTRY	EXPERTISE
Chair Thomas Spengler	Norway	Atmosphere dynamics; Mesoscale meteorology; Air-sea-ice interactions
Vice-Chair Halldor Bjornsson	Iceland	Climate dynamics; Meteorology; Sea ice dynamics
Vice-Chair Stephen Arnold	UK	Arctic trace gases and aerosols; Atmospheric chemistry; Tropospheric ozone
Vice-Chair John Cassano	USA	Polar meteorology; Polar climate; Boundary layer processes;
Leopold Haimberger	Austria	Climate; Energy and water budgets; Surface and pper air instrumental records
Harald Rieder	Austria	Atmospheric chemistry; Chemistry-climate connections; Polar ozone
James Drummond	Canada	Remote sounding; Ozone and air quality; Climate change
G.W.K. (Kent) Moore	Canada	High-latitude air-sea-ice interactions; Polar meteorology; Paleoclimatology
Ding Minghu	China	Mass balance; Air-sea/ice interaction; Measurement technique
Kamil Laska	Czech Republic	Solar radiation modelling; Boundary layer processes; Glacier-climate interactions
Jacob Klenø Nøjgaard	Denmark	Arctic aerosol; Mass spectrometry; Source apportionment
Ole John Nielsen	Denmark	Atmospheric chemistry; Climate change; Spectroscopy
Kalevi Mursula	Finland	Space climate; Heliospheric and magnetospheric physics
Timo Vihma	Finland	ATM - Sea ice/snow interactions; Climate system; Arctic-mid latitude linkages
Kathy Law	France	Arctic air pollution; Long-range transport; Climate change
Günther Heinemann	Germany	Atmospheric boundary layer; Sea ice remote sensing; Mesoscale modelling
Annette Rinke	Germany	Arctic climate modeling; Arctic atmospheric processes; Surface-atmosphere interactions
Gudrun Nina Peterson	Iceland	Arctic weather; Extreme weather; Numerical weather prediction
Nuncio Murukesh	India	Arctic precipitation; Teleconnections; Tropical ocean atmosphere variability
Suresh Babu	India	Aerosol radiative forcing; Aerosol-cryosphere interaction; Aerosol-cloud interaction
Vito Vitale	Italy	Atmospheric Physics; Radiative transfer in the Atmosphere; Climate and climate change
Hiroshi L. Tanaka	Japan	Atmospheric science, General circulation, Dynamic meteorology
Jun Inoue	Japan	Arctic climate change; Air-sea-ice interactions; Arctic weather
Seong-Joong Kim	Korea	Polar climate dynamics; Climate modelling; Climate variability
Young Jun Yoon	Korea	Climate change; Atmospheric aerosols; Atmospheric physics
Peter van Velthoven	The Netherlands	Atmosheric chemistry and transport modelling; Near term climate forcers
Kjetil Tørseth	Norway	Atmospheric composition; Arctic air pollution; Long-range transport
Rajmund Przybylak	Poland	Climate variability and change in the Arctic and Poland; Historical climatology
Ewa Łupikasza	Poland	Climate change; Atmospheric circulation; Synoptic climatology
Daniele Bortoli	Portugal	Atmospheric physics; Active and passive remote sensing; Spectroscopy
Alexander P. Makshtas	Russia	Sea ice-atmosphere interaction; Climatic thermodynamic modeling
Boris Vladimirovich Kozelov	Russia	Geliogeophysical impact to Arctic atmosphere; Climate and micro-climate in Arctic region
Angel Frutos Baraja	Spain	Atmospheric optics; Lasers; Optical instrumentation
Michael Tjernström	Sweden	Arctic climate and climate processes; Arctic clouds and boundary-layer processes
Julia Schmale	Switzerland	Aerosol chemistry and microphysics; Cloud condensation nuclei; In-situ observations
Jo Browse	UK	Aerosol; Cloud; Modelling
Gijs de Boer	USA	Arctic clouds; Autonomous Observing; Aerosol-cloud interactions
FELLOWS		
Manisha Ganeshan	2017	Atmospheric boundary layer; Convection; Atmospheric turbulence
Gillian Young	2018	Cloud microphysics; Mixed-phase clouds; Aerosol-cloud interactions
SECRETARY: Rui Wang	China	Polar Research Institute of China

Recent Activities

Arctic/Midlatitude Weather and Climate Linkages

When: 12-13 September 2017 | Where: Helsinki (Finland)

Highlights:

- Despite numerous workshops and a growing literature, there is little scientific consensus on the topic.
- The jet stream provides the bridge between Arctic thermodynamic warming and midlatitude weather.
- Although there is major sea ice loss and Arctic warming in every year since 2007, only in a few years is the jet stream favorable for weather linkages.

This workshop compared case studies of recent linkage events, focusing on large- and synoptic-scale circulation patterns. The two recent winters (2015-6 and 2016-7) had extreme warm Arctic temperatures, yet how they evolved on a month to month basis were different in both East Asia and eastern North America. An eastern shift in the longitudinal phasing of the long wave pattern was evident between years earlier in this decade. Activities include cases that represent strong and weak meridional flow (Eurasia), high amplitude flows (western N. America), the initiation and maintenance of high-latitude blocking episodes in key regions (Greenland, Siberia) and their teleconnections, planetary wave trains, and coupling with the stratosphere.

A key path forward is to improve mechanistic/dynamical understanding. Analyses are needed connecting extreme weather events with longer-term climate forcings. Multiple factors are involved that make it difficult to develop a whole picture; there are no single pathways.

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Towards an Interdisciplinary Research Agenda for Arctic Air Pollution (PACES)

When: 2 April 2017 | Where: Prague (Czech Republic)

Highlights

- The workshop engaged researchers from humanities, social and natural sciences in discussing Arctic air pollution from a multidisciplinary perspective.
- Participants from three IASC working groups submitted a successful cross-cutting proposal to follow up with concrete on the ground research plans.
- A multi-scale framework of air pollution drivers, impacts, and related decision making was created.

The Arctic is increasingly considered an Anthropocene climate frontier, as the consequences of global warming look set to first and foremost impact the circumpolar hemisphere. The region is expected to

become increasingly important as climatic changes look set to spark industrial-scale resource extraction and increased transport and commodity shipping, in turn, spelling severe impacts for the regions ecological and cultural landscapes due to industrialization and consequent increases in pollution emissions from local sources related to mining and shipping. In studying the developments that are happening right now, research exchange and collaboration is timely not only between academic disciplines, but also increasingly, with relevant local partners and society at large.

This workshop provided a forum for focused discussions on how to combine research methodologies from humanities, social and natural sciences to understand current and future air pollution in the Arctic with the aim of proposing mitigation options. The conversations built on ideas from two previous PACES meetings held in 2015 and the "Air Pollution and Arctic Societies" workshop in Fairbanks during ASSW 2016. Participants designed a multi-scale framework in which research methodologies of drivers, impacts and related decision making of air pollution were identified at the local, regional and global level.

Website: pacesproject.org
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The Second PACES Science Workshop

When: 27-29 June 2017 | Where: Victoria (Canada)

Highlights

- Long-range transport of pollution to the Arctic is intimately linked to Arctic climate change and changes in large-scale circulation patterns but such linkages require improved quantification.
- Natural sources of trace constituents in the Arctic such as dust aerosols or biogenic hydrocarbons, and their potential evolution as a result of climate change, are poorly constrained.
- Large uncertainties surround the formation and processing of local air pollution under very cold, dry, stable conditions in the Arctic.
- Model treatments of wet deposition and chemical/aerosol processing are still significant and are motivating the planning of a new field experiment (IMPAACT) designed to sample air masses in a quasi-Lagrangian fashion during transport of pollution from Asia to the Arctic.

At the 2nd PACES Open Science Workshop, leading investigators in the Earth-Arctic system gathered to discuss the latest issues regarding sources, processing, and impacts of trace gas and aerosol pollution in the Arctic. The workshop was focused on improving predictive capabilities of Arctic air pollution processes and the interaction between Arctic air pollution and Arctic societies through discussions and presentations. PACES aims to review existing knowledge and foster new research on the sources and fate of Arctic air pollution, its impacts on climate, health, and ecosystems, on the feedbacks between pollution and natural sources, on climate responses, and on societal perspectives, including sustainability, adaptation and economic feedbacks.

Key recommendations for improved understanding of pollution processes and impacts emerged from

discussions at the workshop, including motivation for new modelling and field observations. These include efforts to develop international collaborative experiments aimed at improving knowledge of processes controlling export of pollution from mid-latitudes to the Arctic, as well as experiments targeted at sampling sources and processing of pollution in an Arctic urban environment.

Website: www.pacesproject.org
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Sandy Starkweather · sandy.starkweather@noaa.gov

PHOTO: GABRIEL LEWIS
Launching a weather balloon at Summit Station, Greenland

Cryosphere Working Group (CWG)

Scientific Foci:

- Sea-ice boundary layer dynamics, particularly as they relate to biogeochemical exchanges and polar amplification.
- Permafrost, including support of activities being undertaken by the International Permafrost Association.
- Tidewater glacier dynamics and response to climate change, with a focus on methods for studying these issues. This activity is intended to have a large early career scientist and training component

The Cryosphere Working Group (CWG) is composed of 40 members from 23 countries, including three early-career IASC fellows and an IASC Officer. Our research interests span all elements of the cryosphere - the frozen regions of our planet - including sea ice, mountain glaciers, ice caps, icebergs, the Greenland ice sheet, snow cover, permafrost and seasonally frozen ground, and lake and river-ice. The CWG helps promote activities that enhance our understanding of these cryospheric components of the Arctic/sub-Arctic and their interaction with the Earth's climate system. While the CWG is interested in all elements of the cryosphere, our activities we have structured across three main themes:

- ***Atmosphere-glacier-ocean interactions: implications on the pan-Arctic glacier mass budget***, which explores the link between the response of glaciers to climate change and both atmospheric changes and ocean circulation, with focus on the dynamics and mass budget of Arctic glaciers and their impact on global sea-level and regional freshwater runoff.
- ***Cutting barriers in snow knowledge***, in which the impact of snow on glacier and ice-sheet mass balance and sea-ice variability is explored. Through this theme we seek to promote an improved common knowledge of snow-related processes by bringing together snow-interested scientists working within the various IASC working groups.
- ***Causes, impacts and prediction of extreme Cryospheric events***, which aims to gain understanding on a wide variety of phenomena, including intense storms/cyclonic activity, severe warm periods, droughts, rapid iceberg calving events, anomalous ice-sheet surface melt, avalanches, and heavy rain-on-snow events, many of which are becoming more frequently observed in the Arctic.

