25 Years of International Arctic Research Cooperation

IASC after 25 Years

Special Issue *of the IASC Bulletin*

The **International Arctic Science Committee (IASC)** is a non-governmental, international scientific organization, founded in 1990 by the eight Arctic countries. Over the past 25 years, IASC has evolved into the leading international science organization of the North and its membership today includes national science organizations from 22 countries involved in Arctic research.

The IASC mission is to encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research and in all areas of the Arctic region.

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Accumulations of sea-ice algae (melted into the sea ice) in a meltpond near the North Pole

25 Years of International Arctic Research Cooperation

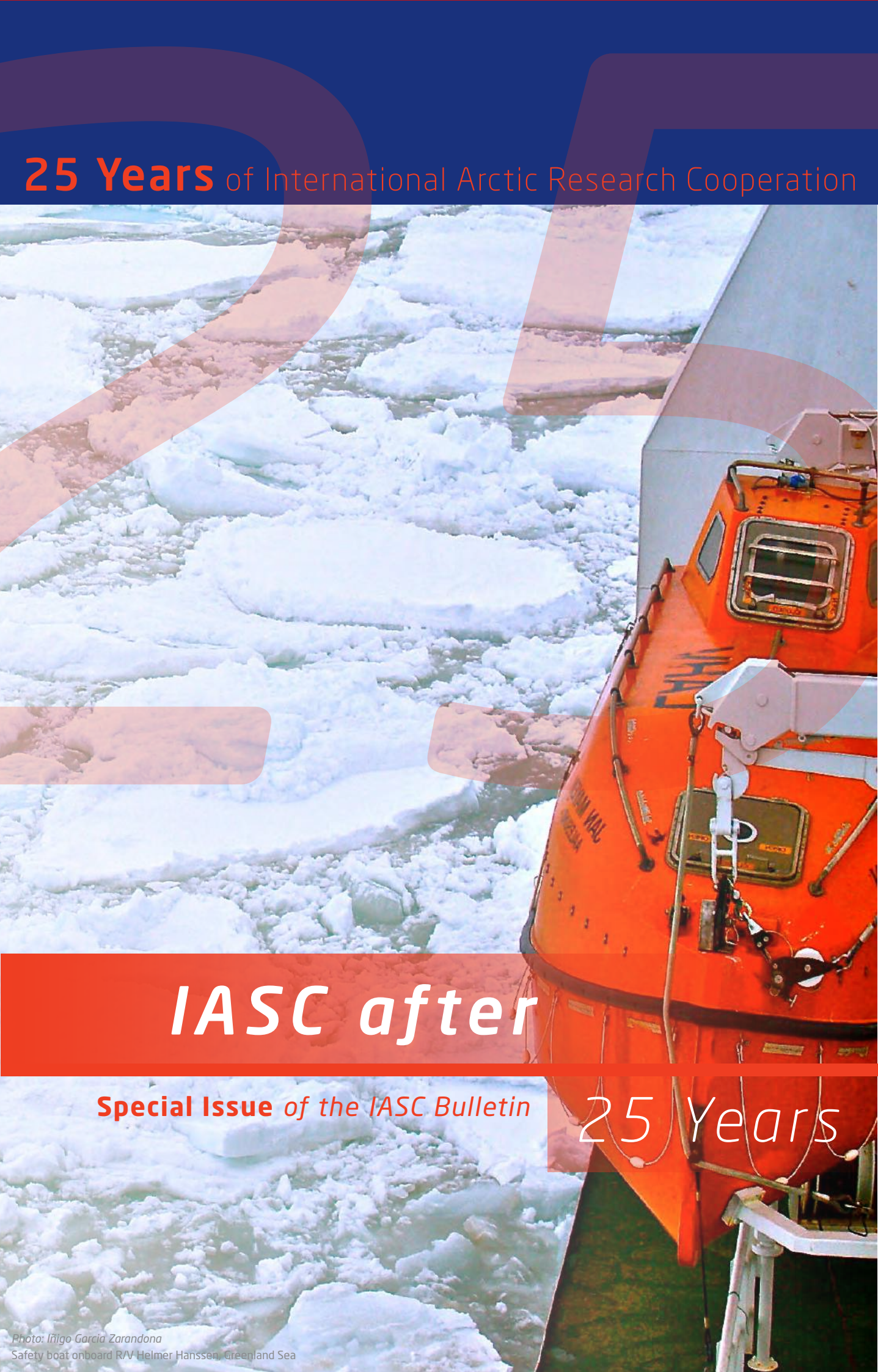

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Photo: Iñigo Garcia Zarandona
Safety boat onboard R/V Helmer Hanssen, Greenland Sea

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Photo: Iñigo Garcia Zarandona
Summer comes to Longyearbyen (Svalbard) in early June

Preface

Initiation of the International Arctic Science Committee (IASC):

Susan Barr
IASC President 2014

The First International Polar Year 1882-83 was initiated with the goal of changing the focus of arctic expeditions from personal and national ambitions to scientific cooperation for the common good. This cooperation increased and expanded through the following three Polar Years. At the same time the number of scientific bodies cooperating on specific disciplines increased until arctic science seemed to be well covered with scientific societies and committees. In the Antarctic the International Geophysical Year 1957-58 (Third Polar Year) established the Special (later Scientific) Committee on Antarctic Research (SCAR) in order to increase cooperation and structuring of the various scientific activities, and SCAR became a model for the idea of a non-governmental scientific body in the Arctic that could help to promote and facilitate cooperation and coordination within the various disciplines over the entire circum-Arctic.

The background for the establishment of IASC was many faceted and involved also shifting international political developments as is well documented in this review of IASC's history. Once the organization was established, however, the development from 1990 to today has proved that the idea of such a body was both sound and, indeed, seems to have been successful beyond even the ambitions of its founders.

This preface will not attempt to summarize the developments that are documented in the book, but I will point to the fact that IASC now consists of representatives of 22 member countries and the membership continues to grow. This fact alone proves that those involved in arctic science consider IASC to be relevant and important. In addition I wish to highlight some developments that I have seen during my period of direct involvement, starting as a Council member in 2008. The Arctic Science Summit Week, which began in a modest way in 1999, has become a leading forum for interaction and communication. The Association of Early Career Scientists (APECS), which grew out of the Fourth Polar Year 2007-2008, has been and continues to be strongly supported by IASC, as is also the inclusion of indigenous representatives in the development of arctic science. The establishment in 2010 of the five Working Groups enables active scientists to participate more strongly in providing initiatives and cross-cutting possibilities for arctic research. Not least I am personally pleased to note the stronger position that the humanities and social sciences now has within the IASC system. The newly-established Fellowship Program to help young scientists develop a network within their own discipline, and the expansion of the IASC Secretariat to include more officers based in their own countries, are the latest initiatives of IASC which underline the organization's purpose as a non-governmental organization that aims to encourage, facilitate and promote cooperation in all aspects of arctic research in all countries engaged in arctic research and in all areas of the arctic region.

This account of "25 Years of Arctic Research Cooperation" could have been a relatively dry listing of facts. However, the contributors have all been, or still are, deeply committed to the development of the International Arctic Science Committee and they convey an insight, engagement and enthusiasm that lifts the story to a higher level. I am sure that both the knowledgeable and the less involved reader will find much here to awaken interest and understanding, not only of IASC itself, but also of the general history of the last 25 years of arctic research.

Photo: Martin Fortier
Scientists sampling newly formed pancake sea ice in the Beaufort Sea.The scientists are lowered in a cage from the research icebreaker CCGS Amundsen as a part of ArcticNet´s annual expedition to the coastal Canadian Arctic.

01 *Development* of IASC

01 Development of IASC

1.1

Initiation of the International Arctic Science Committee (IASC):

Odd Rogne with contributions from Robert W. Corell and Vladimir M. Kotlyakov

International scientific cooperation in the Arctic has a long and interesting history. In order to understand why the International Arctic Science Committee (IASC) was established, it is important to learn about the initiatives and cooperation that preceded it. IASC did not start from nothing, but evolved through a series of developments. The background to IASC is well documented in the contribution by Fred Roots (see Chapter 3.1) and will not be repeated here.

Although this paper focuses on the history of IASC, due prominence should be given to emerging circumpolar scientific thought, and the essential role of science in the Polar Regions as a component of world scientific consciousness.

Many international cooperative scientific activities and organizations preceded IASC and led to it. A good number of these efforts focused on a specific scientific discipline, or on a particular region of the Arctic; however, they contributed to the idea of the need for a strong circumpolar scientific organization that would not be restricted to specific scientific disciplines.

Another important aspect of understanding developments in the Arctic is its geopolitical significance after World War II.

Glasnost and Perestroika

The Cold War was a strong reality in the Arctic, as the Arctic Ocean represented the shortest distance between the superpowers (the USA and the USSR). Military infrastructure was being ramped up on both sides, as well as early warning systems, to prevent missile attacks. Although it was a terrible situation, Arctic scientists and weather observatories benefitted to some extent from the development of infrastructure and transportation.

This development cooled during Khrushchev´s time and discussions among the Arctic rim nations (those bordering the Arctic Ocean) began. The initial agenda was broad. However, it was soon narrowed down, and a practical outcome was the Polar Bear Treaty.[1] On the geopolitical scene, the Cuba crisis nearly started a third world war, and the world faced a cold war situation again. Although the 'Iron Curtain' existed between the East and the West, there were

Early IASC Planning Meeting in Reykjavik, Iceland, 1988. Left to right: Robert Corell, Odd Rogne, Francois Mathys, Vladimir Kotlyakov and Eva Grønlund.

Photo provided by Anders Karlqvist

Odd Rogne, Fred Roots and Magnusson (left to right) at a meeting in Reykjavik, Iceland, 1992.

Photo provided by Odd Rogne

some holes in the armor that allowed for scientific contact, and a certain number of projects continued. During the 80s, some changes were noticed in the USSR. Discussions began on bilateral scientific cooperation in the Arctic between Canada and the USSR, and shortly thereafter between Norway and the USSR. President Gorbatchev introduced such Russian terms as *glasnost* and *perestroika*, which prompted the world to watch for any further changes in the USSR.

The other superpower (USA) was watching even more intensively. In 1985, the President of the USA established the US Arctic Research Commission, and appointed James H. Zumberge as its first Chairman. Zumberge was also President of the University of California at Los Angeles and President of the Scientific Committee on Antarctic Research (SCAR).

Zumberge was in a good position to explore current and possible future cooperation in Arctic research, and he did so by inviting representatives from countries undertaking Arctic research to an informal meeting during the XIX SCAR meeting in San Diego, USA in June 1986. Odd Rogne (Director of the Norwegian Polar Institute) and Fred Roots (Environment Canada) served as advisors for this meeting.

The main outcome of the San Diego lunch meeting was an agreement to continue to explore the possibility of creating an international Arctic science committee.[2] However, as the USSR had as its policy to cooperate bilaterally with Arctic rim nations, it was agreed that another meeting would be organized in some months' time with representatives from Arctic nations with the idea of exploring Arctic scientific cooperation. Odd Rogne was given the task of organizing this meeting because he headed the Norwegian delegation discussing Norwegian-Soviet scientific cooperation in the North. The Soviet counterpart was the State Committee on Science and Technology (GKNT), an inter-ministerial body close to the top of Soviet administration.

What was meant by 'Arctic nations' was not clear, and needed clarification before the meeting would be called. The term used at that time was 'Arctic rim nations,' which included three large countries (Canada, the USA and the USSR) and two smaller countries (Denmark and Norway). After informal consultations (starting with the Arctic rim nations), it was decided that "countries with territories north of the Arctic Circle" would be used as the definition of an Arctic country. As a consequence, Finland and Sweden were added to the list of invitees. Later, it was brought forth that a small area of Iceland lay north of the Arctic Circle, and so by adding these three there was a final list of eight Arctic countries. The process for deciding on the definition was to ask all Arctic rim nations their opinion. As there were no objections, representatives of all Arctic countries were invited to the Oslo meeting. This definition was later adopted by the Arctic Environmental Protection Strategy (AEPS) and ultimately by its successor, the Arctic Council (AC)

The biggest challenge was to ensure that all the Arctic countries would be represented at the meeting, and particularly the USSR with its 'bilateral only' policy. At that time, President Gorbatchev had ini-

Correct mail name til Hushen

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30 May 1986

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Dear Mr. Rogne:

The President of the United States has appointed me as Chairman of the newly created Arctic Research Commission. The Commission, which has been in existence for a little over a year, is charged with promoting Arctic research and recommending an Arctic research policy.

My reason in writing is to propose that we take advantage of the presence during the SCAR meeting in June of several key individuals from countries active in Arctic research to informally discuss existing mechanisms for international cooperation in Arctic research. One of the issues the Arctic Research Commission wants to explore in greater detail over the next year are current and possible future mechanisms for international cooperation in Arctic research. Tentatively, I suggest we meet on Wednesday afternoon, June 25 from 2:00-5:00 p.m. at the Kona Kai Club to have a general discussion. Others I am inviting to participate include G. Hempel (FRG), E. S. Korotkevich (USSR), E. F. Roots (Canada), A. Karlqvist (Sweden) and T. Nagata (Japan). If I have overlooked others you believe should be invited, and who will be in attendance at the SCAR meeting, please let me know.

I am enclosing a short fact sheet about the Commission and transmitting under separate cover the Commission's first annual report and the recent issue of Oceanus dedicated to "The Arctic Ocean."

I look forward to seeing you at SCAR-19 in San Diego and I hope we will have time to explore our mutual interests in the Arctic.

Sincerely yours,

James H. Zumberge

James H. Zumberge

Invitation letter for Odd Rogne to attend the SCAR-19 Meeting in San Diego CA, USA, sent by James H. Zumberge, then President of SCAR and Chair of the US Arctic Research Commission.

Letter provided by Odd Rogne

tiated an internal process to cut at least one layer of bureaucracy in the Soviet administration, which meant that key Soviet people were reluctant to go abroad and miss the opportunity to defend their position at home. The solution to USSR representation was to engage the Science Advisor at the USSR Embassy in Oslo. He was advised to check some of the expected key issues with GKNT and other bodies in Moscow, so he could effectively represent the USSR at the meeting held Friday 13 February 1987 in Oslo, Norway.

The Oslo gathering served as a scoping meeting for IASC, and was followed by a rather intensive period of consultations. One or two key persons holding a position in the interface between science and policy from the Arctic countries were directly involved and attended the meeting. However, in most countries national consultations were held in ministries or appropriate national bodies. The reason for governmental attention was the potential political significance of the initiative; i.e., representatives of the Arctic countries sitting around a table discussing cooperation, instead of cold war propaganda.
However, it was not a homogenous group, and their insight into Arctic research was diverse.[3] There was a need for some common understanding of the needs for Arctic research from both a regional and a global perspective. A discussion paper, "Some Points for Consideration on the Need for, Feasibility and Possible Role of an International Arctic Science Committee," written by E.F. Roots and Odd Rogne aimed at serving this need.[4]

The Oslo meeting was a positive brainstorming session, and a small working group (Rogne, Roots, and Taagholt) was tasked to elaborate on the ideas presented. There was unanimous agreement to proceed, and to organize a larger meeting (there was an indication that Sweden would be interested in hosting). The minutes of the consultative meeting in Oslo also summarized the outcome of the San Diego meeting and strongly appealed to all participants to use available channels to encourage the USSR to fully join in the discussion.

« I headed the Norwegian delegation on bilateral cooperation in the Arctic between Norway and the USSR. The State Committee on Science and Technology (GKNT) was the Soviet counterpart. GKNT was an inter-ministerial body and close to the Kremlin administration. In addition to bilateral cooperation, related issues could be discussed. I used this opportunity to inform about the thinking at and after the San Diego meeting as well as the preparation for the Oslo meeting. The response by the Foreign Affairs member on GKNT was that the Soviet policy allowed for bilateral cooperation only. If one had taken that njet for an answer, IASC would have died right there. However, I noticed positive body language by some members of GKNT when I argued the benefits of the USSR joining the IASC discussions. My oral presentation was followed up by sending IASC material to the Embassy (Minutes from the Oslo meeting), the Director of GKNT and personal contacts in good positions. I have been informally told that this promotion work actually was successful. The material found its way to President Gorbachev´s speech writer and a short paragraph was used in the President´s speech in Murmansk 1 October 1987. The speech mentions the "need to coordinate research in the Arctic" and "setting up a joint Arctic scientific council."

Our next meeting in Moscow on the bilateral agreement was a pleasant surprise: On the Soviet side, they were now ready to agree on all points of the bilateral agreement in less than a day, and to use most of the remaining time to follow up discussions on the Gorbachev speech in Murmansk. It was an excellent opportunity to feed GKNT with arguments and information on the needs for and potential benefits of joining the IASC discussions. These discussions were very positive and I was assured that the USSR would be well represented at the next meeting (in Stockholm).

The day ended with a splendid Russian dinner. As usual at these dinners, there are many toasts and a tradition of making small speeches or offering extended comments on an issue (not simply saying 'cheers'). It means that one has to do some creative thinking, and when there are more than twenty Russians and only three Norwegians at the table, I had to do more creative thinking than drinking. In particular, as leader of the Norwegian delegation, most of the toast speeches fell to me on the Norwegian side.

After several toasts, one tends to get even more creative. I came to think of the Summit meetings between the presidents of USA and the USSR, and actually that this circumarctic cooperation we had discussed earlier that day should be on their agenda. "What an excellent idea" was the Russian toast answer, "and we can see to it that it is included in the preparations on our side. However, we have no proper contact on the US side." My answer to that was that I could easily phone or otherwise inform the Polar Advisor in the US State Department, whom I had met earlier, and whom I believed could help on the US side.

If anyone should read the communique from the Reykjavik Summit Meeting (between Reagan and Gorbachev), they will discover that circumarctic cooperation is in there.

Lesson learned: You never know what a toast in Russia can lead to!

For those interested in text analysis, you will discover that the sentences used by Gorbachev in his Murmansk speech are nearly identical to those in the early IASC papers. The same goes for the Summit Meeting text, except that 'cooperation between indigenous peoples' was added. »

After the Oslo meeting, the following happened:
- The small working group (Rogne, Roots, Taagholt) gathered together earlier texts as well as ideas put forward at the Oslo meeting. This publication "International Communication and Co-ordination in Arctic Science: A Proposal for Action" (Roots, Rogne, and Taagholt), also referred to as the RRT Report,[5] is a rather comprehensive report on the need for an organization like IASC and how to create an entity that would meet those needs. The report formed the basis for further planning (and for educating those who later became involved in the IASC planning process). The report also drew attention to the different science needs of Arctic and non-Arctic countries, and introduced the concept of an "Intergovernmental Forum on Arctic Science Issues."
- Discussions with the Soviets; without their participation, IASC would be incomplete; see page 13 for an example of one such dialogue.

Between the Oslo meeting (February 1987) and the Stockholm meeting (March 1988), Soviet President Michael Gorbachev delivered a seminal speech in Murmansk on 1 October 1987, giving substantive impetus for intergovernmental cooperation in the entire Arctic region. In that speech, among other important statements, he suggested that there should be international bodies with concerns over the development and stewardship of the Arctic region. First, he suggested that there should be an intergovernmental body to oversee development, environmental conservation, and policy development for the region. Further, he suggested that there should be an international organization formed to facilitate scientific research that would underpin such development and environmental perspectives and policy formation.

This speech made the USSR position very clear, as it made way for both intergovernmental and international Arctic research cooperation. It was a revolutionary message, as Soviet policy until then had been restricted to bilateral cooperation with other arctic rim nations, and to only certain regions of the Arctic.

For IASC planning, this speech was crucial as it could be seen as backing from the largest Arctic country and contained key elements from the IASC planning documents.

The Stockholm Meeting

The Swedes had offered to organize the next meeting. Meanwhile Gorbachev had held his Murmansk speech, and there were some attempts from the Soviets to get the next planning meeting in Murmansk. However, the decision was to keep with Stockholm (as preparations for that meeting were well in progress) with the promise that the following meeting would be held in the USSR.

The Stockholm meeting "International Cooperation in Arctic Science" on 24-26 March 1988 was attended by a broader group of people and backgrounds, and included science managers, representatives of funding agencies and ministries, senior scientists, etc.[6]

The main outcomes of the meeting were:
- A broad discussion on scientific needs
- Continuation of the IASC planning process – it was agreed that an IASC Planning Group would be appointed
- Agreement on the need for an IASC Secretariat
- Invitation to a conference on Arctic science cooperation in the Soviet Union at the end of 1988.

Arctic vs. Non-Arctic Interests

In the early 1950s, Arctic science was dominated by thematic mapping and research serving domestic needs simply because the broader interest was limited and resources (including logistics) were controlled by national agencies. However, as logistical opportunities improved and the Arctic attracted attention as a scientific laboratory, basic science interests started to grow both inside and outside the Arctic countries.

Nevertheless, an important barrier – the Cold War – meant limited (or no access) to some Arctic areas. This 'sensitivity fear' continued to linger for most of the last century. In addition, there was growing awareness of Arctic resources and the suspicion that non-Arctic countries were after these resources under the guise of Arctic science.

Full control of their own Arctic territory was a mantra for some Arctic countries, and a challenge that multinational research projects had to face (military sensitivity, perceived threats to sovereignty, etc. were a part of it). Planning an IASC under these conditions was not easy, and required understanding and respect for the challenges faced by the representatives of the various countries.

It was a strong wish by some countries to have some 'governmental control' of the potential new circumarctic research cooperation. In the RRT report to the Stockholm meeting, it was suggested that this need could be met by an 'Intergovernmental Forum on Arctic Science Issues.'

'Governmental control' is not popular with 'free science,' a dilemma that caused numerous discussions by the IASC Planning Group.

Why polar research?

« The Arctic countries, having needs for data and information for the management of their Arctic areas, have a broader interest in Arctic research than non-Arctic countries. Whereas non-Arctic countries focus their Arctic research on global issues, the Arctic countries have to cover a wide range of science-based data and information for the management of their Arctic area. This management involves answering three basic questions: What?, Where?, and Why? The two first questions are answered by thematic mapping, usually undertaken by specialized, national agencies. The `Why´ is answered by drawing on basic research inside or outside the agency. Examples of this type of thematic mapping/research are: management of nature (wildlife, fish resources), industrial activities (resource management, industrial threats to nature—such as pollution). In other areas of research, in particular those related to humans and social issues, scientists from Arctic countries dominate.

Scientists from non-Arctic countries mainly focus on global issues that are of prime concern to their home country; for example, climate change. Global issues are also of interest to Arctic scientists and countries, and so this forms the logical basis for Arctic/non-Arctic cooperation. »

The struggle over the IASC Secretariat and the birth of the Finnish Initiative

« At the Stockholm meeting, the question about an IASC Secretariat arose. As only the Nordic countries were interested, the issue was referred to the 'Nordic consultations on polar affairs.' The next meeting of this group was to be held in Ny-Ålesund, Norway. Denmark, Norway and Finland were all interested in hosting the IASC Secretariat. Iceland supported Norway immediately. After some discussion, Denmark and Sweden withdrew, leaving the issue to be discussed bilaterally between Finland and Norway. Both the Finnish and the Norwegian heads of delegation were experienced diplomats and they had both been ambassadors to Moscow.

The Finns had, at that time, rather limited experience in Arctic research and organization. However, they had developed the prospectus for an Arctic Centre, and their intention was to attract another building block (e.g., the IASC Secretariat) to this center. On the Norwegian side, we felt that we had polar issues well organized both in science and at a governmental level, and an expertise built up over decades. An IASC Secretariat could easily draw on all sorts of expertise.

Bilateral discussions (between Finland and Norway) were split into three parts: First was a dinner discussion between the Finnish and Norwegian ambassadors. If no agreement was reached, the Finnish ambassador and the Norwegian polar adviser should discuss it further. Finally if there was still no agreement, I (as Director of the Norwegian Polar Institute) would get the 'night shift' with the Finnish ambassador. No solution had been reached during the first two meetings, so we came to the 'night shift,' which started with reviewing the qualifications on both sides. Although being involved on the Norwegian side, I had to conclude that we had the best cards (since then, the Finns have built up their polar activity quite considerably). The Finnish ambassador soon ran out of really good arguments. However, he had obviously been instructed from Helsinki not to give in.

As it was a night shift, I had ordered a good bottle of whisky, so we left the issue at hand and had a creative discussion about the Soviet Union, and in particular the pollution drifting from Russia to Finland—an issue he had worked hard on as ambassador to Moscow. However, he had not succeeded. My comments were that when you have a superpower and a small country, in that constellation, a small country is not likely to win. However, if several countries organized themselves and hopefully convinced some other countries to join, then you could create a new situation. If he used the IASC model with the Arctic countries, you would have an interesting mix of countries discussing Arctic environmental issues. Although late at night, I observed that that idea struck him, or he 'saw the light' if you wish to use that metaphor.

The location of the IASC Secretariat was later settled between the ministers of foreign affairs of the two countries, and the conclusion was that Norway should host it.

However, a few weeks after the Ny-Ålesund meeting, the 'Finnish Initiative' was born, and Ambassador Rajakoski sent a short note to all Arctic countries, and followed up by visiting all ministries of foreign affairs in these countries. See the text of this note "Protection of the Environment in the Arctic" together with a short note by Odd Rogne.[7] *The response from the other Arctic countries was not directly enthusiastic at the beginning. Meanwhile, President Gorbachev had held his speech in Murmansk which helped fundamentally. However, after the idea was supported by Canada and a series of consultative meetings had been held, a meeting initiating the Arctic Environmental Protection Strategy (AEPS) was held on 14 June 1991 in Rovaniemi, Finland. »*

The Moscow Meeting

The meeting was well prepared based on earlier IASC material, and the Chairman had circulated a full draft text of a potential report. Most of the draft text was easy to agree on or modify. It was more a question of 'fine tuning,' as Canada and the USSR had nominated senior persons from their ministries of foreign affairs; i.e., not having attended earlier IASC meetings.

The meeting was held 12-14 July 1988 at the Institute of Geography, Russian Academy of Science (RAS) and produced the document "Proposal for an Organizational Structure of an International Arctic Science Committee (IASC)."[8] The main obstacle was reaching an agreement on non-Arctic representatives becoming full members of the IASC Council. A compromise was reached with the inclusion of a footnote, and thereafter we were able to enjoy a good dinner.