PHOTO: IASC FILE PHOTO
IASC CWG during ASSW 2017 in Prague (Czech Republic)

Membership

NAME	COUNTRY	EXPERTISE
Chair Francisco Navarro	Spain	Glacier and Ice-sheet dynamics modeling; Ground-penetrating radar; Glacier mass balance
Vice-Chair Jari Haapala	Finland	Sea ice physics; Numerical modeling; Climate variablity and change
Vice-Chair Martin Schneebeli	Switzerland	Snow and snow tomography; Stratigraphy; Snow instruments
Annett Bartsch	Austria	Permafrost; Snow; Remote sensing
Wolfgang Schöner	Austria	Glacier mass balance; Surface energy balance; Snow climatology
Shawn Marschall	Canada	Glacier and ice sheet modelling; Cryosphere-climate processes; Glacier mass balance
Sun Bo	China	Radioglaciology; Ice sheet mass balance and sea level; Sea ice processes and climate
Marie Sabacka	Czech Republic	Environment, Molecular Biology, Ecology and Evolution
René Forsberg	Denmark	Ice sheet changes from satellites; Airborne lidar; Sea ice thickness determination
Signe Bech Andersen	Denmark	Glaciology; Greenland Ice sheet; Climate
Pentti Kujala	Finland	Modeling of Arctic shipping; Senario based risk management of arctic shipping and operations
Hans-Werner Jacobi	France	Snow physics and chemistry; Snow-atmosphere interactions; Climate
Hugues Lantuit	Germany	Permafrost; Geomorphology and remote sensing; Coastal science
Lars Kaleschke	Germany	Sea Ice Remote Sensing; Operational sea ice forecast; Sea ice in the climate system
Gudfinna Th. Adalgeirsdottir	Iceland	Climate - glaciers/ice sheets interaction; Evolution of Icelandic glaciers and the Greenland ice sheet;
Thorsteinn Thorsteinsson	Iceland	Glaciology; Ice drilling; Climate history
Parmanand Sharma	India	Glacier mass and energy balance; Surface and sub surface flow (ice flux)
Hiroyuki Enomoto	Japan	Climate research; Satellite remote sensing; Sea ice, snow, ice sheet
Shin Sugiyama	Japan	Glacier; Ice sheet; Greenland
Hyun Cheol Kim	Korea	Remote sensing; Sea ice
Soon Do Hur	Korea	Ice core; Glacio-chemistry; Geochemistry
Carleen Tijm-Reijmer	The Netherlands	Meteorology; Climatology; Glaciology
Elisabeth Isaksson	Norway	Glaciology; Ice cores; Snow chemistry
Jon Ove Hagen	Norway	Glaciology; Arctic glaciers and ice caps; Mass balance and dynamics
Mariusz Grabiec	Poland	Mass balance; Geometry changes; Thickness and internal structure of Arctic glaciers
Krzysztof Migala	Poland	Climate and cryosphere; Ecosystems and cryosphere; Snow cover
Gonçalo Vieira	Portugal	Permafrost; Remote sensing; Geomorphology
Dmitry Drozdov	Russia	Remote sensing; Permafrost; Arctic Coastal Dynamics
Sergei Verkulich	Russia	Glaciers; Antarctic sediment; Terrestrial records
Carolina Gabarro	Spain	Remote sensing; Sea ice extension; Sea ice thickness
Veijo Pohjola	Sweden	Glaciology; Climatology; Natural hazards
Martin Lüthi	Switzerland	Glaciology; Ice sheet dynamics; Glacier calving
Poul Christoffersen	UK	Glacial hydrology; Ice-ocean interactions; Basal processes
Richard Essery	UK	Snow modelling; Seasonal snow cover; Snow hydrology
Elizabeth Hunke	USA	Sea ice modeling; Polar climate; Computational performance
Robert Hawley	USA	Glaciers, ice sheets, snow and firn; Mass balance; Remote sensing
FELLOWS		
Shridhar Jawak	2017	Polar remote sensing
Alice Bradley	2018	Sea ice; Marginal ice zone and coastal processes; Environmental heat transport
SECRETARY: Tetsuo Sueyoshi	Japan	National Institute of Polar Research

Recent Activities

4th Snow Science Winter School

When: 11-17 February 2018
Where: Col du Lautaret (France)

Highlights:

- from the survey after the course: 90% of the students would recommend the course to their colleagues, 80% of the students found the course „useful or extremely useful"
- unique opportunity for lecturer and student to exchange snow know-how in lectures, workshops and field measurements
- challenging and interesting field conditions between -20°C and almost rain, but everybody kept working in good mood!

The 4th Snow Science Winter School (SSWS) brought together 24 students from 13 countries. Organized by the Snow study center (CNRM/CEN - Météo France/CNRS), WSL Institute for Snow and Avalanche Research SLF from Davos, Switzerland, the Station Alpine Joseph Fourier (SAJF), the Institut des Géosciences de l'Environnement (IGE/OSUG – CNRS / Grenoble INP / IRD / UGA), and the Finish Meteorological Institute FMI, the snow school focused on modern snow measurement techniques and alpine snowpack detailed modelling.

Traditional and modern field instruments were available for the students to get hands-on experience in the field, together with introductory lectures. Two full field days of exercise were organized close to Col du Lautaret and gave a first feeling for a self-organized expedition. The success motivated the lecturers to prepare a 5th SSWS that will take place in Finland in 2019.

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PHOTO: SVETA STUEFER

Snow science winter school: Martin Schneebeli and Martin Proksch demonstrating the SnowMicroPen on the bog site of the Finnish Meteorological Institute in Sodankylä, Finland.

Marine Working Group

Scientific Foci:

- Predicting and understanding rapid changes to the Ocean system
- Understanding biological and ecosystem processes in the Arctic and sub-Arctic seas
- Understanding sea ice structure dynamics and the Arctic system
- Understanding geochemical processes in the Arctic and sub-Arctic seas
- Climate and geological history of the Arctic basin

The Marine Working Group (MWG) of IASC facilitates international coordination of research in the Arctic marine environment and supports cross-cutting objectives through face-to-face annual meetings. Frequent electronic communication is used throughout the remainder of the year, including exchange and collaboration with terrestrial, cryospheric, atmospheric and social scientists where appropriate. The MWG also seeks to encourage and facilitate two-way communication between working group members from each member state of IASC and their national science constituencies. Another important goal is to provide support for early career scientists and include their involvement in international research coordinated by IASC member countries, including expanding roles for IASC Fellows in MWG tasks.

Specific work goals that were integrated into the MWG Work Plan in 2017 included project coordination and support for prominent initiatives that include: renewal of the Arctic in Rapid Transition network that has provided a mechanism for the early career science community to become engaged in international Arctic research; implementation of the Multidisciplinary drifting Observatory for the study of Arctic Climate (MOSAiC); contribution to the Workshop on Arctic Glaciology and Proglacial Marine Ecosystem; and expansion of the Distributed Biological Observatory on a pan-Arctic basis. Strengthening international cooperation with Russian scientists remains a key goal, including support for IASC's Russian Arctic (ISIRA) activities that are seeking to improve conditions for marine research within Russia's Exclusive Economic Zone. Finally, identifying new mechanisms to involve the MWG in Arctic Council observer activities and meetings are critical to connecting research with governmental affairs at the international level.

PHOTO: IASC FILE PHOTO
IASC MWG during ASSW 2017 in Prague (Czech Republic)

Membership:

NAME	COUNTRY	EXPERTISE
Chair Lee Cooper	USA	Marine biogeochemistry, including stable and radioactive isotopes
Vice-Chair Heidi Kassens	Germany	Marine Geology; Interdisciplinary polar research projects; Cooperation with Russia
Vice-Chair Hajime Yamaguchi	Japan	Naval architecture and ocean engineering; Arctic sea routes; Sea ice
Gerhard Herndl	Austria	Limnology; Microbial oceanography of Polar seas
Renate Degen	Austria	Marine ecology; Benthic ecosystems; Functional traits
John Fyfe	Canada	Global and regional climate variability; Role of the poles in the global system
Christine Michel	Canada	Role of sea ice in Arctic marine ecosystems; Pelagic and benthic Arctic food webs
Jinping Zhao	China	Physical oceanography; Sea ice physics; Ice and marine optics
Oleg Ditrich	Czech Republic	Parasitology; Zoology; Polar ecology
Naja Mikkelsen	Denmark	Marine geology; Climate history; Paleoceanography
Jaakko Heinonen	Finland	Arctic marine technology; Offshore structures; Offshore wind energy
Hermanni Kaartokallio	Finland	Sea ice ecology; Microbial ecology in cold marine environments
Torsten Kanzow	Germany	Observational physical oceanography; Long-term time series observations
Gudrun Marteinsdottir	Iceland	Fish biology; Behavioral ecology; Population structure and dynamics
Steingrimur Jónsson	Iceland	Physical oceanography; Ocean circulation; Hydrography
K.P. Krishnan	India	Microbial ecology; Bacterial taxonomy; Cold adaptation
Stefano Aliani	Italy	Physical oceanography; Marine ecology; Marine debris
Koji Shimada	Japan	Physical oceanography; Sea ice dynamics; Climate dynamics
Baek Min Kim	Korea	Wind; Climate variability
Sung-Ho Kang	Korea	Biological oceanography; Marine phytoplankton ecology
Anita Buma	The Netherlands	Marine phytoplankton; Ecophysiology; Photobiology
Marit Reigstad	Norway	Marine systems ecology; Biological carbon pump; Plankton
Randi Ingvaldsen	Norway	Physical/Polar oceanography; Climate variability; Climate impacts on species and ecosystem
Monika Kędra	Poland	Oceanography; Marine ecology; Food webs; Carbon cycling
Waldemar Walczowski	Poland	Physical oceanography; Hydrology; Ocean and glacier interaction
Teresa Cabrita	Portugal	Marine biogeochemistry; Coastal ecosystems; Phytoplankton ecophysiology
Alexander Makshtas	Russia	Air - sea ice interaction in the Arctic; Structure of atmospheric surface layer in the polar regions
Sergey Viktorovich Pisarev	Russia	Meso-scale oceanographic processes; Shot-period variations of ocean climate in the Arctic Ocean
Franscisco Gordillo	Spain	Marine ecology; Plant physiology; Marine bontany
Miquel Canals	Spain	Marine sedimentary proccesses and products; Marine environment; Marine biogeochemistry
Pauline Snoeijs Leijonmalm	Sweden	Sea-ice ecology; Microbiology; Fish ecology
Jeremy Wilkinson	UK	Sea ice physics; Thermodynamics and mechanics; Ocean wave propagation through sea ice
Andrew Brierley	UK	Marine ecology; Scientific echosounding; Zooplankton ecology
Karen Frey	USA	Global environmental change; Land-ocean linkages; Permafrost hydrology and vegetation dynamics
FELLOWS		
Thomas Armitage	2017	Polar sea ice and oceanography, Sea ice-ocean interactions, Arctic freshwater budget, Ice sheet-ocean interactions
Françoise Amélineau	2018	Seabird and shorebird ecology; Spatial ecology; Microplastic pollution
SECRETARY: Jeanette Axelsson	Sweden	Swedish Polar Research Secretariat

Recent Activities

Understanding Polar Ecosystem Change through Time Series Observations, Technological Advances, and Biophysical Coupled Modeling

When: 25-26 March 2017 | Where: Ventura, CA, USA

Highlights:

- Discussion of a range of innovative marine technology including autonomous and remotely operated instruments, camera systems, advanced laboratory techniques, and numerical modeling for polar research use.
- Discussion of new findings and uncertainties associated with marine time series data and identified successes and challenges emerging from time series observations and biophysical modeling.
- Early career scientists were given the opportunity to present data and give perspectives on how these technological advances could improve the physical-biological understanding of polar marine ecosystems.

Held under the sponsorship of the Gordon Research Conferences (GRC) the Gordon Polar Marine Science Conference focused on the theme "Understanding Polar Ecosystem Change Through Time Series Observations, Technological Advances, and Biophysical Coupled Modeling". Oral presentations were made by 22 science experts, followed by discussions that were moderated by 7 discussion leaders and the event was attended by 124 registered scientists.

Topics included discussion of cutting-edge interdisciplinary polar science observations, technological advancements and biophysical modeling activities associated with polar time series studies.

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Ecosystem Studies of Subarctic and Arctic Seas (ESSAS) Open Science Meeting

When: 11-15 June 2017 | Where: Tromsø, Norway

Highlights:

- Discussion included the topic of the increasing "borealization" at the Subarctic/Arctic boundary, which appears to be more pronounced in the Atlantic Arctic than in the Pacific Arctic.
- Discussion of both gradual changes and unusual events in recent years in the Subarctic and Arctic that is most likely climate-related, including anomalous warm conditions and unusual mortality events.

- The probability of extreme or unusual events is expected to increase and disruptions of food webs, fish populations and existing fisheries associated with warm events are likely. Inter- and transdisciplinary approaches and training spanning the natural and social sciences is essential to understanding the impacts of these changes.

The Ecosystem Studies of Subarctic and Arctic Seas (ESSAS) Open Science Meeting included a series of workshops and sessions that highlighted the dynamic nature of marine ecosystems in a time of rapid change, and the implications for people that depend on the services provided by these systems. The theme of the meeting was "Moving in, out, and across Arctic and Subarctic Marine Ecosystems: Shifting Boundaries of Water, Ice, Flora, Fauna, People and Institutions". The conference was attended by 187 participants from 17 countries.

The ESSAS meeting covered a wide variety of topics, including several sessions that examined the consequences of changes in Arctic marine ecosystems for human communities that depend upon these ecosystems and how people and communities cope with changes in the goods and services that they derive from these ecosystems.

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Distributed Biological Observatory (DBO) Data Meeting

When: 8-9 November 2017 | Where: Seattle, USA

Highlights:

- Shared data gathered in the North Pacific Arctic, within the Distributed Biologic Observatory (DBO) system collected between 2010 and 2017
- Discussed the idea of implementing a similar system in the Atlantic Arctic
- Discussed the best practices for archiving parameter files and data generated in the DBO

The annual Distributed Biological Observatory (DBO) workshop is organized to facilitate data sharing among countries occupying the established DBO sampling grid in the Pacific Arctic. The MWG also supported expansion of the DBO sampling grid to the Atlantic Arctic through workshop support in 2016 for establishment and coordination of Atlantic Arctic DBO sampling.

Participation in the 2017 Seattle data sharing meeting included 49 scientists from the United States, Canada, Japan, Korea, the United Kingdom, and Poland, with early career scientist participation supported by the MWG. The aim of the overall DBO initiative is to increase the number of observations that can be compiled and synthesized to build a larger and consistent data set in this remote, but rapidly changing region.

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Sue Moore · sue.moore@noaa.gov

Social and Human Working Group (SHWG)

Scientific Foci:

- Arctic residents and change**
- Histories, perceptions and representations of the Arctic**
- Securities, governance and law**
- Natural resource(s)/ use/ exploitation and development: past, present, future
- Human health and well-being

Cross-Cutting Foci:

- Human health, well-being and ecosystem change
- Long-term impacts, vulnerability and resilience in Arctic social-ecological systems
- Competing forms of resource use in a changing environment
- Perception and representation of Arctic science

The scientific scope of the Social and Human Working Group (SHWG) includes all aspects of social sciences and humanities research in the Arctic, as well as their connections with other IASC Working Groups. It is important to integrate the social and human perspective into international efforts to address issues of climate and environmental change. Not only does human behavior have an enormous influence on the environment, but changing natural environments also directly and indirectly affect people. A wide range of topics is therefore of interest to the SHWG, including human health and well-being; exploitation and development of natural resources; governance and law; vulnerability and resilience in changing social-ecological systems; and histories, perceptions, and representations of the Arctic. As demonstrated by the supported activities in 2017/18, SWHG members address these topics in all manners of ways: by going into depth on core concepts, by bringing a global perspective to the Arctic, and by working closely with local stakeholders.

PHOTO: IASC FILE PHOTO
IASC SHWG during ASSW 2017 in Prague (Czech Republic)

**denotes a priority within the scientific foci

Membership:

NAME	COUNTRY	EXPERTISE
Chair Peter Sköld	Sweden	Arctic regional development; Indigenous health, cultures, identities; Research planning
Vice-Chair Gunhild Hoogensen Gjorv	Norway	Security in the Arctic; Geopolitics of the Arctic; Peace and conflict in the Arctic and globally
Vice-Chair Andrey Petrov	USA	Arctic regional/economic development; Sustainability; Urbanization
Past-Chair Gail Fondahl	Canada	Indigenous rights in Russian North; Sustainability; Historical/cultural geographies of reindeer herding
Gertrude Saxinger	Austria	Anthropology; Indigenous communities; Extractive industries; Labour mobility (FIFO); Infrastructure
Peter Schweitzer	Austria	Infrastructure Studies; Anthropology of Climate Change; Indigenous Political Movements
Susan Chatwood	Canada	Health Research Capacity in Northern Canada; Arctic/Remote Health Systems Research Indicator development & health systems performance frameworks
Xu Shijie	China	Geomagnetism; Remote Sensing
Yang Lei	China	Climate Change
Su Ping	China	International relations, Diplomacy, Governance
Barbora Padrtova	Czech Republic	Arctic geopolitics and security; International relations; Foreign policy
Pelle Tejsner	Denmark	Human rights; Sustainable development; Land use policy
Robert Chr. Thomsen	Denmark	Autonomy/self-governance movements; Greenland; Indigenous movements.
Arja Rautio	Finland	Environmental health; Social exclusion; Indigenous health and wellbeing
Lassi Heininen	Finland	International relations, geopolitics and security; Environmental politics; Northern Europe and Russia
Béatrice Collignon	France	Inuit geographic knowledge; Geographies of the Inuit; Inuit culture and contemporary societies
Virginie Vaté	France	Anthropology of religion; Shamanism and christianity; Conversion
Alexander Proelss	Germany	International law; International law of the Sea; International environmental law
J. Otto Habeck	Germany	Gender and social distinction; Segregation, marginality and mobility; Indigenous land use
Joan Nymand Larsen	Iceland	Economic development; Arctic economies; Human development in the Arctic
Dhurjati Majumdar	India	Arctic sustainability
Shinichiro Tabata	Japan	Economic development and sustainability of the Russian Arctic regions
Akiho Shibata	Japan	International law; Polar law and policy
Dongmin Jin	Korea	Polar law and policy; International Cooperation
Peter Jordan	The Netherlands	Circumpolar Archaeology; History and Anthropology
Gunhild Hoogensen Gjorv	Norway	Security in the Arctic; Geopolitics of the Arctic; Peace and conflict in the Arctic and globally
Halvor Dannevig	Norway	Climate change adaptation; Environmental governance; Co-production of knowledge
Michał Luszczuk	Poland	Interational relations; Diplomacy; Security
Ryszard Czarny	Poland	Foreign policy of Nordic countries; Nordic security policy; Northern dimensions in EU policy
Andrei Golovnev	Russia	Anthropology, ethnography and ethnohistory; Arctic nomads, migration and movement
Andrey Podoplekin	Russia	Social psychology in the Arctic; Circumpolar states; Policy of scientific researches
Elena Conde	Spain	Arctic; Law of the Sea; Legal regime of marine scientific research
Michael Bravo	UK	Governance; Geography; Science and public policy
Lawrence Hamilton	USA	Sociology; Demography; Survey research
FELLOWS		
Violetta Gassiy	2017	Sustainable development; Community development; Green economy
Stanislav Ksenofontov	2018	Sociology; Demography; Survey research
SECRETARY:		
Gunnar Gunnarsson	Iceland	IASC and Stefansson Arctic Institute

In addition, the SHWG continues to develop its cross-cutting activities along the research priorities that emerged from the ICARP III – Roadmap for the Future. The ICARPIII process concluded that more research is needed into 'Cultural Responses to Long-Term Arctic Change.' In light of this, the SHWG continued to support the Sustainable Arctic Infrastructure Forum (SAIF) and launched a new cross-cutting initiative entitled 'Long-term impacts, vulnerability and resilience in Arctic social-ecological systems' (SESs). The SESs session at ASSW 2017 focused on the paleo-history, as a starting point for further investigation into what factors contribute to long-term vulnerability and resilience in complex human-environment relationships.

Recent Activities

Multidisciplinary Communication and the Governance of Evolving Global Dynamics in the Arctic

When: 6 April & 12 June 2017 | Where: Prague (Czech Republic) & Umeå (Sweden)

Highlights

- The notion of "boundary objects" from Science and Technology Studies offers one way to enter the analysis of why specific initiatives that include conflicting interests, many actors and a need for collaboration thrive and others do not.
- An exercise of translating and discussing the different social worlds present and interconnected to work sites of scientists is one way of acknowledging silenced or implicated actors and biases in research design i.e. rising out from differences in temporal and spatial scales.
- In cross-disciplinary research planning there should be enough time planned for interchange between the different paradigms. This ensures that there is respect for the differences in them. It also lessens the tendency of setting different paradigms in hierarchical position against each other.

Specific evolving socio-political and material global dynamics, such as the progress of unprecedented anthropomorphic global warming and the rise of climate change skepticism, put increasing pressure on multidisciplinary communication. This project explores whether the notion of ‚boundary object' from science and technology studies could be used to facilitate the further development of multidisciplinary and multi-stakeholder communication in the context of evolving, global Arctic governance. In its original framework, the concept was used to examine how the viewpoints and interests of actors inhabiting different social worlds, such as natural and technical scientists, philanthropists, and recreational hunters, have been able to be accounted for in the organization of cooperation for scientific work in complex institutional settings.

Two conference sessions, one during Arctic Science Summit Week 2017 and the other during IX International Congress for Arctic Social Sciences, were planned to assist in exploring whether it could also be utilized to facilitate the translation and communication of different normative, epistemic and ontological assumptions of different socio-political actors and scientific disciplines in the development of new, sustainable global governance.