However, this footnote lasted only some hours, as the Chairman was called to the Legal department of the USSR Ministry of Foreign Affairs the next day. During that meeting, the Head of the department made it abundantly clear that this footnote was not acceptable to the USSR. A heated discussion ensued, in which the main reasons for having non-Arctic countries as equal partners on the IASC Council were presented.

The message was clear; we had to prepare for a new round of discussions in the IASC Planning Group.

The next meeting of the Planning Group was held 22-23 October 1988 in Stockholm. The main task was to revise the Moscow draft and suggest a way forward. As for the Moscow draft, the main issue was the role of Arctic vs. non-Arctic countries. The challenge was to find a compromise between the views of the USSR ('full control') and those of the USA ('everyone who contributes is welcomed in'). As a way of accommodating the governmental control aspect, the idea of a Regional Board was put forward – an issue that was heavily debated during subsequent meetings. An exchange of views had been ongoing between members of these two countries prior to the Stockholm meeting. Some revisions to the Moscow draft were accepted. Furthermore, it was time for the five-member Working Group (WG) to report back to all eight Arctic countries, informing them of the current version of the text, asking them for comments, and suggesting that all eight countries nominate a member to the IASC Planning Group.[9]

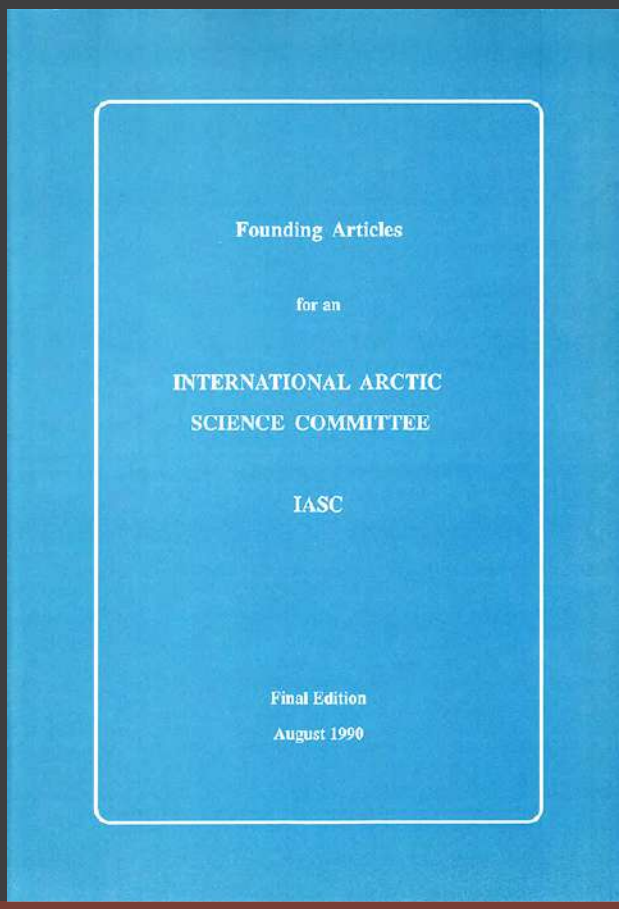
As a follow-up to the Gorbachev speech in Murmansk, a major international Arctic science conference was being planned for December 1988 in Leningrad, USSR. As all working group members planned to attend this conference, it was agreed that a meeting of the IASC Planning group would be held in advance of that conference. At the Leningrad meeting, 10-11 December 1988, the Planning Group agreed on a revised version (see: IASC. 1988. Founding Articles, Leningrad 10-11 December 1988[10]). This text was then circulated to all eight countries asking for national comments by appropriate, national bodies. These comments are summarized in "IASC—Survey of Comments."[11]

The Icebreaker Krasin (1917)

« Prior to the Leningrad conference, I was approached by Sevmorgeologia (a state institute) that owned the old and famous icebreaker Krasin with the idea to making this icebreaker a floating science platform. The proposal was that it should be a multi-national undertaking, and could be used in all Arctic seas (outside the European Economic Zone—EEZ). As this could become an opportunity to implement at least an important ocean component of IASC, I agreed to lead consultations with various countries during the Leningrad conference. No one could make commitments over the table, so the intention was to explore the interest and get personal views. In general, the response was overwhelming. Clearly, people would have to consult at home both on the concept and about funding. No exact budget was presented for rebuilding expenses and operating costs. One country said "we'll take it all." However, I had to point to the idea of having it as a multinational undertaking and as a partnership. However, there clearly was sufficient interest to proceed.

My correspondence with the Russians in the months that followed indicated disagreements on the Russian side. There were people working for the old and famous icebreaker to be turned into a museum and in the end they won the internal discussions. Personally, I would have done the same. The answer as to 'why' they wanted to preserve the Krasin you can read in more detail in Wikipedia using 'Krasin 1917 icebreaker' as a search word. In hindsight, one could conclude that the outcome was right. However, it was a pity that there was not a less famous platform being offered. If it had been implemented, we would have had a flying start in circumarctic science cooperation. »

IASC Founding Articles, Final Edition August 1990



by Odd Rogne

'Note Verbale'

« Although colleagues from non-Arctic countries had been kept fairly well-informed about the planning of IASC, France, the Federal Republic of Germany (FRG), the Netherlands and the United Kingdom (UK) formally approached all Arctic countries with a 'Note Verbale.' *This démarche came as a surprise to most of us, and revealed a lack of insight into the current situation. It was agreed that we should provide those countries with proper information, in particular explaining to them about regional science needs vs. global science, and asking them for patience until we had an agreed text.*

See also: IASC. 1989: A personal note on the present situation, 3 April 1989.[12]
This was an insider´s comment. Please also see Chapter 1.1.1. »

Although the comments received on the Leningrad text were close to being accepted, full consensus had not been reached, and so a hectic period of correspondence followed and another 'final' meeting was planned for 19-20 May 1989 in Helsinki.

A slightly amended version of the Founding Articles (dated 20 May 1989) was drafted.[13] It was further agreed that if there still should be any disagreement, a meeting of the 'big three' (Canada, the USA and the USSR) should be held later in the year in Moscow. Canada did not find the Helsinki text acceptable (after a national consultation), so the meeting of the big three was held in Moscow on 28-29 June 1989. The basic difficulty was that Canada and Russia believed that the coordination of Arctic research through an international committee should be controlled by nations and not by a collection of academies of science. At 'the big three' meeting, it was agreed that the other participating nations should be convinced that a regional board, comprising government representatives from the eight Arctic countries, should be established that would have a level of purview over the implementation of the programs and activities of what is now known as IASC (see report on a meeting of Canadian, Soviet and American representatives[14] and Chapter 1.2).

We were not 100% finished yet. However, from that point forward, discussions on wording could be carried out by correspondence, so we had a printed text well in advance of the IASC Founding Meeting that was planned for 28-31 August 1990 in Resolute, NWT, Canada.[15]

The Founding Meeting

Prior to the Founding Meeting, there was a short final meeting of the IASC Planning Group in Dorval, QC Canada to ensure that the draft Founding Articles developed earlier and finalized by correspondence were acceptable to all.

At the Founding Meeting, there was the signing ceremony, excursions, etc. However, there were also important business discussions considering the way forward, such as:

- Definitions and Criteria
- Rules and Procedures (draft)
- Actions needed to set IASC in motion
- Decisions and Recommendations

The report from the Founding Meeting in Resolute[16] contains a comprehensive survey of planning and preparations for the implementation of IASC. The formal implementation had to be left to the first IASC Council meeting, so the appropriate nominations could be made by the proposed national adhering bodies. However, a solid foundation had been laid for calling the first regular meeting of the IASC Council.

Further documentation on the operational activities of IASC can be found in the Council meeting reports and in the various initiatives and activities mentioned in parts of this history document.

IASC Founding Meeting in Resolute Bay NU, Canada, August 1990.

Photo provided by Anders Karlqvist

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1.1.1

How Science Organizations in the Non-Arctic Countries Became Members of IASC

Louwrens Hacquebord

Introduction

The exploration of the Arctic has always been an international effort. For a long time, explorers and scientists from both Arctic and non-Arctic countries have been active in seeking to understand Arctic geophysical, biological and socio-economical processes. From mediaeval times onward, ships sailed from the temperate zone to the North to discover new lands and new sea routes to Southeast Asia. In the sixteenth century, English and Dutch expeditions sailed North to search for a northern sea route.[1] New discoveries were recorded in documents and historical maps demonstrating increased geographical knowledge of the Arctic.

The scientific and realistic representations of the area were being published as early as the whaling period of the seventeenth century. One of the best documented and earliest realistic descriptions of the Arctic was written by a German ship´s barber, Friedrich Martens (1675).[2] His description of the North formed the basis of subsequent accounts written by Dutch and English whaling captains Cornelis Gijsbert Zorgdrager (1720, 1727)[3] and William Scoresby (1820).[4] Other classic works, which provided descriptions of Greenland and the Davis Strait are those of Lourens Feikesz Haan (1720), Hans Egede (1746), Johan Anderson (1756), and David Cranz (1765-1770).[5]

In this way, descriptions of the coast and coastal maps were generated. Many of the old maps have been preserved and they provide a good record of how the geographical image developed.[6] In the 19th century, researchers from other disciplines became interested in the Arctic as well. Geologists began to search for minerals in the interior Arctic lands, meteorologists and geoscientists became interested in the earth system and especially in earth magnetism. Prospecting for coal and minerals brought new expeditions to the lands around the North Pole.

Most expeditions, however, were individual efforts. No structured scientific circumpolar research was being undertaken. It is for this reason that Karl Weyprecht in 1875 devised a plan to establish a network of stations for systematic and synchronous observations in polar areas, which he aimed to realize through international collaboration. His plan formed the starting point for the organization of the first International Polar Year (IPY) in 1882-1883.[7] Ten countries – six Arctic and four non-Arctic - participated in the initiative. In the second IPY (1932-1933) the number of participating countries increased to fourteen – seven Arctic and seven non-Arctic – all contributing to one science plan. In the third IPY (most often referred to as the International Geophysical Year – IGY 1957-1958), twelve countries participated in polar research, but this time the science focused mostly on Antarctica.[8]

IASC Council Meeting in Illulisat, Greenland, 1994.

Photo provided by Louwrens Hacquebord

In the twentieth century, scientists learned that polar research had to be undertaken cooperatively. Subsequent to the third IPY, several initiatives, such as the establishment of SCAR and the Comité Arctic International (CAI) were established by scientists in order to work together in polar areas, and this led to the foundation of IASC.

In the 4th IPY (2007-2008) scientists from more than sixty countries worked together in both polar areas. The research was highly multidisciplinary, with strong engagement from biological and social disciplines to complement the geophysical sciences.[9]

The IASC Plan

On 20 June 1986 at the SCAR meeting in San Diego (USA), delegates of some Arctic rim countries came together with those of non-Arctic countries such as Japan, the Federal Republic of Germany, the UK, Poland, and France to discuss a plan for the establishment of a Science Committee to stimulate and facilitate international cooperation in Arctic scientific research. The plan was well-received and it was decided that representatives of the Arctic rim countries would further explore the possibility of establishing an IASC. During this so-called IASC Planning Process, discussions were held in Oslo in February 1987, in Stockholm in March 1988, in Leningrad in December 1988, and in Helsinki in May 1989. Already by the time of the Oslo meeting, the Arctic rim countries were joined by two other countries with territories within the Arctic Circle - Sweden and Finland. "Then" said Odd Rogne, the then chairman of the IASC Planning Process, "I got a phone call from the Icelandic embassy informing me that they had some square meters north of the Arctic Circle and consequently they were invited. The eight Arctic countries were then defined and this was later adopted as a definition by the AEPS and the Arctic Council (AC)."[10] The planning process finally culminated with the signing, in Resolute Bay, Canada of the founding articles for an IASC by representatives of the national science organizations of Canada, Denmark, Finland, Iceland, Norway, Sweden, the USA, and the USSR.[11]

In this way, a non-governmental scientific organization was established to encourage and facilitate international consultation and cooperation in scientific research concerning the Arctic. This committee covers all fields of Arctic science and provides a forum for discussion, exchange of information, and cooperation.[12]

Reaction of the Science Organizations in Non-Arctic Countries

In the meantime, leading scientists in some non-Arctic countries felt excluded from the process of the founding of IASC. On 20 February 1989, representatives of Arctic research institutes from Germany, the UK, and the Netherlands met with officers from their ministries of foreign affairs in Bonn, in the Federal Republic of Germany. Participants at this meeting were of the opinion that all scientific activities should be conducted according to the principle of scientific openness and that scientists from all countries should be able to participate in scientific work in the Arctic. They discussed the founding of the IASC to date, concluded that if these scientists wanted to proceed with their research in the Arctic, their science organizations had to become full members of the IASC and asked their governments to take action.