Contact: **Justiina Dahl** · Justiina.Dahl@EUI.eu

PHOTO: KAMIL JAGODZINSKI
Rovaniemi, 2012

Understanding Peace in the Arctic

When: June 2017 | Where: Tromsø (Norway)

The Arctic is often claimed to be a unique region, both for its natural environment, as well as the peaceful political conditions that continue to prevail, despite the tensions and challenges taking place on a global scale. Cooperation in the Arctic has shown to be robust and in some ways detached from disagreements and tensions developing elsewhere in international policy. The Understanding Peace in the Arctic conference was a timely international event that brought together international and local researchers that contribute to the understanding of Arctic geopolitics and society, bringing expertise in natural sciences, social sciences, and the arts. The purpose of the conference was to ask what is "Peace" in the Arctic, in which ways, or how, does our research across the disciplines play a role in contributing to peace in the Arctic, and how is our research relevant to developing policy?

Contact: **Gunhild Hoogensen Gjørv** · gunhild.hoogensen.gjorv@uit.no

Permafrost Dynamics and Indigenous Land Use in the Northern Urals

When: 24-27 September 2017 | Where: Vorkuta (Russia)

Highlights:

- The workshop complemented previous permafrost research by focusing on the more extensive forms of renewable resource use, notably mobile pastoralism.
- The workshop brought together local land users, environmental scientists and social scientists, each of which groups holds different understandings of permafrost landscape characteristics.
- As an activity of the International Permafrost Association (IPA) Action Group Permafrost and Culture (PaC), the workshop will facilitate a synthesis of current knowledge and help identify needs for future research.

While it is often assumed that Indigenous livelihoods in the Far North will inevitably suffer from permafrost degradation under conditions of a warming climate, the actual linkages between permafrost degradation and renewable resource use are still unclear. Considering the potential of mobile pastoralism to modify the natural environment to some degree, it is necessary to examine the interplay of land use, vegetation, climate, hydrological, and cryospheric processes in more detail, taking into account the diversity of regional and local conditions. With this in mind, the IPA (International Permafrost Association) Action Group "Permafrost and Culture" conducted an interdisciplinary workshop in Vorkuta in September 2017, addressing the link between reindeer husbandry and landscape dynamics in the lowland tundra areas on both sides of the Northern Urals. The workshop complements previous studies on permafrost and land use (Central Yakutia, Republic of Sakha) and contributes to establishing a comparative circumpolar perspective.

Contact: **Joachim Otto Habeck** · otto.habeck@uni-hamburg.de

Terrestrial Working Group (TWG)

Scientific Foci:

- Improving knowledge at multiple spatial scales of the current state of Arctic terrestrial geosystems and ecosystems
- Determining the net effect of the terrestrial and freshwater environmental and biosphere's processes that amplify or moderate climate warming
- 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
- Estimating past changes in Arctic geo- and biodiversity, measuring current change and predicting future changes
- Developing high spatial resolution models of terrestrial geosystem 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
- Determining the role of connectivity in the functioning of Arctic terrestrial systems, including connections within the Arctic and the global system

The Terrestrial Working Group (TWG) fosters and supports a broad spectrum of activities, reflecting the enormous geo-, bio- and social diversity associated with the Arctic terrestrial and freshwater realms. A couple of highlights for 2017 illustrate this diversity of emphasis, as well as our commitment to cross-cutting activities with other IASC WG partners. 2017 saw the launch of 'T-MOSAiC' (the Terrestrial Multidisciplinary distributed Observatories for the Study of Arctic Climate) following its inception at the TWG and CWG meetings in Prague as a circumpolar, land-based program that would operate in parallel with the IASC ocean-atmosphere program, MOSAiC; a T-MOSAiC secretariat has been established at the University of Lisbon.

PHOTO: IASC FILE PHOTO
IASC TWG during ASSW 2017 in Prague (Czech Republic)

Membership:

NAME	COUNTRY	EXPERTISE
Chair Philip Wookey	UK	Biodiversity; Biogeochemistry; Carbon fluxes and cycling
Vice-Chair Josef Elster	Czech Republic	Microbial ecology; Stress ecophysiology of cyanobacteria and microalgae
Vice-Chair Vladimir Romanovsky	USA	Geographic areas: Beringia (Alaska and NE Siberia), Norway and Svalbard
Past-Chair Ingibjorg Svala Jonsdottir	Iceland	Biodiversity; Tundra ecology; Plant animal interactions
Andreas Richter	Austria	Microbial ecology; Terrestrial ecosystem ecology; Belowground plant-microbe interactions
Birgit Sattler	Austria	Microbial ecology; High altitude and polar limnology; Aerobiology
Philip Marsh	Canada	Hydrology; Snow; Permafrost; Hydrologic-Terrestrial System Interactions
Warwick F. Vincent	Canada	Freshwater ecosystems; Impacts of climate change on permafrost systems; Microbial biodiversity
Luo Wei	China	Phytoplankton; Microbiology; Molecular ecology
Mads Forchhammer	Denmark	Arctic biology; Climatic responses; Ecosystem structure
Torben R. Christensen	Denmark	Biogeochemistry; Carbon cycling; Terrestrial ecosystem functioning
Miska Luoto	Finland	Data mining; Remote sensing; Biogeography
Otso Suominen	Finland	Animal ecology; Herbivory impacts on communities and ecosystems; Biodiversity
Thierry Boulinier	France	Seabird ecology; Disease ecology; Animal ecology
Ulrike Herzschuh	Germany	Ecosystem change on decadal to glacial time-scales; Ancient DNA and pollen analysis
Karsten Piepjohn	Germany	Structural Geology
Jón S. Ólafsson	Iceland	Freshwater Ecology; Ecosystem Processes; Subarctic freshwater ecosystems
Manish Tiwari	India	Paleoclimatology; Stable isotope geochemistry; Geology
Ratan Kar	India	Geology; Palynology; Palaeoclimate
Atsuko Sugimoto	Japan	Biogeoscience; Permafrost ecosystem; Methane
Takayuki Nakatsubo	Japan	Ecosystem Ecology; Plant Ecology; Microbial Ecology
Yoo Kyung Lee	Korea	Arctic terrestrial ecology; Permafrost microbial community analysis; Astrobiology
Tae-Yoon Park	Korea	Palaeontology; Evolutionary Biology; Polar Geology
Rien Aerts	The Netherlands	Global Change effects on polar ecosystem functioning; Biodiversity; Biogeochemistry
Inger Greve Alsos	Norway	Arctic flora; Ancient DNA; Effect of climate change
Piotr Glowacki	Poland	Physical Geography; Hydrology
Wieslaw Ziaja	Poland	Physical Geography; Landscape Ecology; Environmental implications of climate change
João Canário	Portugal	Biogeochemistry; Permafrost; Trace-elements
Olga L'vovna Makarova	Russia	Mites and insects; Arthropod communities; Mite phoresy
Alexander Makarov	Russia	Carbon cycle
Benjamin Vinegla Pérez	Spain	Plant ecophysiology; Plant-soil interactions; Soil ecology
Daniel Sanchez-Mata	Spain	Bioclimatology; Biogeography; Plant sociology
Hans Linderholm	Sweden	Arctic climate change; Paleoclimate; Glacier variability
Christian Rixen	Switzerland	Arctic and alpine plant ecology; Biodiversity and ecosystem functioning
Gabriela Schaepman-Strub	Switzerland	Biodiversity; Ecosystem functioning; Energy budget; Remote sensing
Mary Edwards	UK	Vegetation ecology and palaeoecology; Quaternary biogeography; Long-term climate history
Michelle Mack	USA	Plant and ecosystem ecology; Disturbance ecology; Nitrogen cycling
FELLOWS		
Alevtina Evgrafova	2017	Soil science, Permafrost degradation, Spatial data analysis
Anna-Maria Virkkala	2018	Ecosystem ecology, Greenhouse gases, Soil organic carbon
SECRETARY: Galina Antonovskaya	Russia	N. Laverov Federal Center for Integrated Arctic Research

With a very different emphasis, and targeting a new audience, the TWG (together with the CWG and other partners) was proud to help support the development of The Frozen-Ground Cartoon(s), an international outreach and education project led by permafrost early-career scientists. The project aims to present and promote permafrost research to the general public, specifically school children. The comic strip series was released in late 2017 (https://frozengroundcartoon.com/cartoons/) and features, among many other things, a bumpy road, reindeer herders and even a frozen turkey! Translations into other languages are underway, along with the production of augmented reality material (e.g. 3-D sketches, videos).

Recent Activities

Arctic Vegetation Archive (AVA)

When: 30-31 March 2017 | Where: Prague (Czech Republic)

Highlights

- An Arctic Vegetation Archive is an essential first step for developing an Arctic Vegetation Classification, monitoring change in terrestrial ecosystems, and developing a circumpolar framework for studying and modeling changes to the Arctic.
- Major progress on the AVA was achieved since the first AVA workshop in Krakow, including completion of the Alaska Arctic Vegetation Archive, and recent efforts toward using this in developing an Arctic Vegetation Classification.
- Many of the legacy data in the AVA were collected using non-standardized protocols. Going forward, new datasets should incorporate standardized methodologies for surveys, archiving, and analysis of Arctic plot data; workshops to develop these protocols should probably be proposed as part of the Arctic Observing Network activities.

An Arctic Vegetation Archive (AVA) is needed to develop an effective Arctic terrestrial monitoring program and provide a standardized vegetation framework and data for an Arctic Vegetation Classification (AVC), land-cover mapping, ecological experiments, modeling, and biodiversity studies. Insufficient and non-standardized Arctic vegetation plot data are available to accomplish this task. The recently launched AVA and AVC aim to fill this knowledge gap.

The AVA and AVC would cover the entire Arctic tundra biome, the first for any of the world's major biomes. This is achievable because the Arctic is the only biome that has its entire list of known vascular plants, mosses and lichens documented in up-to-date flora checklists developed by taxonomists within the CAFF Flora Group. Also the amount of vegetation plot data from the Arctic is still relatively modest compared to other biomes (approximately 31,000 plots). A large body of international experience and collaboration with database experts in other regions will also help to make the Arctic task feasible.

Contact: **Donald A. (Skip) Walker** · dawalker@alaska.edu

PHOTO: PHILIPP ASSMY, NORWEGIAN POLAR INSTITUTE
An arborescent colony of the Arctic sea ice diatom Nitzschia frigida at 200X magnification sampled in drifting sea ice east of Svalbard

T-MOSAiC

When: 11-15 December 2017 | Where: Québec (Canada)

Highlights:

- The objective of T-MOSAiC is to coordinate activities by extending the work of MOSAiC to the lands surrounding the Arctic Ocean and to the northern communities who live on those lands
- The T-MOSAiC logo is based on the Inuit "Inukshuk" figure that symbolizes Arctic lands and indigenous communities and is as a point of reference for travel routes, camps and other important sites.
- The 2nd workshop of T-MOSAiC, held at Polar2018, aims to approve the Science Plan and discuss an Implementation Plan.

T-MOSAiC is now underway! T-MOSAiC (Terrestrial – Multidisciplinary distributed Observatories for the Study of Arctic Climate) is the result of Working Group discussions at the IASC Arctic Science Summit Week in Prague in April 2017. T-MOSAiC aims to reinforce and extend the success of the IASC-initiated MOSAiC by taking a land-based perspective on human systems, geosystems and ecosystems, and their responses to sea-ice, oceanographic, and climate change in the Arctic Ocean.