The governments of these countries, together with the government of France, decided to ask the Arctic countries to explain their policy regarding the IASC. In the second week of March 1989 the *quatre exclus* (as the four non-Arctic countries called themselves) executed a common *démarche* to the Ministries of Foreign Affairs of the eight Arctic countries which caused various reactions.[13] Some representatives of the eight countries held the opinion that the demarche had politicized the establishment of IASC and blamed the *quatre exclus* for it; others agreed with them and supported the four in their endeavor to involve their science organizations in the IASC process.[14]

The reaction of the IASC Planning Process group to the demarche was to postpone the Helsinki meeting in order to have time to contact science administrators in non-Arctic countries to provide them with more background information about the

planning process. At the same time, they searched for better solutions to the issue by categorizing IASC science into regional and world science, and connecting decision-making within IASC to this structure. Moreover, the non-Arctic countries were invited to send text suggestions for the founding articles.[15] Although there was no official document, the discussions in Helsinki in May 1989 produced draft founding articles, which allowed for scientific organizations in non-Arctic countries to participate in IASC on an equal basis. However, the USSR and Canada did not agree with this and considered the founding articles drafted in Leningrad in December 1988 to be the official basis for the establishment of IASC.[16]

Deadlock

On June 22 the British High Commission delivered a Note Verbale to the Canadian Ministry of Foreign Affairs on behalf of the UK, France, the Netherlands and the Federal Republic of Germany concerning the proposed creation of IASC. Referring to a note of 14 April, the Canadian Ministry answered on 17 July 1989 that the scientific activities of the proposed non-governmental IASC would be conducted according to the principle of scientific openness, and scientists of all countries would be able to participate. At the same time, the Canadian government believed that the founding articles of IASC must reflect the broader range of scientific interests and responsibilities of the Arctic countries.[17] According to the Canadian government, this balance was achieved in the draft founding articles agreed to in Leningrad in December 1988.

Now that the science organizations of non-Arctic countries were allowed to participate, the discussion became focused on their position within IASC. From an informal message sent by the German Embassy in The Hague, we know that the quatre exclus very much cherished the principle of equal rights for all IASC members (Arctic and non-Arctic countries) in the decision-making process. Decisions should be taken in consensus and they were not convinced that this idea was represented in the founding articles agreed on by the eight Arctic countries in Leningrad. The USA supported the non-Arctic countries in wanting decisions to be taken in consensus with no special role for the scientific organizations of the Arctic countries. The USA wanted to see IASC as a purely scientific organization with no governmental control specified in the founding articles. The creation outside IASC of an advisory committee for regional questions would be sufficient. The USA brought this to the table at a meeting with representatives of Canada and the Soviet Union in Moscow on 28-29 June 1989. It again became clear that the USSR and Canada were very much against the participation of non-Arctic countries on an equal basis. According to the Soviet representative, the scientific organizations of non-Arctic countries could participate in the working groups of IASC but not in the decision-making body.[18] This went so far that the Soviet representative openly cast doubt on the validity of a new Arctic scientific organization in which non-Arctic countries participated.[19]

In the meantime, a new initiative known as the Rovaniemi or Finnish Environment Initiative brought the eight Arctic countries together at a meeting (20-27 September 1989), again without the presence of non-Arctic countries, which further complicated the political situation. It became more and more clear that the eight Arctic countries wanted to collaborate in several fields without the participation of non-Arctic countries, and the quatre exclus felt affirmed in their opinion. During the Rovaniemi meeting, the participation of non-Arctic countries was again considered, but when Canada suggested inviting the participation of Non-Governmental Organizations (NGOs) and indigenous peoples' organizations, the discussions stopped rather quickly.[20]

The Breakthrough

In December 1989, the working group of representatives from Canada, the USSR and the USA developed a proposal for a new structure and new founding articles of IASC. In this new plan, representatives of the science organizations of Arctic and non-Arctic countries would be admitted to the Council, the highest decision-making organ of IASC. The regional questions would be discussed and decided at the

Regional Board level, where only representatives of relevant national organizations of Arctic countries held positions.[21]

However, the relationship between the Council and the Regional Board was still rather loose. Although they liked the new text much better, the *quatre exclus* were not completely satisfied with two founding articles that dealt with the position of the Council and the Regional Board in the decision-making process, and had questions about participation in the review meeting of IASC. Finally, as a demonstration of good intentions to include them from the beginning, the four wished to be represented as observers at the founding meeting of the IASC.[22]

The four submitted these points as an *aide-memoire* to the officers representing the American government and asked them to discuss the points with the seven other Arctic countries. The four expected much from the USA and the American negotiators. On 8 February, a *démarche* was executed in Washington, whereby articles C4 and D1 of the founding articles were seen as the key problems, but participation of all members of the Council in the review meeting was also put forward. The text of the *démarche* finished with the wish of the four to participate in the April meeting of the Rovaniemi Environment Initiative in Yellowknife, Canada, which was confusing. Linking these two completely different activities made the political situation more complicated yet, and did not strengthen the position of the non-Arctic countries in IASC. Therefore, the Americans advised the four non-Arctic countries to act with reservation with the *démarche*.[23]

In April 1990 the decision-making structure of IASC was explained by a Canadian officer as a process based on consensus with equal rights for representatives of science organizations of Arctic and non-Arctic countries. There was to be no discrimination between members of Council, only the Arctic countries were to be free in their decisions to establish specific scientific projects to address certain regional problems, and in whether to use IASC as a forum or not. The Regional Board would consider regional problems and other questions affecting the common interests of the Arctic countries. The purpose of the Board was to ensure that the activities of IASC were consistent with those interests. The Regional Board had no right of veto in this explanation of the Canadian officer.[24]

Founding Meeting in Resolute Bay

Finally, after all these discussions about the founding articles, the founding meeting of IASC took place on 27 August 1990 in Resolute Bay, NU, Canada. In addition to representatives of the national scientific organizations of the eight Arctic countries, representatives of the science organizations of France (Claude Lorius), the UK (David Drewry), Poland (Maciej Zalewski), the Federal Republic of Germany (Gotthilf Hempel), and Japan (Takao Hoshiai) were invited to attend the meeting as observers.[25] The science organization of the Netherlands was very disappointed not to be invited. The explanation of the inviting government of Canada was that the Netherlands had not participated in the preceding discussions in San Diego in 1986 and that there were no seats left on the plane to Resolute Bay.[26]
At the meeting in Resolute Bay, some general principles were adopted. First, it was agreed that IASC would be an international NGO of national scientific organizations; second, no decisions would be made on behalf of states; third, no judgment would be passed on the value of specific scientific research; fourth, IASC would try to avoid competition with other scientific organizations but would accept a certain overlap; fifth, the participating organizations would be represented at the level of directors or active scientists; and, finally, in order to make use of the momentum generated, IASC had to act fast and formulate some future lines of research. The first IASC meeting also formulated the criteria for admitting new members.[27] Qualified science organizations from non-Arctic countries must have a research program with at least five years of scientific publications and current scientific activities in at least two disciplines.[28]

Admittance of the Science Organizations of Six Non-Arctic Countries

Now the founding articles were signed by the representatives of the national scientific organizations in the Arctic countries and the first regular Council meeting of IASC could take place. It was planned for Oslo, Norway in early 1991 and actually took place on 21-23 January 1991. A diplomat of the Dutch embassy in Oslo had an informative talk with Odd Rogne and asked him what the science organization in the Netherlands should do to become a member of IASC. Rogne answered: "First of all no demarches anymore; those were, for some of the eight Arctic countries, the wrong signals at the wrong moments and a wrong psychology! Let the national scientific organization submit an application for membership before November 15." As a science organization in the Netherlands interested in Arctic research, the Netherlands Marine Research Foundation of the Royal Dutch Academy of Sciences sent an application for membership to the secretariat of IASC with a report of recent Dutch Arctic scientific research activities.[29]

In the report of the first regular IASC Council meeting on 21-23 January 1991 under agenda 3.2 Applications for membership of the IASC Council: the science organizations of France, the Federal Republic of Germany, Japan, the Netherlands, Poland and the UK were admitted as full members of IASC after a brief discussion of Council. Admittance of these organizations was based on an application in accordance with the founding articles, significant arctic research and naming the appropriate national scientific body having an interest in arctic scientific research. The report of the meeting states: The IASC Council henceforth comprises fourteen members, all of whom took part in all subsequent activities.[30]

And, indeed, the representatives of the science organizations of non-Arctic countries subsequently served IASC in all positions – as president, vice president, chair and vice chair of working groups, and as project leaders. The IASC Council meetings – after 1999 held as part of the Arctic Science Summit Week (ASSW) – were also organized in Arctic as well as in non-Arctic countries all over the northern hemisphere. Today, science organizations in twenty-two countries are full members of IASC. After twenty-five years, IASC is flourishing as never before thanks to collaboration of the science organizations in Arctic and non-Arctic countries.

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Left to right: Maciei Zalewski (Poland), Takao Hoshiai (Japan), Gotthilf Hempel (Germany) and David Drewry (UK) at the IASC Founding in Resolute Bay NU, Canada, August 1990.

Photo provided by Anders Karlqvist

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1.2

IASC Regional Board

Odd Rogne
Reviewer: Robert Corell

The roots of and the thinking behind an IASC Regional Board dates to the 1987 publication, "International Communication and Coordination in Arctic Science. A proposal for action,"[1] which was the first comprehensive working paper early in the IASC planning process, and one that influenced subsequent discussions on how IASC could be formed and what needs it could or should address.

The authors of this contribution envisaged the need for:

"1. A non-governmental scientific committee provisionally called the "International Arctic Science Committee" to be established to promote international cooperation in scientific research in arctic areas.
2. Representatives of governments of arctic nations—countries with territories north of the boreal forest zone—to discuss the feasibility of establishing a mechanism for regular, structured intergovernmental discussions and liaison in arctic science matters. The discussions would deal with matters of common interest, ...".

In other words, the authors called for a non-governmental scientific committee and an intergovernmental forum. In the paper, this intergovernmental body was called "The Intergovernmental Forum on Arctic Science Issues."

At that time (prior to 1987), the USSR was receptive to bilateral science cooperation with arctic countries, and Canada and Norway had some experience with such cooperation. The authors suggested some possible areas of regional, governmental interest. In hindsight, the tasks suggested for this intergovernmental body were taken over by entities involved in intergovernmental cooperation directly with the initiation of the AEPS and its successor, the Arctic Council (see Chapter 1.1).

However, in the ensuing IASC planning process, the discussion on regional science needs (with some governmental involvement) and more global science thinking led to extensive discussions, and a series of meetings (listed in other parts of this history document). For some countries, having this intergovernmental forum was a condition for agreeing to join in the founding of IASC. The challenge was to find a solution that accommodated rather diverse views.

The need for an IASC Regional Board was substantially diminished with the establishment of AEPS. Still, some countries felt the need to have a division of IASC that could keep an eye on IASC science discussions. The terms of reference for the IASC Regional Board, as given in the IASC Founding Articles, are as follows:

"The Regional Board will consider general regional problems and other questions that will affect the common interests of arctic countries. Its membership includes one representative from each of the eight arctic countries. The purpose of the Regional Board is to ensure that the activities of IASC are consistent with those interests."

In reality, members of the Regional Board were science managers with some links to their governments. However, having lost its main mission (assumed by AEPS), and left with a watchdog role created some frustration for the Regional Board. "The Role and Function of the Regional Board" was a frequent item on the agenda.

Although the agendas of the Regional Board were limited (and there was only one small project that IASC had to abolish as it was "against the interest of one arctic country"), these short meetings served as an exchange of information between key arctic science managers. In addition to getting to know each other and discuss bilateral cooperation and issues, there was one initiative strongly promoted by the Chair of the Regional Board, Robert W. Corell, and that was the Arctic Climate Impact Assessment (ACIA). The background on this initiative was that

IASC had been managing two major projects on climate impact studies (as an important part of the IASC science agenda). Members had also been discussing assessments as a tool to identify important gaps in the science agenda. Two working groups of AEPS—the Arctic Monitoring and Assessment Programme (AMAP), and the Conservation of Arctic Flora and Fauna (CAFF)—started to use assessments for their own needs, so IASC invited them to participate in a joint venture—ACIA—which engaged many scientists, and became a success story (see Chapter 2.5).

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1.3

From Project Groups to Working Groups

Odd Rogne and Volker Rachold
Reviewer: Kristjan Kristjansson

Initially, IASC was designed with a Working Group (WG) concept and some strong ideas about multi-disciplinary groups. However, in practice it was too ambitious. The first and immediate challenge was to develop east-west cooperation as there had been very limited contact between the scientific communities in the two blocks during the cold war. Second, scientists preferred to interact with colleagues in their own discipline; and third there was a language barrier that had to be overcome.

For a new organization, there was also a need to demonstrate tangible outcomes within a reasonable period of time; hence the project concept was adopted. For international projects, what is needed is a simple and easily understood organization with clear goals, main objectives and a timeline, and progress reports. Internally, project proposals were discussed by the IASC Executive Committee that also had an advisory function for project leaders. At their annual meeting, IASC Council approved the projects. Council members also had the important task of informing their national scientific communities, encouraging national participation, and stimulating their communities to suggest project ideas. This system was based on well-organized national committees appointing active Council members that took their two-way reporting task seriously. As in all international cooperation, those who engage will profit and those who only attend will not.

In the beginning, the IASC science agenda was developed and based on four themes:

- Impacts of global changes on the Arctic region and its peoples
- Arctic processes of relevance to global systems
- Natural processes within the Arctic, and
- Sustainable development in the Arctic.

It was also agreed (1994), that it would be useful to convene an international planning conference bringing together arctic scientists to develop these themes further. The first International Conference for Arctic Research Planning (ICARP) was held in 1995. It was quite successful, and laid the foundation for many of the inaugural IASC projects or those to be implemented over the next few years (see further details in Chapter 2.3).

Most of these early projects were quite successful, and each year new projects emerged. IASC became a 'market place' for testing new ideas that scientists could suggest to the organization either through their national committees or directly. The ideas were screened by the IASC Executive Committee and circulated to all Council members for consultations in the national committees. Members gave advice and comments during this process, and project ideas could be developed into an attractive proposal. (A list of IASC Projects is given in Appendix 6.3).

As Arctic changes became more apparent, and as cooperation expanded in the Arctic, there was a need to renew the IASC project portfolio. A Second ICARP was agreed to in 2003, and took place in 2005 (see

Chapter 2.6). Unlike ICARP I, ICARPII did not directly result in new IASC projects, but produced a set of forward-looking science plans. Building upon the planning efforts of ACIA and IPY 2007/2008, the ICARP II Steering Committee identified twelve areas of potential research need. International teams of scientific experts and indigenous leaders were appointed for each of these areas and mandated to develop forward-looking science plans to guide international cooperation over the next 10 to 15 years. Many of the scientific priorities identified in the science plans fed directly into the framework of the emerging IPY.

At about the same time, IASC Council decided to call for a second review of IASC (see Chapter 1.4.2). The report, prepared by the Review and Strategy Group, was presented in early 2007. A central recommendation was for IASC to consider "adopting a new organizational structure to reflect the progressively more integrative nature of today´s polar science," including "restructuring IASC along working group lines as opposed to project-driven activities." The Review and Strategy Group noted that IASC had gradually migrated, seemingly without a conscious decision, from a 'working group' structure to a 'science project' structure. Based on a thorough review of IASC Projects, they came to the conclusion that "many projects had been discontinued prematurely, without producing any substantial results." A strong argument for returning to the working group structure was that with members from (at that time) 18 countries and various disciplines, the organization had the ability to harness a significant amount of energy and expertise in order to fulfill its mission. The network of working groups provides IASC with a mechanism to utilize the talent of a large number of active scientists to provide initiatives and directions for Arctic research.

Consequently, at its meeting in 2007, the IASC Council decided that ongoing IASC Projects would be finalized. Project leaders were asked to wrap up their work and prepare a final report, which was published in the IASC Bulletin. Some former IASC Projects requested to maintain their IASC affiliation and they were given the opportunity to re-apply for IASC endorsement as an IASC Network (a list of IASC Networks is provided in Appendix 6.3).

The transition back to the original working group structure, as outlined in the Founding Articles, took some time, but at the 2010 IASC Council meeting, five Working Groups (WGs) were formally established: (1) Atmosphere WG; (2) Cryosphere WG; (3) Marine WG (the former Arctic Ocean Sciences Board—AOSB, see Chapter 4.4); (4) Social & Human WG; and, (5) Terrestrial WG. The first workshop that brought together members of all five WGs took place in Potsdam in January 2011. The scope of IASC Working Groups is provided in Appendix 6.4.

IASC Working Group Workshop in Potsdam, Germany, January 2011.

Photo: IASC Secretariat

1.4

IASC Reviews

The IASC Founding Articles called for a review five years after IASC was founded. It was later agreed to continue regular reviews.

1.4.1

The 1995-1996 Review of IASC

David J. Drewry (Chair of the Review Group)
Reviewer: Jörn Thiede

In 1995, IASC had been operating for barely five years, so it was surprising that a decision was made to review its activities and performance. This was in part the result of the phenomenal development of its work, driven principally by its Executive Secretary, Odd Rogne. The IASC Council must have spotted a naive candidate when, attending the Council for the first time, I was asked to chair the review. To be fair, I was not too upset since I had been following the progress of IASC since 1990. Moreover, the selection of the other members of the review group brought a breadth of experience and knowledge of Arctic scientific affairs, including Anders Karlqvist from Sweden, Vladimir Kotlyakov from Russia, Barrie Maxwell from Canada, Jens-Peder Hart-Hansen from Denmark and Claude Lorius from France. That there were three glaciologists on the team failed to cool their enthusiasm for the task! Furthermore, three of the members also had considerable experience working in Antarctica and with its coordinating organizations, which provided a useful comparative perspective. Indeed, Lorius had recently been the SCAR President and I had not long before stepped down as the Chair of the Council of Managers of National Antarctic Programs (COMNAP).

IASC had charged the review team with the following Terms of Reference: To "1) determine the adequacy of policy formulation; 2) examine the scope and achievement to date of IASC's scientific activities (in particular the process for identifying program areas, the role and delivery mechanism through the working groups, information exchange, workshops, and conferences); 3) examine the effectiveness of the relationship between IASC's science activities and international science programs; 4) determine whether the volume and balance of IASC's programs are adequate to meet the perceived needs of the natural and human sciences; 5) assess the ability of IASC to respond to requests for scientific advice; 6) examine the effectiveness of all other components by which IASC delivers its mission." This was quite a task, but the team felt they could provide a useful canvas on which to paint IASC's future scenes.

At an early gathering, it was decided that it was vital to canvas the opinions of the Arctic science constituency. There were people who had taken an early interest in IASC and its various projects, but it was recognized that there were many others in universities and government organizations, in commercial enterprises, NGOs, and indigenous peoples associations that were keenly interested in the science agenda but had little awareness of IASC. It was agreed that a questionnaire should be circulated as widely as possible and a good deal of the thinking should be based on the replies. At that time, I was Deputy Chief Executive of the UK Natural Environment Research Council and had access to staff assistance. I therefore seconded one of my team to work on the preparation of the Questionnaire. The questions were designed around the Terms of Reference of the Review and approved by the Review Group. About 450 questionnaires were sent out to addresses provided by the IASC Secretariat and from the successful ICARP I. These were supplemented by a variety of other minor inputs. Approximately 30% of the questionnaires were returned; for such a survey this is considered a reasonable outcome. The comments on the returned questionnaires were probably the most valuable, as participants commented freely on their perceptions of the organization.

So what were the outcomes of the review? The report[1] was submitted to Council in 1996 and the overall thrust of the recommendations were accepted. Three years later, an analysis of progress on the implementation of the recommendations was made, and the table contained in that report[2] is reproduced below:

Progress of IASC *against 1996 IASC Review recommendations*

Recommendation	*Progress (1999)*
01 IASC become principal international organization coordinating arctic science	Slow. ASSW represents progress. Multi-disciplinary activity now taken on board.
02 Provide forum for operators	Forum of Arctic Research Operators (FARO) established.
03 Develop science agenda, focus on user needs, incorporate info on finance and timing constraints, seek higher profile, stimulating and prioritizing programs, review portfolio etc.	Contact with, inclusion and addressing needs of Arctic residents still require considerably more effort. Finance and timing constraints have been included. Publicity has improved, ASSW has assisted, always more to do. Program development: project guidelines have been produced. Implementation: planning is improving. Regular reviews of projects now undertaken by ExCom.
04 Encourage more human science representation	Social science and humanities representation still too light.
05 Become vehicle for international funding	Proactive seeking of funds has not proved easy.
06 Greater contact with users	Greater contact with Arctic research users/stakeholders has been slow and patchy.
07 Membership in the International Council for Science (ICSU)	ICSU membership mired in Russian internal politics
08 Relations with Arctic Council	IASC-Arctic Council relations (part of wider policy-science dialogue) has progressed well but requires continuous attention.
09 Interaction with International Human Development Program (IHDP), Intergovernmental Panel on Climate Change (IPCC)	IHDP/ IPCC interactions have been positive, especially the latter.
10 Communications with other organizations	Satisfactory: Arctic Climate System Study (ACSYS)/ World Climate Research Program (WCRP), International Arctic Social Sciences Association (IASSA)
11 Mechanisms for provision of advice	Advice issue not tested.
12 Review of Working Groups	WG activities have been reviewed. Reporting is much better. Arctic Global Change Program Office (AGCPO) closed
13 Dissemination of information	Dissemination of information - WWW is assisting
14 Cooperate with the Scientific Committee on Antarctic Research (SCAR)	Cooperation with SCAR possible in future, quiet liaison. Joint data meetings with Arctic Environment Data Directory (ADD).
15 Review structure of Annual meeting	Council meetings have been streamlined: possibly now too efficient!! ASSW developed.
16 Keep up with changing technology	Information Technology (IT) is being used.

This provides a fair idea of the trajectory of the outcomes. Perhaps I would point our emphasis on getting the internal structure right, having more social science and humanities involvement, better effective engagement with native peoples/first nation groups and wider liaison with cognate science bodies and organizations.

Of course, looking back on the Review some sixteen years on, it is no surprise that some of the same issues were revisited in the second IASC Review and Strategy report and indeed are still current today, albeit in a somewhat different guise as science and its coordination have moved on in style and approach. *Plus ça change, plus c'est la même chose!*

Reference

[1] IASC (1996). Review (see Background Document at http://iasc25.iasc.info/)
[2] Drewry, D. (1999). Arctic Science - Opportunities and Challenges for IASC: a personal perspective.

1.4.2

IASC Review and Strategy 2006-2007

Sara Bowden
Reviewer: Jörn Thiede

The IASC Founding Articles interestingly call for a review "five years after entry into effect of the Founding Articles..." Nonetheless, the IASC Council, at the March 2005 meeting in Kunming, China decided to call for a second review. As noted earlier, the first review was held in 1995-96, five years after the formation of IASC. Now, a decade later, a second Review and Strategy Group was formed for another review of the organization.

The Terms of Reference invited the Review and Strategy Group to:

- study and review IASC activities since 1996;
- suggest and justify any major changes to be undertaken;
- suggest forward-looking strategic actions to be taken to fulfill the IASC mission;
- clarify issues such as project initiation, gender balance, inclusion of young scientists, and appointment procedures; and
- consult the usercommunity and learn from the SCAR review.

The members of the Review and Strategy Group as appointed by the IASC Council were: Hajime Ito, Anders Karlqvist, Igor Krupnik, Hanne Petersen, Tom Pyle (Chair), and Jörn Thiede.

The group began in 2006 by developing several documents, including a summary of the mission of IASC, an assessment of the SCAR review and how it might provide guidance for the current undertaking, a social sciences assessment of IASC, and an assessment from new members in Asia of IASC and how it meets the needs of non-Arctic countries. The group met for a first time in April 2006 in Stockholm, Sweden where they outlined their plans for the report. During the Stockholm meeting they also developed a survey on performance which was sent over the summer of 2006 to 25 Arctic organizations familiar with the work of IASC. The results of the survey were included in the Review and Strategy Report. The group met for a second time in January 2007 in Arlington, VA, USA to discuss the report as it was developed between the two meetings.

In February 2007, the report[1] was transmitted by Tom Pyle to Kristján Kristjánsson, Chair of IASC Council. The report provided a detailed review of IASC´s activities over the previous decade as well as strategic thinking of ways in which IASC could move forward productively in the coming years. The Review and Strategy Group indicated that they believed IASC was well-placed to play a central role in advancing scientific understanding of the Arctic not only in the region, but globally.

The Summary of the Report states that: "The R&S Group found a healthy organization, but one in need of revitalization; one which needs to better respond to environmental, social, economic and scientific

changes taking place in the Arctic. The Group felt that the mission of IASC remains valid, but new realities, such as the emergence of new organizations engaged in scientific undertakings in the Arctic, rapid climate change as highlighted in the Arctic Climate Impact Assessment, and increased linkages to the global system, to name a few, demand that IASC embrace a new vision. This new vision is one in which IASC upholds a holistic and multidimensional perspective needed in the decades ahead and addresses the Arctic as part of the global process; and one in which IASC plays a central role as THE international organization in the North to harness the scientific expertise of the Arctic. The R&S Group believes that IASC must find a way to bring the full body of scientific knowledge of the Arctic together so that it can provide collective international advice on science issues in the North."

The Review and Strategy Group suggested that IASC consider:

- Adopting a new organizational structure to reflect the progressively more integrative nature of today´s polar science.
- Expanding its functions to embrace various science policy issues such as new technology, data management, education, and public outreach.
- Strengthening its relations with the Arctic Council, social science organizations representing constituencies in the North, and other global organizations interested in the science of the Arctic region.
- Reorganizing and revitalizing the ASSW as a major cross-disciplinary venue.

  In addition, the R&S Group suggested some changes internal to IASC to improve its public image and efficiency.

Within these broad areas, 29 specific recommendations were made. These included:

- Restructuring IASC along Working Group lines as opposed to project-driven activities;
- Merge the Arctic Ocean Sciences Board (AOSB) and IASC;
- Improve relations with the Arctic Council and SCAR;
- Enhance the social sciences within IASC;
- Enhance ASSW with a science conference every other year and include social science organizations in the planning process;
- Encourage the involvement of early career scientists in IASC working groups and activities;
- Improve IASC's public presence.