In the first workshop in Quebec City last December the Program Steering Committee discussed the scientific highlights of the program based on the terrestrial concept of coastal and continental interdisciplinary science in order to develop the T-MOSAiC Science Plan.

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Contacts: **Warwick F. Vincent** · warwick.vincent@bio.ulaval.ca
João Canário · joao.canario@tecnico.ulisboa.pt
Diogo Folhas · diogo.folhas@tecnico.ulisboa.pt

PHOTO: MANA TUGEND
Landscape pictures taken at the power station Krafla, from the Viti crater (Iceland)

Circumpolar Arctic Flux Workshop

When: 6-9 February 2017 | Where: Hyytiala (Finland)

Highlights:

- Detailed observations of energetic, hydrological and chemical fluxes
- surface-atmosphere interface are necessary to understand and model coupling within the Arctic climate system
- To address these poorly constrained processes,

Detailed observations of energetic, hydrological and chemical fluxes at the surface-atmosphere interface are necessary to understand and model coupling within the Arctic climate system. Global and regional models may represent Arctic state variables with relative accuracy, but it has been observed that they consistently fail to represent the observed magnitude and direction of energetic fluxes within the Arctic system. Some results of this failure are highly uncertain projections about the future state of the Arctic cryosphere and biosphere and high uncertainty about the fate of cryospheric carbon in the global atmosphere. To address these poorly constrained processes, coupling between the Arctic atmosphere, land surface and subsurface must be evaluated as an integrated system of energy, moisture and chemical exchange – each with unique observational challenges and process complexities in extreme Arctic environments.

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Sandy Starkweather · sandy.starkweather@noaa.gov

PHOTO: ZODEBALA / ISTOCKPHOTO
The Charles Bridge in the historic center of Prague

3. Arctic Science Summit Week 2017

» 3 Arctic Science Summit Week 2017

ASSW 2017, hosted by the Centre for Polar Ecology, Faculty of Science, the University of South Bohemia, was held in April in the heart of Europe, in Prague. The theme of the conference was "A Dynamic Arctic in Global Change" and over 700 delegates from 28 countries, represented by scientists, indigenous leaders, business and nonprofit organizations or representatives from government from throughout the world, were kindly welcomed in Prague.

The conference was held under the auspice of Gianfranco Cardinal Ravasi, President of Pontifical Council for Culture, Vatican City, Holy See and the first part conference was opened by Msgr. Tomasz Trafny, council secretary.

In addition to the many IASC and partner business meetings convener each year at ASSW, the 2017 open scientific conference included more than 500 scientific contributions grouped in 26 sessions. Within the conference, the two-day MOSAiC workshop was also held where coordination of the complex observations and implementation of measurement concepts was discussed.

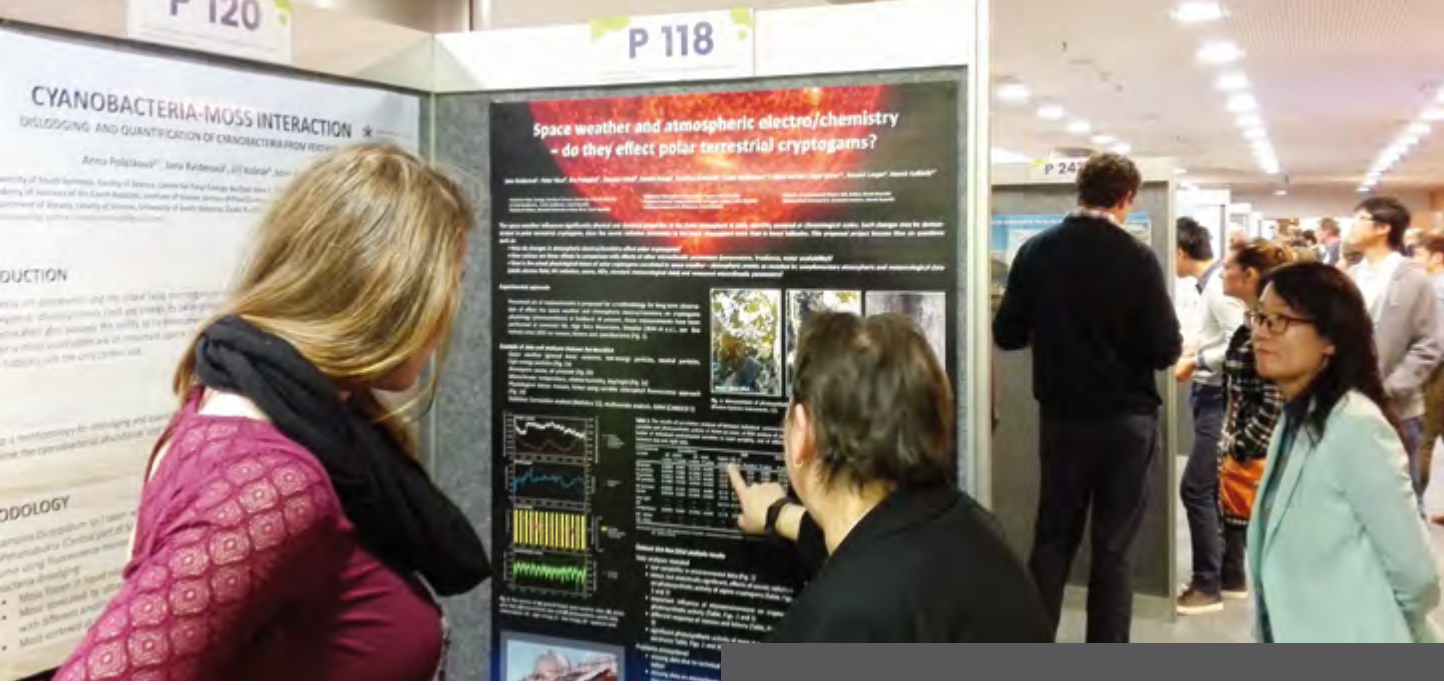
It was opened by a lecture by Hans Joachim Schellnhuber, Professor for Theoretical Physics, University of Potsdam, who presented "Earth System in Crisis," where he discussed the forces changing the world and especially the Arctic before our very eyes. In addition, Professor Terry Callaghan from Royal Swedish Academy of Sciences, Sweden, Department of Animal and Plant Sciences, University of Sheffield, UK and Tomsk State University, Russia was honored with by the IASC medal for outstanding contributions to international Arctic science collaboration and he delivered a lecture "The Rapidly Changing Arctic: what we know, what we need to know and how we can identify and overcome challenges in Arctic Science" afterwards.

Upcoming ASSWs

Polar2018

When: 15-27 June 2018
Where: Davos, Switzerland

Together, IASC and SCAR (the Scientific Committee on Antarctic Research) will jointly host Polar2018, "Where the poles come together." Located in Davos (Switzerland), this meeting will combine SCAR and IASC Business Meetings, an Open Science



Conference, the SCAR Delegates Meeting, and the Arctic Observing Summit. The International Scientific Organizing Committee of the conference is co-chaired by Karin Lochte (Germany, SCAR Vice-President and IASC Council Member), Huigen Yang (China, IASC Vice-President and SCAR Delegate), and Martin Schneebeli (Switzerland, SCAR Delegate and IASC Council Member).

Website: **www.polar2018.org**

ASSW 2019

When: 22-30 May 2019
Where: Arkhangelsk, Russia

ASSW 2019 will feature a science conference and the ASSW business meetings, as well as social and cultural events. The theme of the symposium will be "Climate change and security of the Arctic population." The main IASC liaison for ASSW 2019 is IASC Council Member Vladimir Pavlenko, and IASC is also nominating other representatives to various planning committees. The conference organizing committee will be headed by the Governor of the Arkhangelsk region, Igor Orlov. The scientific committee of the conference will be headed by Vice-President and Academician of the Russian Academy of Sciences, Valery G. Bondur. We look forward to seeing you in Arkhangelsk!

ASSW 2020

When: March 27 - April 2 2020
Where: Akureyri, Iceland

The ASSW 2020 meetings will be held in Akureyri, Iceland, from March 27 to April 2. The ASSW will have three major components: the business of ASSW members (March 27-30), a separate Arctic Observing Summit (March 30-April 2), and numerous Arctic side-meetings. Most of the ASSW events will take place in the facilities of the University of Akureyri. Hosted by the Icelandic Centre for Research, Rannís, and the University of Akureyri, the ASSW 2020 will be an important part of the Icelandic Chairmanship in the Arctic Council.

PHOTO: ALEX BERNARDOVA
Poster session during ASSW2017 in Prague

PHOTO: GABRIEL LEWIS
Grad student Karina Graeter takes snow density measurements for the Greenland Traverse for Accumulation and Climate Studies (GreenTrACS) project, Western Greenland.

4. Data and Observations

» 4 Data and Observations

Arctic Data Committee (ADC)

The IASC-SAON Arctic Data Committee (ADC) was formed in late 2014. The overarching purpose of the ADC is to promote and facilitate international collaboration towards the goal of free, ethically open, sustained, and timely access to Arctic data through useful, usable, and interoperable systems. Since its formation, the ADC has convened, co-convened, or contributed to a number of activities and events including special sessions at major conferences (e.g., ISAR 4 & 5, ASSW, IDW, International Data Week, and others), the 2015 Polar Data Forum, an international workshop on data Interoperability, and annual meetings, including joint meetings with the Standing Committee on Antarctic Data Management and the Southern Ocean Observing System.

A number of these recent conferences, workshops, and meetings have confirmed that there are many national, regional, and local projects and programs that are active in polar data management and stewardship that also have a mandate or desire to contribute to regional or international coordination of efforts and activities. Many of those initiatives have resources available and are making progress towards an envisioned connected, interoperable polar data system. The international polar data community is eager to improve cooperation and coordination of their efforts.

In May 2018, representatives from a wide range of different active programs and projects came together to focus on work planning and coordination of effort. This meeting complemented past workshops and fora that have been effective in defining important community challenges and technical issues. The focus of the Summit was to generate detailed plans on how best to mobilize existing and soon-to-be initiated funded activities to develop a small set of international data sharing use cases or scenarios. At the time of writing, three use cases are being developed:

- Discovering and linking data to support our understanding of cryospheric extreme events in the past, present and future
- Sharing Biological and Oceanographic Data in Support of Marine Science and Resource Management

- Mobilizing Data and Information to Support Vibrant and Resilient Arctic Communities

Results will be presented at Arctic Science Summit Week, the SCAR/IASC Open Science Conference, and the Arctic Observing Summit Week in Davos in June 2018 and a number of other relevant meetings and conferences.

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Sustaining Arctic Observing Networks (SAON)

SAON is a joint initiative of the Arctic Council and IASC that aims to strengthen multinational engagement in pan-Arctic observing and monitoring of Arctic environmental change.

SAON's vision is to foster a connected, collaborative, and comprehensive long-term pan-Arctic Observing System that serves societal needs. SAON's mission is to facilitate, coordinate, and advocate for the pan-Arctic Observing System and to mobilize the support needed to sustain it.

A new strategy for SAON was approved in January 2018 and it identifies three overarching goals:

1. Create a roadmap to a well-integrated Arctic Observing System;
2. Promote free and ethically open access to all Arctic observational data; and
3. Ensure sustainability of Arctic observing.

PHOTO: LUCA BRACALI ©
Sermeq Kujalleq (Jakobshavns Isbrae), an outlet glacier of the Greenland Ice Sheet, is the biggest producer of icebergs in the Arctic.

SAON implementation will be achieved through two committees: The Committee on Observations and Networks (CON) and the Arctic Data Committee (ADC). The CON aims to promote and facilitate international collaboration towards a pan-Arctic Observing System (Goal 1). The ADC aims to promote and facilitate international collaboration to establish free, ethically open, sustained, and timely access to Arctic data through easily accessible and interoperable systems (Goal 2). The plan for SAON Implementation describes how the Committees and the SAON Board will work together to achieve its objectives.

It is understood that addressing these goals will require the expertise and cooperation of a wide range of stakeholders and knowledge systems. With the Arctic Council as one of the parents, the eight Arctic States are born members of SAON. This inherently means that SAON maintains strong connections to national level priorities and activities of its member countries. Effective implementation of SAON, however, will require partnerships. Such partnerships include collaborations with policy-makers at all levels, Arctic Indigenous Peoples organizations, non-Arctic states, academia, civil society and the private sector, as well as engagement from other multilateral/ international groups.

In 2017, AMAP, a working group of the Arctic Council, appointed Thorsteinn Gunnarsson, IASC Council Member for Iceland, as the new Chair of SAON and Larry Hinzman, IASC Vice-President, was confirmed as Vice-Chair of SAON. Christine Daae Olseng of the Research Council of Norway stepped down as Chair on 1 July 2017; thanks to Christine for her hard work!

Website: https://www.arcticobserving.org
Contact: **Jan René Larsen** /// jan.rene.larsen@amap.no

PHOTO: MICHAEL FRITZ
Researchers spotting a grizzly bear not too far from camp on Herschel Island, Canada

PHOTO: LUCA BRACALI ©

Canadian Eskimo Dogs are an ancient breed of sled dogs descended from wolves. When motorized vehicles were introduced in Arctic Canada, the Canadian Eskimo Dog started a rapid decline. Brian Ladoon selected 300 examples for breeding and today owns about 50 pure-breed examples in Churchill, Canada.

5. Partnerships

» 5 Partnerships

With the goals to develop and stimulate shared initiatives that are of high interest to the broader Arctic research community, to make better use of limited financial resources, and to avoid a duplication of efforts, IASC strives for close cooperation with other groups interested in Arctic research. Today, IASC maintains an excellent relationship with many other polar and global science organizations.

Arctic Council

IASC has been an accredited observer of the Arctic Council from its very beginning and supports the work of the Arctic Council, its Working Groups (WGs), and Permanent Participants (PPs) by providing scientific expertise from all its members, including the non-Arctic countries. The biennial Arctic Observing Summit (AOS) is held in conjunction with the Arctic Science Summit Week (ASSW) and through SAON both IASC and the Arctic Council contribute to the organization and program.

Since 2013, the Arctic Council Indigenous Peoples Secretariat (IPS) has been involved in the planning of the ASSW and IASC has provided travel support to enable the participation of PP representatives as participants. Supporting the work of the Arctic Council PPs, in particular with respect to traditional and local knowledge, is of high priority for IASC. IASC will continue to provide travel support for Indigenous participation in Polar2018 and future ASSWs.

IASC is in the position to provide scientific advice on all aspects of Arctic research and during recent years, Arctic Council WGs made use of IASC's broad expertise to ensure the scientific quality of their reports and assessments. IASC has helped coordinate reviews of previous reports and in 2017 nominated experts to multiple groups, including a desktop study on marine litter in the Arctic.

IASC has participated in all Arctic Council SAO and Ministerial meetings, mostly through its Executive Secretary, and increasingly with additional representatives. In 2017, the Arctic Council chairmanship transitioned from Finland to the United States, giving such opportunities to a new group of IASC representatives. All meeting reports are published in the IASC newsletter.

IASC maintains very good relationships with those Arctic Council WGs addressing scientific questions, in particular AMAP, CAFF, PAME, and the Sustainable

Development Working Group (SDWG). IASC representatives attended meetings for all of these groups in 2017 and will continue to do so in 2018. CAFF and IASC are also co-sponsoring a Fellowship program and IASC is represented on the organizing committee for the Arctic Biodiversity Congress. In addition, several members of the IASC family are involved in activities of these Arctic Council WGs in their national capacity, as experts from either Arctic Council member countries or Observer countries.

Through its representatives, IASC also participated in the meetings of the Task Force on Arctic Marine Cooperation (TFAMC) and the new Arctic Shipping Best Practice Information Forum. IASC´s Marine Working Group (MWG), comprising the marine expertise from all 23 IASC member countries, would be in the position to provide scientific input essential for marine stewardship.

The Arctic Council initiative to develop a legally binding agreement to strengthen international scientific cooperation is of great interest to IASC and IASC representatives participated in all meetings of the Science Cooperation Task Force (SCTF). Arctic research is international and non-Arctic countries are making invaluable contributions both in terms of scientific expertise and research infrastructure. This agreement was signed in May 2017 and is expected to be ratified by the signatory nations in 2018.

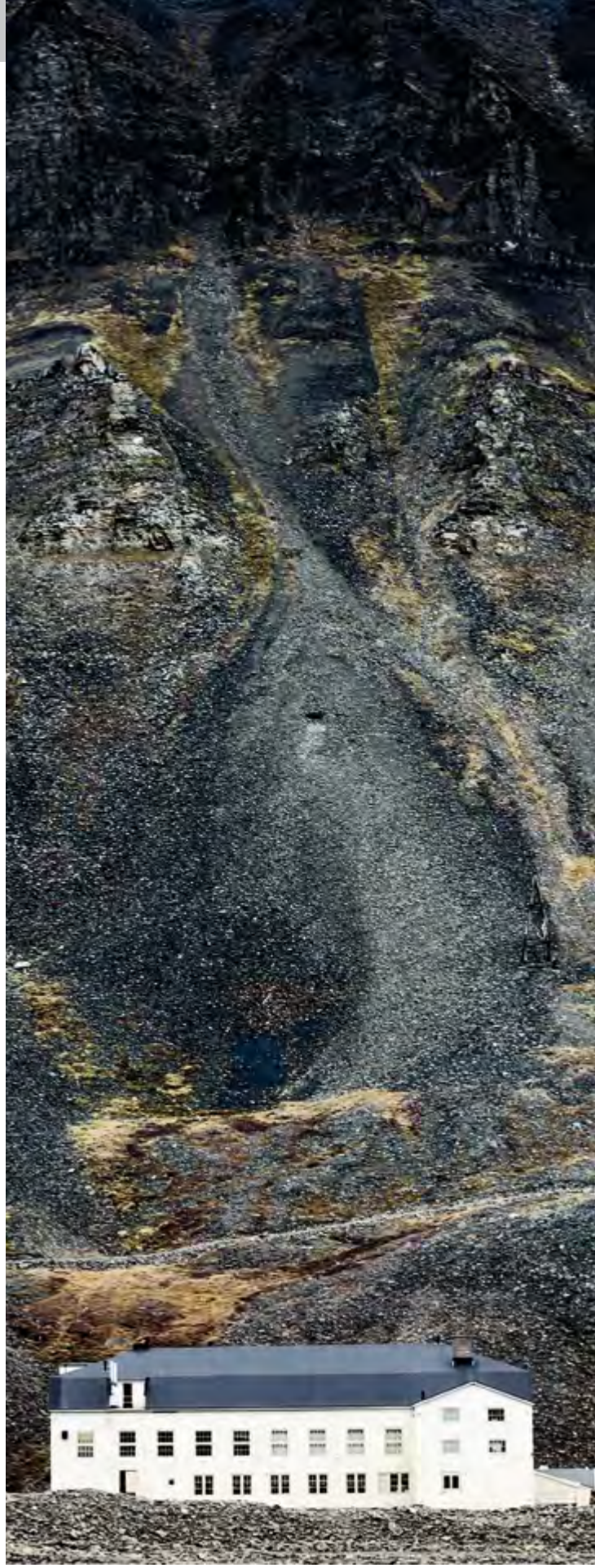

PHOTO: KAMIL JAGODZINSKI
Longyearbyen, Svalbard. September 2016

Asian Forum for Polar Sciences (AFoPS)

AFoPS is an international organization of the national polar operators and research institutes in Asian countries. AFoPS was established in 2004 to encourage and facilitate cooperation for the advancement of polar sciences among countries in the Asian region. It has served as an important medium of collective endeavors in human and information exchange, research collaboration, and logistics cooperation among Asian polar science institutions. At present, AFoPS consists of six members: China, Japan, South Korea, India, Malaysia, and Thailand, with more Asian countries as observers.

AFoPS signed a Memorandum of Understanding with IASC and SCAR in 2016. The parties to the MoU share the common goal of working internationally on polar science and technology to increase our understanding of Earth's Polar Regions and their connections to the global system. The purpose of the present MoU is to foster cooperation between IASC, SCAR and the AFoPS members, and to lay the foundation for joint efforts in developing international programs and initiatives based on scientific priorities and scientific excellence, and sharing use of Asian Arctic and Antarctic infrastructures for scientific and technological purposes, as well as increasing the engagement of Asian scientists in both IASC and SCAR activities

Website: **www.afops.org**

Association of Polar Early Career Scientists (APECS)

APECS is an international and interdisciplinary organization for undergraduate and graduate students, postdoctoral researchers, early faculty members, educators and others with interests in Polar and Alpine Regions and the wider Cryosphere. APECS aims to a) create a network of polar researchers across disciplines and national boundaries to meet, share ideas and experiences, and develop new research directions and collaborations; b) Provide the opportunity for career development for both traditional and alternative polar and cryosphere professions; and c) promote education and outreach as an integral component of polar research and to stimulate future generations of polar researchers. APECS builds on extensive national and disciplinary networks to develop integrated research directions, meet career development needs, and communicate the urgencies of polar science to a worldwide audience. APECS decisions are made by an open Council, and an elected Executive Committee. An Advisory Committee of senior polar researchers provides guidance to APECS. Day to day operations of APECS are supported through an international Directorate Office, led by the Executive Director hosted and funded currently by the Alfred-Wegener Institute, Helmholtz Centre for Polar and Marine Research in Potsdam, Germany. APECS also has a project office hosted at the UiT The Arctic University of Norway in Tromsø, Norway.

APECS works closely with IASC on creating opportunities for early career scientists within IASC and the Arctic research community as a whole. Every year for examp-

le, APECS helps to coordinate the application and evaluation process for the IASC fellowship program.