The IASC Council received and reviewed the report at its 2007 meeting and began immediately to implement many of its recommendations. As a result of the Review and Strategy Report, for example, the Council formed five working groups. IASC WGs identify and formulate science plans, research priorities, encourage science-led programs, promote future generations of arctic scientists and act as scientific advisory boards to the Council. Another example of activities undertaken as a result of the Review and Strategy Group report is greatly enhanced collaboration with SCAR through the formation of a Bi-polar Action Group which meets annually to make recommendations for bi-polar activities.

IASC can point to the implementation of most of the recommendations made in the report, which has subsequently increased its visibility not only in the Arctic, but globally. Membership has grown through the addition of four new countries since the report was released, and activities of the working groups have grown significantly. In addition, secretariat staff has grown accordingly and education and outreach is at an all-time high. Whether some of these accomplishments might have occurred even without a Review and Strategy Group to help guide the way is not known, but what is clear, is that since the report was delivered to Council, IASC has made a good attempt to respond to the recommendations and has increased its profile and activities substantially in the years since.

Reference

[1] IASC (2007). Review and Strategy Report (see Background Document at http://iasc25.iasc.info/)

Photo: Michael Hardwood
Alert, Nunavut: Polar wolf and Inukshuk at a stopover during the PAMARCMiP
(Polar Ariborne Measurements and Arctic Regional Climate Model Simulation Project) study.

02 *IASC* Initiatives

02 IASC Initiatives

2.1

International Science Initiative in the Russian Arctic (ISIRA)

Sergey Priamikov and Odd Rogne
Reviewer: Lee Cooper

IASC was founded just after the end of the Cold War and as circumarctic cooperation was about to emerge. However, there were several barriers to overcome before such cooperation could become a reality. A lack of contact networks between eastern and western scientists, language barriers, and funding opportunities were just a few of the challenges.

Toward the end of the Soviet Union, a few bilateral agreements had been signed and some progress had been made in joint arctic studies. However, the collapse of the Soviet Union and the ensuing economic problems severely handicapped Russian arctic scientists and science institutions – a community that could contribute significantly to addressing some of the vast environmental and other challenges in the Russian Arctic and beyond.

For western arctic scientists, the Russian Arctic – covering almost half of the Arctic polar region – constituted a wealth of research opportunities both in the natural sciences and also, to some extent, in the human and social sciences.

After a short period of time when foreign research groups flooded into the Russian Arctic (a region that had been mainly forbidden to foreigners), a federal access system was put in place with permits and logistical requirements.

The idea of an International Science Initiative in the Russian Arctic (ISIRA) was launched in 1993. This was a Russian and international cooperative initiative designed to assist arctic science and sustainable development in the Russian Arctic by:

- Initiating multinational research programs that would address specific key problems in the Russian Arctic;
- Providing a forum to link on-going or planned bilateral projects to achieve added value and avoid duplication;
- Facilitating improved scientific access to the Russian Arctic;
- Advising on funding and organizing the implementation of agreed-upon projects.[1]

At first, the ISIRA secretariat (served by the IASC Secretariat) was focused on identifying potential partners on both sides, pushing for funding opportunities (from the European Union – EU, and national sources), and promoting the Russian Arctic as an outstanding laboratory for both natural, and human

Meeting of the IASC Advisory Group International Science Initiative in the Russian Arctic (ISIRA) at the Arctic Science Summit Week 2014 in Helsinki, Finland.

Photo: IASC Secretariat

or social sciences.
In 1993, ISIRA was organized as an international group advising the IASC Executive Committee on the development and promotion of international cooperation in the Russian Arctic. Members were from countries with bilateral projects in the Russian Arctic, and from the Russian side participants included a representative from the Academy, one from the major polar research agency (the Arctic and Antarctic Research Institute – AARI), and a key person from the federal bureaucracy.

Initially, ten countries appointed members to this group. Russia was naturally a key stakeholder in this initiative and several authorities were involved, reflected in the troika composition of Russian representation in the group.
ussian policies and regulations with regard to their northern regions changed rather often, so increasingly field activities had to be based mainly on bilateral collaborations (some of which were very successful). As a result, the multinational program idea diminished. However, membership in ISIRA also had value for sharing information through regular updates.
Information was a basic need both for members of the ISIRA group and for anyone else interested in undertaking research in the Russian Arctic. In the beginning, such information was made available on the IASC website. Later, AARI developed a very good information website as a part of their role as the IPY Eurasian Sub-Office (see: *www.ipyeaso.aari.ru*). Hopefully, this website will continue to operate for many years.
Several projects emerged under this initiative, both in the natural and the social sciences.

An example of a major natural science project is: Land-Ocean Interactions in the Russian Arctic (LOIRA). This Russian-led project developed its own science plan using the template of the international Land-Ocean Interactions in the Coastal Zone (LOICZ) Science Plan and the European Land-Ocean Interaction Studies (ELOISE) plan. The project involved extensive fieldwork in the coastal zones of the Pechora Sea and the White Sea. Several workshops were organized over the years with considerable multinational participation. Annual outputs were recorded in annual workshop publications. Some of the research outputs can be found in the publications referenced at the end of this chapter. The LOIRA concluded in 2005 after about 10 years of successful planning and implementation.[2,3]
Problems of Indigenous Peoples in the Russian Arctic was a project development process based on workshops in which users (indigenous peoples and GOSCOMSEVER - the State Committee for Social and Economic Development of the North) defined their priority problems, which then should be addressed by scientists working with the users. In total, four projects were chosen and work was started. Unfortunately, GOSCOMSEVER was abolished and succeeded by the Russian Finance Ministry, which informed IASC that these projects were no longer acceptable. Consequently, one project was transferred to the Caribou/Reindeer project (IASC), one was completed during the summer of 2001, and the last two were merged into one ('Health and Nutrition') and became a significant Russian contribution to the circumarctic project "Nutrition and Health of Northern Indigenous Peoples (NUHIP): Interactions with ethnicity, social status and environment."

Over the years, the activities of ISIRA have changed, from the initial 'partnership' role, to bringing scientists together for project development workshops, funding advice, etc., to linking related bilateral projects. Because the next generation has other obstacles to address, changes are being implemented to assist young scientists.

References

[1] ISIRA (1994). International Science Initiative in the Russian Arctic (ISIRA)—an information and promotion brochure published in English and Russian. Oslo, 10p.

[2] Lisitzin, A.P. et al. (2001). Experience of System Oceanologic Studies in the Arctic. Moscow, 644 p.

[3] Romankevich, E.A.; A.P. Lisitzin and M.E. Vinogradov, eds. (2003). The Pechora Sea: Integrated Research (Hydrophysics, Hydrology, Optics, Biology, Chemistry, Ecology, Social and Economic problems). Moscow, 486p.

2.2

Forum of Arctic Research Operators (FARO)

Anders Karlqvist
and Magnus Tannerfeldt
Reviewer: Morten Rasch

The Forum of Arctic Research Operators (FARO) was established in 1998 as an off-spring of IASC. It had as its source of inspiration the development of a similar logistics coordination initiative in Antarctica. IASC has, in many ways, served a similar role for Arctic science as SCAR for Antarctic science. The two organizations are scientific in the spirit of ICSU, and are closely related in terms of scientific interests and scientific community. COMNAP, which was created out of the logistic and operational dimensions of Antarctic science, was an idea that clearly could be relevant also in the Arctic. Hence there was a proposal to create a forum that: "...aims to encourage, facilitate, and optimize logistics and operational support for scientific research in the Arctic, through international collaboration for all those involved in arctic research."

The challenge in the initial phase was the complexity of the arctic scene, which is quite different from Antarctica where virtually all science is supported and guided by national organizations—typically governmental institutes. This is not the case in the Arctic, where an abundance of local, regional and national organizations conduct research and monitoring programs. Nevertheless, in order to have an effective international forum it was necessary to identify national representatives who could serve as links to the prime operators and the science community in the relevant countries. The choice of the term 'forum' made it possible to accommodate different solutions, depending on the various national organizations providing research logistics.

The tasks of FARO can be summarized in five bullet points:

- Exchange information between operators
- Coordinate logistics
- Respond to requests from the science community
- Share information and experiences with Antarctic colleagues
- Advise policymakers

The first years of FARO were very much a learning-by-doing experience. It took time to define its role and to form a constituency. A major step forward was taken when a secretariat was established, hosted by the Danish Polar Center and supported financially primarily by the US National Science Foundation (NSF). Odd Rogne served as Executive Secretary at the initiation of FARO. When he retired in August 2005, secretariat assistance was transferred to Denmark with Morten Rasch as Executive Secretary. In 2009, the FARO secretariat became fully staffed. The secretariat is now hosted by Aarhus University and run by Morten Rasch (Executive Secretary) and Lillian Magelund Jensen (Academic Secretary).

FARO meets once a year in conjunction with the IASC Plenary and the ASSW. Meeting agendas have typically emphasized information exchange and ways of strengthening collaboration between operators based on the mandate. A key asset for arctic research is access to ships capable of operating in ice-covered waters. FARO has made continuous efforts to keep members updated on the availability of Arctic research vessels, their capabilities and planned cruise tracks. Web-based systems such as Arctic Logistics Information and Support (ALIAS) have been explored. Another resource for scientific research and cooperation is observatories and stations. An early example of a successful effort in this spirit was the initiation (in 2000) of the Circumarctic Environmental Observatories Network (CEON), which became a joint FARO/IASC project. FARO also fostered the initiation of SCANNET (a network of field site leaders, research station managers and user groups in northern Scandinavia and Europe) and later endorsed the establishment of the International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT), an organization that now oversees cooperation between approximately 60 research stations in the Arctic and in Northern

Alpine areas (*www.eu-interact.org*). Still, in 2012 it was stated that "there is an unrealized potential in the coordination of ships/vessels/stations. It simply needs innovative thinking and cooperation. We will save money by coordinating of logistics and by helping each other."

Several national and international research logistics initiatives have been presented and discussed within FARO, such as the formation of a regional forum—the Pacific Arctic Group (PAG), the planning for new research vessels, the initiative for a new Canadian High Arctic Research Station (CHARS), and the Arctic Research Icebreaker Consortium for Europe (ARICE) initiative on icebreaker collaboration.

The primary function of FARO is to serve the arctic scientific community, and as such FARO maintains a close relation to IASC. FARO has also maintained good contacts with its 'sister organization' in the South, COMNAP, and has been active in major international activities such as IPY. Another operational matter of great importance to Arctic scientists relates to harmonizing procedures for permissions to do research on land and in waters of national sovereignty. Such questions are discussed in FARO and will be further addressed with the Arctic Council and its member states.

The organizational structure of FARO has yet to be developed. It was initiated as an informal platform for information exchange between Arctic logistics operators but has not yet evolved into an organization with the mandate and resources to coordinate research logistics at an international level. New Terms of Reference were adopted in 2013, and the ties between FARO and the newly reformed IASC have been reinforced through a Memorandum of Understanding. The potential for the future is open.

Leadership of FARO

Chairperson

1998-2003
Bonnie Hrycyk,
Polar Continental Shelf Program, Canada
2004-2005
Anders Karlqvist,
Swedish Polar Research Secretariat, Sweden
2006-2009
Simon Stephenson,
National Science Foundation, USA
2009-2011
Marty Bergmann,
Polar Continental Shelf Programme, Canada
2012-
Magnus Tannerfeldt,
Swedish Polar Research Secretariat, Sweden

Executive Secretary

1998-2005
Odd Rogne,
Norwegian Polar Institute, Norway
2005-
Morten Rasch,
Aarhus University, Denmark

Academic Secretary

2009-
Lillian Magelund Jensen,
Aarhus University, Denmark

The R/V Lance while anchored to sea-ice during the Air-Ice-Sea Interaction II course on Svalbard, fall of 2012. Icebreaker cruise to (81N,1E) to conduct measurements on the sea ice.

Photo by Jakob Sievers

2.3

First International Conference on Arctic Research Planning (ICARP I)

Oran Young

Reviewers: Robert Corell and Odd Rogne

In the early 1990s, as IASC became fully operational, three developments converged to highlight the value of planning for the conduct of Arctic science. First, the end of the cold war and the emergence of a spirit of regional cooperation in the Arctic (reflected in the launching of the AEPS as well as the establishment of IASC itself) opened up the prospect of substantive cooperation between western and Russian scientists interested in the circumpolar north. Second, the onset of the era of 'big science' with research projects involving collaboration among larger groups of scientists and research institutes placed a premium on the development of effective coordination mechanisms. And third, the realization that the Arctic is a dynamic region subject to rapid and often non-linear changes in both biophysical and socioeconomic terms provided new impetus for conducting coordinated observations in an effort to understand the behavior of Arctic systems.

IASC took the initiative early on to address this need, beginning with an effort on the part of the Executive Committee to develop a Science Agenda for the organization, and moving forward at the 1994 annual meeting to approve an initial agenda focusing on four broad themes: (1) impacts of global change on the Arctic region and its peoples; (2) Arctic processes of relevance to global systems; (3) natural processes within the Arctic; and, (4) sustainable development in the Arctic. This meeting also generated the idea that it would be useful to convene a larger international planning conference to provide a roadmap for all those engaging in or desiring to engage in research on Arctic topics that would contribute to common themes and produce more robust findings. The US NSF, with proactive leadership on the part of Bob Corell and Pat Webber, rose to the occasion and provided generous financial backing for this initiative. Thus was born the idea of organizing the first International Conference on Arctic Research Planning (ICARP) at Dartmouth College in Hanover, New Hampshire, USA from 5 to 9 December 1995.