For the ASSW2017 and 2018 APECS organized the poster prices, and supported IASC in evaluating travel funding application from early career researchers and indigenous people to attend POLAR2018. During the ASSW 2018 at POLAR2018, APECS also organizes its APECS World Summit 2018 (17/18 June 2018), a 2-day career development workshop for early career participants of the conference.

APECS and IASC share common goals of working internationally and across disciplines to increase our understanding of Earth's polar regions and their connections to the global system.

Website: **www.apecs.is**

Circumpolar Health Research Network (CHRN)

CHRN was formed in 2012 with the coming together of two international circumpolar health organizations – the International Network for Circumpolar Health Research (INCHR) and the International Association of Circumpolar Health Publishers (IACHP). CHRN aims to promote cooperation and collaboration among health researchers engaged in research in the circumpolar region; facilitate the exchange, communication and dissemination of research results and other health data; support the training and development of researchers in circumpolar health; and publish the International Journal of Circumpolar Health and other scholarly publications. CHRN and IASC share a common interest in scientific research in the Arctic regions. Both organizations view that there is much to be gained from developing a synergy between CHRN and IASC in promoting health research in the Arctic. Following the success of the IPY where researcher teams with expertise in health, natural, and social sciences collaborated with Arctic residents in a variety of multidisciplinary projects, CHNR and IASC agree to seek new opportunities to combine their efforts for activities related to health sciences in the Arctic.

Website: **circhnet.org**

PHOTO: JASON BRINER

Nicolás Young, Lamont-Doherty Earth Observatory, collecting a sediment core from a proglacial lake in southwestern Greenland. With the help of Heidi Roop (lower left) and Michele Koppes (University of British Columbia), the team uses sediments from glacier fed lakes to reconstruct past changes in Greenland Ice Sheet size.

European Polar Board (EPB)

The European Polar Board is an independent organization that focuses on major European strategic priorities in both the Arctic and the Antarctic regions. The EPB's Vision is of a Europe with a strong and cohesive polar research community, wherein decisions affecting or affected by the polar regions are informed by independent, accurate, and timely advice. The EPB has a Mission to coordinate, promote, and advance European polar research by facilitating multilateral collaborations between its Members and providing a single contact point for the global polar community.

As part of our mandate, we work with various international and European partner organizations. Our latest work with the European Space Agency (ESA) involves common scientific targets using complementarities of polar and space platforms. An upcoming project, planned by ESA in partnership with EPB, will investigate how isolation, confinement, and extreme conditions affect human immune systems, with data collected from EPB Member Antarctic research stations.

EPB organizes activities that help to advance our mission and vision by convening various events, including conference sessions, policy briefings, and panel discussions, that aim to connect polar research, policy, and society at a variety of scales.

Website: **www.europeanpolarboard.org**

PHOTO: GABRIEL LEWIS
PI (and CWG Member) Bob Hawley stopping an instrument for the day and taking notes. The GreenTrACS project is calculating surface mass balance of the western Greenland Ice Sheet through a two year snowmobile traverse.

Forum of Arctic Research Operators (FARO)

FARO aims to facilitate and optimize logistics and operational support for scientific research in the Arctic. The forum encourages international collaboration for all those involved in Arctic research. It was formed in 1998 with 11 participating countries. This year, 2018, we celebrate 20 years of FARO which now has 20 member countries.

FARO acts as a forum for information exchange, establishment of cooperation, and development of new ideas among the national logistics operators in countries with Arctic research activities.

FARO has a Memorandum of Understanding with IASC that recognizes the complementary roles of both organizations; IASC brings together Arctic scientists in all disciplines, and FARO brings together the organizations responsible for research operations, logistics and infrastructure in the Arctic. FARO members fully participate in IASC activities and FARO holds its annual meeting in conjunction with the Arctic Science Summit Week.

Website: **faro-arctic.org**

International Arctic Social Sciences Association (IASSA)

IASSA is the professional association of social sciences and humanities scholars that includes more than 700 members coming from over 20 countries representing a multitude of disciplines and knowledge systems, including anthropology, sociology, human geography, archaeology, political science, history, psychology, heath sciences, Indigenous studies, linguistics, literature, applied engineering, law, economics, and education, as well as Indigenous knowledge.

IASSA is currently headquartered at the ARCTICenter, University of Northern Iowa, USA. IASSA is governed by a seven member Council and chaired by the President elected for three year terms by IASSA membership. The current IASSA President is Dr. Andrey N. Petrov (USA).

IASSA was founded in 1990 as a result of the warming relationships between the USSR and West. Together with IASC and UArctic, IASSA continues its mission to advance and promote international collaboration among Arctic researchers and peoples and to elevate the role of social sciences, humanities and Indigenous knowledge in the Arctic. IASSA is an Observer to the Arctic Council and in this capacity works with other Arctic science organizations, such as IASC, to provide a connection between the sciences and decision making. IASSA holds a triennial International Congress of Arctic Social Sciences (ICASS). The next ICASS (X) will take place in Arkhangelsk, Russia in 2020.

Website: **iassa.org**

International Association of Cryospheric Sciences (IACS)

IACS aims to promote studies of cryospheric subsystems of the Earth solar system by encouraging research in these subjects, providing opportunities for collaboration and international co-ordination and promoting education and public awareness on cryospheric topics. IACS provides oversight of the World Glacier Monitoring Service, and supports standing groups on Glacier and Permafrost Hazards in Mountains (GAPHAZ) in association with the International Permafrost Association (IPA). It maintains a Joint Commission on Ice-Volcano Interactions with the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI). It also supports multiple, fixed-term standing groups focused on specific scientific problems, potentially of interest to IASC. IACS seeks collaboration with other professional organization focused on related and overlapping fields. Since the cryosphere is a dominant feature of Arctic landscapes and undergoing rapid changes, IACS welcomes strengthened collaboration with IASC.

Website: **www.cryosphericsciences.org**

International Council for the Exploration of the Sea (ICES)

The Arctic marine environment is undergoing major changes due to climate change and human activities, making Arctic research a priority area for ICES to better understand ecological processes and human impacts. With accelerating ice retreat, fish stocks expand northwards out of our area of research, and we need to expand our surveys and assessment areas. A number of ICES groups fish stocks in the Barents Sea, around Iceland and East Greenland, and some widely distributed and straddling stocks. The annual ICES Report on Ocean Climate (IROC) and the biannually published ICES Zooplankton Report cover Subarctic waters.

ICES' vision is truly global – we want to be a world-leading marine science organization that advances the scientific capacity of the oceans, to give advice to governments on human activities affecting marine ecosystems. To do so, ICES utilizes its network of about 3,500 scientists worldwide from hundreds of institutes of which many also provide survey data on fish, fisheries, and the environment, from plankton to physical oceanography.

ICES also conducts and develops Integrated Ecosystem Assessments for the Barents Sea as part of the Ecosystem Approach to Fisheries Management. Recently a joint group with the North Pacific Marine Science Organization (PICES) and the Arctic Council Working Group Protection of the Arctic Marine Environment (PAME) has started developing an

integrated ecosystem assessment for the Central Arctic Ocean, with a specific focus on prospect for future fisheries and sensitivity and vulnerability in relation to shipping activities.

In carrying out this work ICES works with several international groups active in Arctic science, such as working groups of the Arctic Council, IASC, Third International Conference on Arctic Research Planning ICARP (III), and Association of Polar Early Career Scientists (APECS).

Website: **www.ices.dk**

International Permafrost Association (IPA)

IPA disseminates knowledge concerning permafrost and promotes research and cooperation among people and organizations engaged in scientific investigation and engineering work on permafrost. The IPA supports the production of scientific products (e.g., permafrost maps and databases) and education and outreach resources through our Action Groups, Interest Groups, and Standing Committees. Additionally, the IPA initiates and oversees Regional and International Conferences on Permafrost. The IPA and IASC both promote Arctic research and aim to raise awareness and provide resources for policy makers regarding the cryosphere. The IPA collaborates closely with IASC primarily through the IASC Cryosphere and Terrestrial Working Groups. Recently, the IPA and IASC have jointly supported the Frozen Ground Cartoon IPA Action Group, and meetings of IASC's initiative Rapid Arctic Transitions due to Infrastructure and Climate (RATIC) have involved IPA participation. The IPA developed and works closely with the Global Terrestrial Network for Permafrost (GTN-P), which provides open-access permafrost data in alignment with IASC's Data Statement.

Website: **ipa.arcticportal.org**

PHOTO: ANAND JAIN
Fieldwork in Svalbard

Pacific Arctic Group (PAG)

PAG is a group of organizations and individuals having a Pacific perspective on Arctic science. Originally organized under the International Arctic Science Committee (IASC), the PAG is now an independent affiliate of the IASC and has as its mission to serve as a Pacific Arctic regional partnership to plan, coordinate, and collaborate on science activities of mutual interest. PAG is engaged in project development and sampling in the Pacific Arctic Region, currently in rapid transition with major sea ice loss, to investigate climate, oceanography, air-sea ice interactions, ecosystems, and modeling. For the above purpose, we have a spring meeting that is mainly focused on business issues during the annual Arctic Science Summit Week, and a fall meeting at various locations in alternating PAG countries after the field season to review accomplishments during the previous summer and outlooks for the future. PAG continues to develop and implement long-term monitoring activities, such as the Distributed Biological Observatory (DBO) and Pacific Arctic Climate Ecosystem Observatory (PACEO).

Website: **pag.arcticportal.org**

Scientific Committee on Antarctic Research (SCAR)

SCAR is the Antarctic sister organization to IASC and an interdisciplinary body of the International Science Council (ISC). Its mission is to facilitate international research in and from the Antarctic and Southern Ocean region. In addition to carrying out its primary scientific role, SCAR also provides objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations such as the UNFCCC and IPCC on issues of science and conservation and on the role of the Antarctic region in the Earth system.

To help achieve its mission in early 2017 SCAR published its new Strategic Plan for 2017-2022. The new Plan commits SCAR to reinforce its alliance with IASC to develop a polar perspective on climate change and other research issues and to partner with IASC and other groups interested in polar research to identify themes of international priority.

Website: **scar.org**

University of the Arctic(UArctic)

UArctic is a cooperative network of universities, colleges, research institutes, and other organizations concerned with education and research in and about the North. UArctic builds and strengthens collective resources and collaborative infrastructure that enables member institutions to better serve their constituents and their regions. Through cooperation in education, research, and outreach, we enhance human capacity in the North, promote viable communities and sustainable economies, and forge global partnerships. UArctic promotes Northern voices in the globalizing world, reflecting common values and interests across all eight Arctic states and among all northern peoples and cultures.

UArctic's goal is to empower the people of the Circumpolar North by providing unique educational and research opportunities through collaboration within a powerful network of members. Our work with IASC includes a three-part Memorandum of Understanding, also including IASSA, to jointly promote scientific cooperation in the Arctic. Practical outcomes of our collaboration include the work on the Agreement on Enhancing International Arctic Scientific Cooperation, incorporation of IASC reports in teaching materials, and sessions at the Arctic Science Summit Week and UArctic Congress events. UArctic is very active in the work of IASC's working groups, largely through the involvement of members of our Thematic Networks and the leadership of our research area.