IASC proceeded to appoint a Program Steering Committee for this effort, that included representatives from Russia, Europe, and North America, from both Arctic and non-Arctic states, and from the community of indigenous peoples. The committee took charge of preparations for ICARP I, meeting several times in advance of the conference, making organizational decisions, and working actively with those who served as leaders of the working groups that became the major vehicles for fulfilling the goals of the conference. In all, ten working groups emerged, each guided by one or more coordinators. Each working group prepared a draft science agenda in advance of the conference, refined the agenda during a week-long effort at the conference itself, and prepared a revised plan in the aftermath of the conference. An eleventh theme, dealing with rapid cultural change, emerged during the conference, an indication of the growth of interest in the human dimensions of Arctic systems.

More than 250 scientists, including 33 from Russia, attended the week-long conference in Hanover. This group was notable both for its diversity and for the strong sense of community that pervaded the meeting. The working groups focused, for the most part, on substantive themes that provided opportunities for scientists representing different disciplines to join forces to design research activities of common interest. A strong theme within the group centered on the linkages between development in the Arctic and broader concerns about global environmental change then emerging as a prominent topic in the international science community.

The participants in the conference, under the leadership of the Program Steering Committee, produced two documents: an Executive Summary and a Final Report on the work of ICARP I entitled "Arctic Systems: Natural Environments, Human

Actions, and Nonlinear Processes." The Final Report[1] contains the report of the Conference Chair (Oran Young of the Institute of Arctic Studies at Dartmouth) as well as reports of the Working Groups on: (1) Effects of Increased Ultraviolet Radiation in the Arctic; (2) Regional Cumulative Impacts—Barents Sea; (3) Regional Cumulative Impacts—Bering Sea; (4) Mass Balance of Arctic Glaciers and Ice Sheets; (5) Terrestrial Ecosystems and Feedbacks on Climate Change; (6) Arctic Marine/Coastal/Riverine Systems; (7) Disturbance and Recovery of Terrestrial Ecosystems; (8) Dynamics of Arctic Populations and Ecosystems; (9) Sustainable Use of Living Resources; and, (10) Environmental and Social Impacts of Industrialization on the Arctic.

A few general observations on the work of ICARP I will help to put this effort in perspective. The title of the final report captured several of the major themes running through the ICARP I process. Although natural scientists dominated the work of IASC at the time, the conference drew attention both to the role of anthropogenic drivers of large-scale developments in the region and to the impacts of biophysical processes on the well-being of humans living in the Arctic. The result was an effort to enhance collaboration between natural and social scientists, an effort that has become an increasingly prominent feature of Arctic research with the passage of time. The report also emphasized the importance of nonlinear processes affecting Arctic systems. At the time, concepts that have become influential recently, such as tipping elements and tipping points, planetary boundaries, and the idea of the Anthropocene were not familiar. But there was an awareness of the importance of rapid and often turbulent change in what is now known as coupled socio-ecological systems. In an important sense, ICARP I not only provided an opportunity for groups of scientists to design coordinated research initiatives, it also helped to move Arctic science onto the cutting edge of the broader effort to increase our understanding of the dynamics of the Earth System.

It is difficult to measure the success or the effectiveness of an event like ICARP I. But there are at least three dimensions by which it is possible to assess the success of the conference. To begin with, ICARP I provided IASC with a programmatic identity. In the wake of the conference, it was much easier to specify where IASC fit in the expanding collection of efforts to foster cooperation in the Arctic. ICARP I also helped strengthen the links between Arctic science and global science. In the intervening

Dartmouth College, Hanover NH, USA, venue of the first International Conference on Arctic Research Planning (ICARP).

Photo: IASC Secretariat

years, it has become clear that the Arctic is experiencing large scale changes (e.g., the recession of sea ice) that are more dramatic than those occurring on other parts of the planet. While clear-cut documentation of this phenomenon would take another decade, ICARP I put Arctic science on track to document key changes as they unfolded. And third, ICARP I played an important role in stimulating a sense of community among scientists working on Arctic issues. What saw its start at the December 1988 Leningrad meeting became a reality in Hanover in December 1995.

Another way of measuring the success of ICARP I would be to compare the "List of IASC Projects" with the ten conference working group reports, which shows that nine of the reports have resulted in an approved IASC project (see Appendix 6.3). Some reports have also inspired the initiation of related projects.

In the final analysis, the value of ICARP I is reflected in the decision to repeat this exercise on a decadal scale. ICARP II took place in Copenhagen in 2005; it is expected that ICARP III is being organized for 2015.

Reference

[1] IASC (1996). Executive Summary, Arctic Systems: Natural Environments, Human Actions, Nonlinear Processes. IASC Report No. 3. Oslo: IASC; and IASC (1996). Final Report, Arctic Systems: Natural Environments, Human Actions, Nonlinear Processes. IASC Report No.4 (Julia Lloyd Wright and Carol W, Sheehan eds.). Oslo: IASC.

Summer melt session is coming, late May, Greenland Sea

Photo: Iñigo Garcia Zarandona

2.4

Formation of the Pacific Arctic Group (PAG)

John Calder
Reviewer: Jacqueline Grebmeier

Formative Stage

As IASC expanded its membership, three Asian countries (Japan, Korea, and China) became members. Yet the focus of IASC science remained on the Atlantic sector and the central portions of the Arctic—regions of lesser interest to the Asian members who quite naturally viewed the Arctic from a Pacific perspective.

During the ASSW in April 2002 in Groningen, The Netherlands, the Asian participants (including O. Watanabe of Japan, B-K. Park of Korea, and Z. Zhang of China) held a dinner and invited Odd Rogne, as Executive Secretary of IASC, to join them. There were informal discussions regarding the participation of Asian countries in IASC and Odd challenged them to think about taking on a more active role. Later discussions between Odd and incoming IASC President Patrick Webber led to the idea of having a more open discussion at the next ASSW with the aim of creating some means to develop an 'Asian agenda' within IASC. This idea became a goal that Pat would champion in the months leading up to the ASSW 2003 in Kiruna, Sweden. During this time, Pat contacted a few people (for example, John Calder from the USA and Martin Bergmann from Canada) to gather ideas for meeting this goal. A decision was made to hold a side meeting during the ASSW in Kiruna to discuss the idea in more depth and, if possible, prepare a proposal for IASC to consider. John and Marty organized the side meeting and it attracted significant participation. Following enthusiastic encouragement from Pat and good discussion, participants agreed that a subgroup of IASC should be formed with the goal of identifying Arctic science topics appropriate for IASC´s attention that would be of particular interest to the Asian and other Pacific-bordering members. A proposal was prepared quickly for consideration by Council that called for the creation of a Pacific Arctic Group (PAG) within the IASC structure. PAG would be a discussion group open to any IASC member and it would report on its discussions to the full IASC Council. The proposal identified Martin Bergmann of Canada as the initial Chair of the group, with Zhanhai Zhang of China as the initial Vice-Chair. John Calder offered to provide administrative support and other resources. The proposal was previewed by Pat Webber and Odd Rogne who indicated it was on the right track. With this reassurance, Marty presented the proposal to IASC Council. After a brief discussion, Council agreed to welcome PAG under its umbrella.

Continuing Activities

Marty and John worked to organize the initial PAG meeting during ASSW 2004 in Reykjavik, Iceland. Perhaps because many PAG participants also participated in the AOSB, PAG gravitated quickly to an ocean science focus. This was also logical as the physical linkage of the member countries to the Arctic was via the North Pacific Ocean and the Bering Strait. An outcome of the 2004 meeting was the decision to organize a science symposium during ASSW 2005 in Kunming, China focused on the theme "Circulation and Ecology of the Pacific Arctic Shelves and Connection to Deep Basins." There was a good turnout of Asian countries and other Pacific Rim members of IASC (Canada, Russia, and the United States), and many of the presentations were published in the Chinese Journal of Polar Science.

During 2006 and continuing through ASSW 2007 in Dartmouth, New Hampshire, USA, PAG developed and expanded its terms of reference and agreed on a set of science themes that were of mutual interest. These remained focused primarily on ocean science. It became the norm that the meetings during the ASSWs were focused on 'business' issues and an update on research plans for the coming summer, while a fall meeting, hosted in various PAG countries, focused on a review of accomplishments during the previous summer and outlooks for the future. These discussions were useful in developing scientific exchanges and other types of collaborations during and after field operations.

At the Dartmouth meeting, a proposed restructuring of IASC was presented to the PAG, with a proposal that PAG evolve to a free-standing organization, but retain a formal affiliation with IASC. Over the next year, members of PAG discussed this proposal and concluded that it was acceptable. A formal letter of agreement eventually was signed in March 2009 between PAG and IASC that provided for interactions between the two groups in a number of important ways. This partnership has been effective and remains to this day.

Key Milestones in PAG History

The October 2007 PAG workshop in Ottawa, Canada, used the agreed science themes and recent experiences in research cruises to organize more structured science collaborations and to undertake PAG-organized synthesis efforts as part of the IPY and its legacy. In particular, it was agreed that the group would hold a 'model-data fusion' workshop and prepare a collection of synthesis reports to be published in book form. In February 2008, the Model-data Fusion Workshop was held in Sanya, China. The results were published in the Chinese Journal of Polar Science 19(2).
From 2008 to 2013, teams of authors formed on a volunteer basis to prepare topical chapters for inclusion in a volume published by Springer in Fall 2014.

In May 2009, a Workshop focused on Marine Biology and Sea Ice was held in Seattle, Washington, USA. The idea for a Distributed Biological Observatory (DBO) was an outcome of this workshop.
In June 2009, a workshop was held in Xiamen, China on the Arctic Marine Carbon Cycle. As agreed during the workshop, several teams of authors were formed to prepare papers for publication in a special issue of Deep Sea Research. These papers were published in December 2012 (DSRII Vol 81-84).

Through the summers of 2010 to 2013, pilot observations were conducted by several PAG countries as part of the DBO.

In February 2013, the first DBO Data Workshop was held in Seattle, Washington, USA.
In Fall 2014 a 2nd DBO data workshop was proposed as part of ICARP III.

Leadership of the PAG

During PAG history, there have been three Chairs: Marty Bergmann from inception through Spring 2008,John Calder from Fall 2008 through Fall 2012, and Jackie Grebmeier from Fall 2012 to through Fall 2014. China has provided a Vice Chair from inception (Zhanghai Zhang) through the present (Jianfeng He). At the ASSW meeting in April 2012 in Montreal, Canada, a second Vice Chair (Takashi Kikuchi of Japan) was selected. The current Chair who started in the Fall of 2014 is Sung-ho Kang of the Republic of Korea.

Postscript

PAG lost one of its great proponents and leaders on 20 August 2011 when Martin Bergmann, Director of the Polar Continental Shelf Program of Natural Resources Canada, was among the victims of an aircraft crash at Resolute Bay.

Meeting of the Pacific Arctic Group (PAG) in Shanghai, China, 2006.

Photo provided by John Calder

2.5

IASC and the Arctic Climate Impact Assessment (ACIA)

Robert W. Corell and Terry Callaghan
Reviewer: Lars-Otto Reiersen

How ACIA came about is here split into two sub-chapters: The first is the more detailed account written by Robert W. Corell, chief architect for the initiation of the Arctic Climate Impact Assessment (ACIA) program and setting the global stage for this initiative. In the second sub-chapter, one of the leading scientists in ACIA, Terry Callaghan, gives an account of the initiative from his perspective.

2.5.1

The Development of ACIA

Robert W. Corell

The Intergovernmental Panel on Climate Change (IPCC) was established in 1988 by two United Nations (UN) Organizations—the World Meteorological Organization (WMO) and the UN Environment Programme (UNEP) to assess "the scientific, technical and socioeconomic information relevant for the understanding of the risk of human-induced climate change."

The First Assessment Report (FAR), chaired by Bert Bolin from Sweden, was completed in 1990 (the same year as IASC was founded) and played an important role in establishing the Intergovernmental Negotiating Committee for the UN Framework Convention on Climate Change (UNFCCC), which provides the overall policy framework for addressing the climate change issue. In its scientific findings, the FAR concluded that:

- Anthropogenic climate change will persist for many centuries.
- Further action is required to address remaining gaps in information and understanding.
- There is continuing imperative to communicate research advances in terms that are relevant to decision-making.

The Second Assessment Report (SAR), also chaired by Bert Bolin, was issued in 1995 and provided key input to the negotiations which led to the adoption of the Kyoto Protocol to the UNFCCC in 1997. One of its main conclusions was "The balance of evidence suggests a discernible human influence on climate change."