Website: **www.uarctic.org**

WCRP Climate and Cryosphere (CliC)

CLiC project is one of the core projects of the Word Climate Research Programme (WCRP), serving as the focal point for climate science related to the cryosphere, its variability and change, and interaction with the broader climate system.

CliC and IASC have a long history of successful cooperation and the core missions of the organizations continue to drive collaborations and encourage joint scientific achievements. The 2013 Memorandum of Understanding between CliC, IASC, and SCAR provides a solid foundation for building on a legacy of important and historic research. In addition to strengthening participation in each other's leadership meetings, panels, and groups, the organizations have jointly supported projects of significance to Arctic and cryosphere research communities. Strategic activities such as the Ice-Sheet Mass Balance and Sea Level project (ISMASS) and the Arctic Freshwater Synthesis have laid the ground work for important new research. CliC was closely involved in the ICARP-III process and will continue to create synergies in long term research planning in the Polar regions. The CliC leadership and wider community look forward to a fruitful engagement with IASC in the coming years.

Website: **www.climate-cryosphere.org**

PHOTO: KARIN SPRINGER
Kelp, near Ny-Ålesund, Svalbard

6. Capacity Building

» 6 Capacity Building

IASC Fellowship Program

IASC recognizes that the next generation of researchers will be faced with increasingly critical challenges due to the impacts of climate change on the Polar Regions and their global significance. IASC therefore believes that it is of great importance to foster young researchers and promote and involve early career scientists working in the Arctic by:

- Striving for representation of early career researchers within IASC;
- Providing endorsement, support and dissemination of information on activities, projects and requests for participation; and,
- Providing travel grants to early career scientists for select conferences.

With these instruments, IASC aims to include more early career researchers in the organization of workshops, science planning activities and research programs.

The recent edition of the Fellowship Program received the record 135 applications for 5 positions. During the selection process, APECS coordinated the work of the reviewers to evaluate and recommend the highest quality candidates, and IASC Fellows were involved in the initial review process. Final selection was made in consultation with each of the IASC Working Group chairs. The chairs and reviewers were certainly impressed by the record amount and excellent quality of the applications.

The incoming 2017 Fellows were introduced during the joint WG meeting at the ASSW 2017 in Prague, and previous years' Fellows were deeply involved in the WG and Council meetings, as well as in the ASSW science symposium. Fellows co-convened scientific sessions, co-organized and participated in an IASC cross-cutting workshop "Sustainable Arctic Infrastructure Forum (SAIF)," and presented a poster on their results of a successful cross-cutting initiative entitled "Do's and Don'ts in Arctic Research? An interactive Workshop on Community-based Research with Early Career Scientists."

The IASC Fellows also called for a meeting with the IASC Working Group Chairs and IASC Secretariat. There, they discussed issues and challenges they experience and talked about possible solutions and improvements of the Program. Based on the outcome of this discussion, a Fellowship Guidelines document for Fellows, WG Chairs and IASC Secretariat was prepared by a group Fellows and presented to IASC ExCom for approval.

The ASSW 2017 was a closing time for the 2014 Fellows. Nevertheless, many of them will continue to stay involved in IASC activities and help mentor incoming Fellows.

After the ASSW, Fellows have been active in numerous initiatives. IASC fellows have convened a session at the IX Congress of Arctic Social Sciences, were involved in a cross-cutting workshop "Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPSII)," have co-chaired an IASC Action Group on Communicating Arctic Science to Policymakers (CASP), contributed at co-leader of an Ecosystems Team co-leader of the Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAiC), and served on the IASC Medal Committee.

At POLAR 2018, IASC Fellows will co-convene scientific sessions. co-organize a workshop on extreme weather events, and contribute to business meetings and mini-symposia. Fellows are also engaged in Association of Polar Early Career Scientists (APECS) Council for the term 2017/2018 by representing the Permafrost Young Researchers Network (PYRN), APECS Germany, and serving as APECS Ex-Officio.

IASC welcomes the 2018 IASC Fellows and is excited about the contributions they will bring to IASC's scientific activities. We would like to acknowledge all that have supported the idea of the IASC Fellowship Program and the Fellows themselves. Four years into the Program is long enough to observe its benefits for the Fellows, for IASC and for Arctic research. Thank you!

PHOTO: IASC FILE PHOTO
IASC Fellows 2017 during ASSW 2017 in Prague (Czech Republic)

CAFF-IASC Fellowship

As two international organizations based in Akureyri, Iceland, the Conservation of Flora and Fauna (CAFF) and IASC, teamed up together and with the Association of Polar Early Career Scientists (APECS) to help early career scientists get more involved in the process of taking research from results through to science policy recommendations.We selected two CAFF-IASC Fellows in the inaugural year (2018): Thomas Lameris (Wageningen University) and Erica Oberndorfer (the Labrador Institute). Fellows identify a joint area of interest and expertise, participate in and contribute to CAFF's work, and produce some culminating output.

2018's areas of interest are:

- Circumpolar Terrestrial Biodiversity monitoring in the Arctic (Oberndorfer)
- The Arctic Migratory Bird Initiative (Lameris)

The duration of the Fellowships is from January through November 2018. Each Fellow began by attending the CAFF Board Meeting (6-8 Feb 2018; Fairbanks, Alaska), continues on with an appropriate working group meeting, and will contribute to the program of the Arctic Biodiversity Congress. As appropriate, Fellows will continue working with their CAFF groups to deliver peer-reviewed publications and/or a report to the Arctic Council Senior Arctic Officials.

In recognition of project funding from Sweden, candidates from Sweden were encouraged to apply. APECS coordinated the application and review process; recommendations from APECS based on the review process were delivered for final selection to the CAFF and IASC Secretariats.

Conservation of Arctic Flora and Fauna (CAFF)

CAFF is the biodiversity working group of the Arctic Council and consists of National Representatives assigned by each of the eight Arctic Council Member States, representatives of Indigenous Peoples' organizations that are Permanent Participants to the Council, and Arctic Council observer countries and organizations. CAFF's mandate is to address the conservation of Arctic biodiversity, and to communicate its findings to the governments and residents of the Arctic, helping to promote practices which ensure the sustainability of the Arctic's living resources. For more information: ***www.caff.is***

PHOTO: ALLAN POPE
Juneau Icefield Research Program faculty members Billy Armstrong and Kiya Riverman leading an outdoor lesson about glaciers in southeast Alaska.

Fellows' Voices

"I am truly grateful to be a part of IASC and would encourage early career researchers to apply for the IASC Fellowship, which can also be considered as an excellent collaboration and soft skill learning platform. Starting from the first minute, I felt very comfortable interacting with both early career and more senior researchers, who cordially welcomed me in their working group and were very supportive that my motivation was boosted as never before."

Alevtina Evgrafova, 2017 Terrestrial Working Group Fellow

"I applied for the IASC Marine Working Group Fellowship because I wanted the opportunity to get involved with an organization that coordinates and influences Arctic science at the highest level. This has allowed me to better place my own research in the much broader context of Arctic science, as well as to meet and interact with researchers from very diverse backgrounds. ...I believe that a holistic and interdisciplinary approach is particularly necessary in Arctic research, and that IASC plays an important role in coordinating and facilitating research efforts – I hope to contribute to these activities where at all possible."

Tom Armitage, Marine Working Group Fellow 2017

"Since I was relatively new to research in the Arctic, I wanted to get involved with an Arctic organization working at the international level, where I could contribute my Antarctic science experience while also gaining significant knowledge about Arctic research. ...Scientifically, the IASC Fellowship is an excellent position to improve my Arctic research activities through suggestions and productive discussion with WG members, which I hope will evolve into long term collaborations. Ultimately, my involvement in the Cryosphere WG represents the contribution of an ECR in promoting IASC's mission in India and internationally, which I hope in turn will motivate other ECRs to contribute to this mission, too."

Shridhar D. Jawak, Cryosphere WG Fellow 2017

"When I learned about the IASC Fellowship, it sounded like the ideal platform to expand my scientific network and to pursue interdisciplinary collaboration with glaciologists, oceanographers, marine biologists, and social and other scientists. ...The Fellowship has allowed me to wade into the depths and breadths of Arctic research while opening up pathways for teamwork and better communication. The range of opportunities offered by this fellowship is invaluable for any early career polar researcher. Moving forward, I am hopeful that our community of IASC Fellows becomes the flag bearers of Arctic research and sustainable development."

Manisha Ganeshan, Atmosphere Working Group Fellow 2017

"In Russia, they say that nature knows no boundaries, but when I look at the tundra, sunsets that turn into sunrises on a polar day, I want to say: the Arctic has no borders. Therefore, IASC work is so important that allows many nationalities to feel like an Arctic crew aboard one aircraft. … The IASC Fellowship program gives impetus, motivation, and support to scientists like me for the development of international research and interdisciplinary partnership."

Violetta Gassiy, Social and Human Working Group Fellow 2017

Overview of Supported Early Career Scientists

77
…EARLY CAREER SCIENTISTS RECEIVED TRAVEL SUPPORT FROM IASC

21
…WORKSHOPS OR OTHER EVENTS AT WHICH IASC SUPPORTED ECS

41%
…OF IASC SCIENTIFIC FUNDS WERE ALLOCATED TO ECS IN 2017

64.155
…USED TO SUPPORT ECS PARTICIPATION

ECS Quotes

"In terms of professional development, the session has been one of the most productive experiences I've had in recent years."

(Sean P. A. Desjardins, Postdoctoral Researcher, The Long-Term Perspectives on Arctic Change Workshop)

From Groningen (Netherlands) to Prague (Czech Republic)

"Several presentations on the interface of science and policy sparked my interest and gave me new ideas how to put my own research into a wider policy context."

(Manuel Helbig, Postdoctoral Researcher, The Circum-Polar Flux Workshop)

From Montreal (Canada) to Hyytiala (Finland)

"I am an Alaskan Gwich'in Indian from the Yukon Flats valley in which I do my research for the benefit of them and the world. PACES showed me where my monitoring data can fit into current international endeavors towards pollutants."

(Stanley G. Edwin, PhD Student, Air Pollution in the Arctic: Climate, Environment and Societies (PACES))

From Fairbanks (Alaska) to Victoria (Canada)

"As a graduate student, there were very few opportunities to attend international conferences due to limited funding, so I am most grateful to the IASC for supporting early career scientists."

(Cathleen Vestfals, Postdoctoral Fellow, Ecosystem Studies of Subarctic and Arctic Seas (ESSAS) Open Science Meeting)

From Fairbanks (Alaska) to Tromsø (Norway)

"This meeting was a very good opportunity for me to present my first results of my master thesis to the sea-ice community and share my experiences."

(Bonnie Raffel, Master Student, Biogeochemical Exchange Processes at Sea-Ice Interfaces (BEPSII))

From Hamburg (Germany) to La Jolla (California)