It is important to note that during the mid-1990s, Bert Bolin (member of the IASC Executive Committee) and Robert Corell (Chair of the IASC Regional Board and as such also member of the IASC Executive Committee) from the US NSF began a series of off-line discussions about the importance of assessing the consequences of climate change for 'hot zones of change' across the planet. Those discussions, actually held outside the preview of IASC, focused on three regions: Amazonia and its central importance to global-scale climate change processes; the Indian Monsoon and its relation to global climate change; and the Arctic region with substantial changes that appeared to exceed the global norms of climate change. These two then decided to approach IASC with the idea of an Arctic climate change assessment, that later became known as ACIA. There were several drafts of documents, prepared by Bolin and Corell and presented to the IASC Executive Committee, and eventually the Council and the Regional Board of IASC.

IASC was a non-governmental official observer to the Arctic Council (as it had been to the predecessor of the Arctic Council, the AEPS). The IASC representative (as the Regional Board Chair) was Robert Corell. The IASC Executive Committee decided that IASC should propose an assessment of climate change in the Arctic region. Such a presentation was made during the US Chairmanship of the Arctic Council; i.e., 1998-2000. IASC proposed a comprehensive assessment built on principles that guided implementation of the IPCC. Those principles were presented by IASC to the Arctic Council.

During several presentations beginning in late 1998, it became known that AMAP and CAFF had been charged by the Ministers of Foreign Affairs at the Arctic Council's 1998 Ministerial meeting to look into their various environmental assessment considerations of climate change in the Arctic. The meeting notes indicated that the Arctic Council Ministers of Foreign Affairs; "Welcome(s) CAFF´s intention to prepare an overview on the status and trends in changes to ecosystems, habitats and species in the Arctic and to identify elements of a program to monitor circumpolar diversity and to assess, in collaboration with AMAP, the effects of climate change and UV-B radiation on Arctic ecosystems." AMAP took the lead on the climate change aspects, and over time AMAP and IASC entered into a partnership to develop the ACIA.

In summary, IASC played a pivotal role in convincing the Arctic Council to establish an ACIA in partnership with IASC, which it did with the full endorsement of all eight Arctic countries and with the engagement of the indigenous peoples of the north through the six indigenous peoples' organizations of the Arctic.

Under the guidance of IASC and AMAP, the ACIA was formally established at the 2000 Ministerial Meeting in Barrow, Alaska. It was stated that the Arctic Council would:

"Endorse and adopt the Arctic Climate Impact Assessment (ACIA), a joint project of the AMAP and the CAFF Working Groups, in cooperation with IASC, and

- acknowledge the establishment of the ACIA Steering Committee to coordinate the ACIA, and express our appreciation to the United States for financing a substantial portion of the ACIA Secretariat;
- request the ACIA to evaluate and synthesize knowledge on climate variability and change and increased ultraviolet radiation, and support policy-making processes and the work of the IPCC;
- further request that the assessment address environmental, human health, social, and cultural and economic impacts and consequences, including policy recommendations; and
- approve the goals and objectives contained in the ACIA Implementation Plan and request that the AMAP and the CAFF Working Groups, in consultation with the Sustainable Development Working Group, promote the availability of the necessary social and economic expertise to complete the assessment."

2.5.2

The ACIA Process and Outcome

Terry Callaghan

Environmental and Political Changes

The global climate change issue gained momentum during and after the production of the first IPCC assessment (IPCC 1990) and at the end of the Cold War, when pan-Arctic collaborations became effective. Around the same time, the first meetings (Ottawa, Canada in October 1987; Royal Society, London in 1992) were taking place to discuss climate change and its impacts in the Arctic and Antarctic. At that stage of our understanding, initial observations, predictions from first principles and early general circulation models indicated that climate warming would be amplified in the Arctic and that there would be important impacts for the cryosphere and biosphere and the people who depended on them. There was also growing awareness that some of the changes in the Arctic—for example, feedbacks from thawing snow and permafrost, and changes in migratory animal populations—would have far-reaching consequences. These concerns were articulated by IASC which had been established in 1990.

In 1995, a meeting was held by IASC (ICARP I: see Chapter 2.3) to prepare research agendas that would address specific issues of Arctic climate

change and such new groups as 'Feedbacks from Arctic Terrestrial Ecosystems (FATE)' were formed. Also, regional assessments of climate change were initiated such as assessments of the Barents Region (Integrated Regional Impact Studies in the European North—IRISEN and the Barents Sea Impact Study—BASIS), the Bering Sea Impact Assessment (BESIS) and the McKenzie Delta Assessment. By the late 1990s, early concerns about the rapidly changing Arctic were being confirmed by observations of glacier dynamics by researchers and other observations by Arctic residents. In addition, the Antarctic Ozone Hole had been discovered in 1985 and the UN Expert Panels had been convened (1988) to assess stratospheric ozone depletion and its impacts. Researchers expected that environmental and health problems would be particularly severe in the Arctic as well as in the Antarctic. To address the concerns about changing climate and UV-B radiation, a joint meeting between IASC, AMAP and CAFF was held in April 1999 and an IASC proposal for an assessment was used as the basis for discussion. A revised version of the proposal was then submitted to the Arctic Council and the IASC Council for approval. ACIA was formally approved by the AC in October 2000 as a joint project between the Arctic Council and IASC.

The ACIA Process

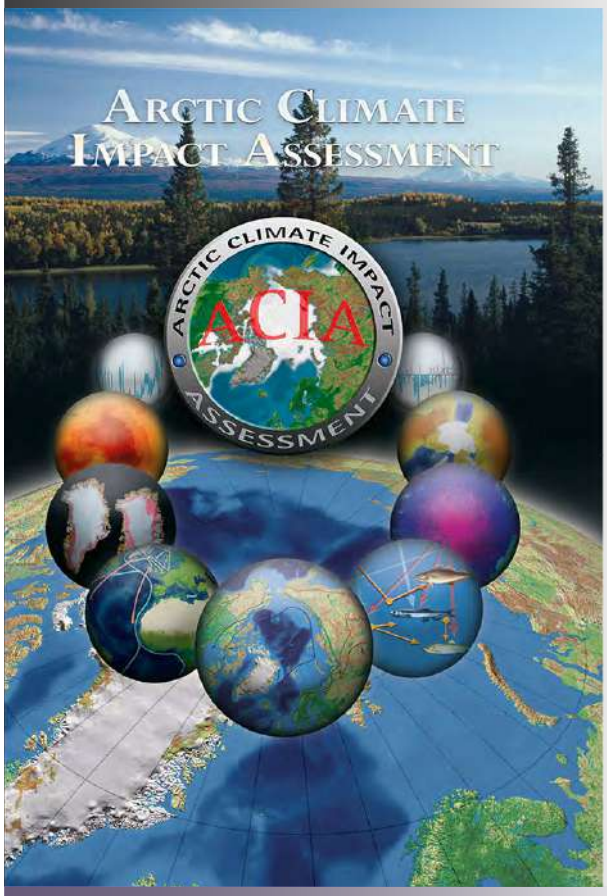
The ACIA approach developed from the three existing regional assessment projects for the Barents Region, Bering Sea area and the Mackenzie Delta, together with an initial assessment by AMAP in 1998. The experiences from the regional assessments, together with an AMAP draft plan based on its initial pan-Arctic climate change review, provided the foundation for planning the future ACIA. At one of the first ACIA scientific meetings in 2000, it was agreed that ACIA would have a circumarctic assessment with integration of findings for four Arctic regions (I—North-east Greenland, Fennoscandia, and the European Russian Arctic; II—Central Siberia; III—Eastern Siberia and Alaska; IV—Canada and West and Central Greenland). During the meeting and soon afterward, a structure for the work emerged, and the *modus operandi.* There would be a major volume divided into disciplinary chapters with some integrating chapters. This work should not be a textbook but should focus on observed and predicted changes. The consequences of these changes for the peoples of the Arctic and the global community would be integrated in chapters at the end of the book, leading to a sequence of chapters from climate and UV changes, through impacts on the cryosphere and ecosystems, to impacts on land management and consequences for people. In addition to this major volume, a popular science summary document would be prepared by a professional popular science writer and there would be other products such as an ACIA film and brochure as well as an international conference to launch the assessment.

It was also decided that the report would be extremely rigorous with the same standard of writing, review, and response to review as IPCC had established. The entire work was to be led by a coordinator (R.W. Corell), a Steering Committee and an Assessment Integration Team supported by a Secretariat in Fairbanks, Alaska. Each chapter was led by an international team of lead authors selected from open nominations provided by AMAP, CAFF, IASC, the Indigenous Peoples Secretariat, the Assessment Steering Committee, and several national and international organizations. With the help of these lead authors and IASC´s contacts and quality control, contributing authors were identified to write minor sections or paragraphs. Mainly because of the increasingly important recognition of the roles of Indigenous Peoples and other Arctic residents within the Arctic Council, chapter authors were encouraged to involve perceptions of Indigenous Peoples. This led to some tokenism, whereby a particular quotation by an Indigenous Person would head a chapter, but more importantly, traditional knowledge was incorporated with science knowledge, probably for the first time in a major assessment, and a young social anthropologist played an important role in the terrestrial ecosystems chapter. Later, the success of combining the two knowledge systems (in some chapters) led to a publication in the scientific literature[1] and a commendation by the Chair of

the Inuit Circumpolar Council, Sheila Watt Cloutier. The chapter leads were also encouraged to involve young scientists where possible. One notable success was a young researcher (Margareta Johansson) who acted as an assistant in the ACIA process, a co-lead in the Snow, Water, Ice, and Permafrost in the Arctic (SWIPA) follow-up assessment of 2011, and an independent lead in the forthcoming Arctic Freshwater Synthesis. Interaction among the chapter authors was stimulated by holding cross-fertilization meetings, and chapters were added or split during the evolution of the assessment. Altogether, the assessment was prepared over four years, and involved an international team of more than 300 scientists, other experts, and knowledgeable members of the indigenous communities.

Did ACIA reach its goals? ACIA was an overwhelming success and raised public awareness around the world of climate change issues in the Arctic. This was achieved through an extensive outreach program targeted at the general public, students, policy makers, Arctic residents, religious leaders and royalty. The findings from ACIA were fed into the 4th IPCC Assessment of 2007;[2] some ACIA authors were also IPCC chapter authors. Because ACIA was the world´s first assessment of a specific geographical region, the Polar Chapter of IPCC had a vast amount of detail upon which to draw. Combined with the amplified changes in the Arctic, this made the Polar Chapter of IPCC generally accepted as the strongest of the impacts chapters. There is no doubt that ACIA strongly contributed to the success of IPCC and its joint award of the Nobel Peace Prize in 2007. Although ACIA was not intended to be a textbook, the strength of its findings is based on a long-term perspective and an understanding based on first principles. Consequently, the ACIA technical volume and its chapters[3] that were published and widely distributed in the scientific journal Ambio, became reference and teaching texts that are still used extensively today. The excellent graphics and schematic diagrams used throughout the text and in the popular science summary volume[4] greatly added to the importance of ACIA as teaching and outreach tools.

Cover of the Arctic Climate Impact Assessment (ACIA) Report



Are there aspects that could have been improved with hindsight? Sadly, it is not possible to identify a global policy decision based on ACIA findings in the same way that the Montreal Protocol and its amendments can be seen to follow from assessments of stratospheric ozone depletion. Mitigating measures against climate change are, apparently, simply too complex and costly at the present time. However, ACIA is the cornerstone of Arctic Change Assessments that will continue to update ACIA findings and will be available when policy-makers need information on Arctic change.

As in other assessments, there was a lack of synchrony between the stage of development of the climate change models that should have been used to determine impacts that, in turn, should have been used to drive assessments of consequences for people and construction of adaptation options. This is a perennial problem that has not yet been resolved. When the ACIA Report was first released, only the popular science volume was available and,

as a result, attention was deflected away from the hard work of hundreds of scientists. Even to this day, many scientists cite ACIA 2004, not ACIA 2005. Furthermore, there was confusion over the authorship of the technical report, and many different citations can be found in the literature. For example, some citations give the overall reviewers the distinction of authors or editors. Fortunately, lessons have been learned and the excellent science dominates.

What has changed in the science? The ACIA findings, often including predictions based on first principles, are still highly relevant and are often cited. Many of the predictions published in 2005 are now being confirmed by observation. However, a better understanding of variability—in processes in space and time—has become apparent since ACIA. More intense and more frequent extreme events such as mid-winter thaws, and tundra fires are being recorded, and there is a growing realization that biological processes such as the greening of the Arctic vary from location to location and even within catchments. There is also growing awareness that the impacts of increased UV-B radiation in the Arctic are less dramatic than many impacts of climate warming. ACIA developed a successful scaling approach, from circumarctic models, through regional assessments, to local case studies, and this was an important development for current down-scaling studies to provide detailed predictions of climate change and its impacts at scales appropriate for the development of adaptation strategies by Arctic residents.

ACIA is a great credit to IASC, the Arctic Council, the ACIA Coordinator and his team, and all the participants. Its legacy is already immense and will continue to grow. Drafting personal perspectives and recollections of the process and working with IASC and AMAP has been an honor.

In summary, it was noted by many that ACIA was the first comprehensive researched, fully referenced, and independently reviewed evaluation of Arctic climate change and its impacts for the region and the world.

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[3] ACIA (2005). Arctic Climate Impact Assessment. Cambridge, UK: Cambridge University Press, 1042p.

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2.6

Second International Conference on Arctic Research Planning (ICARP II)

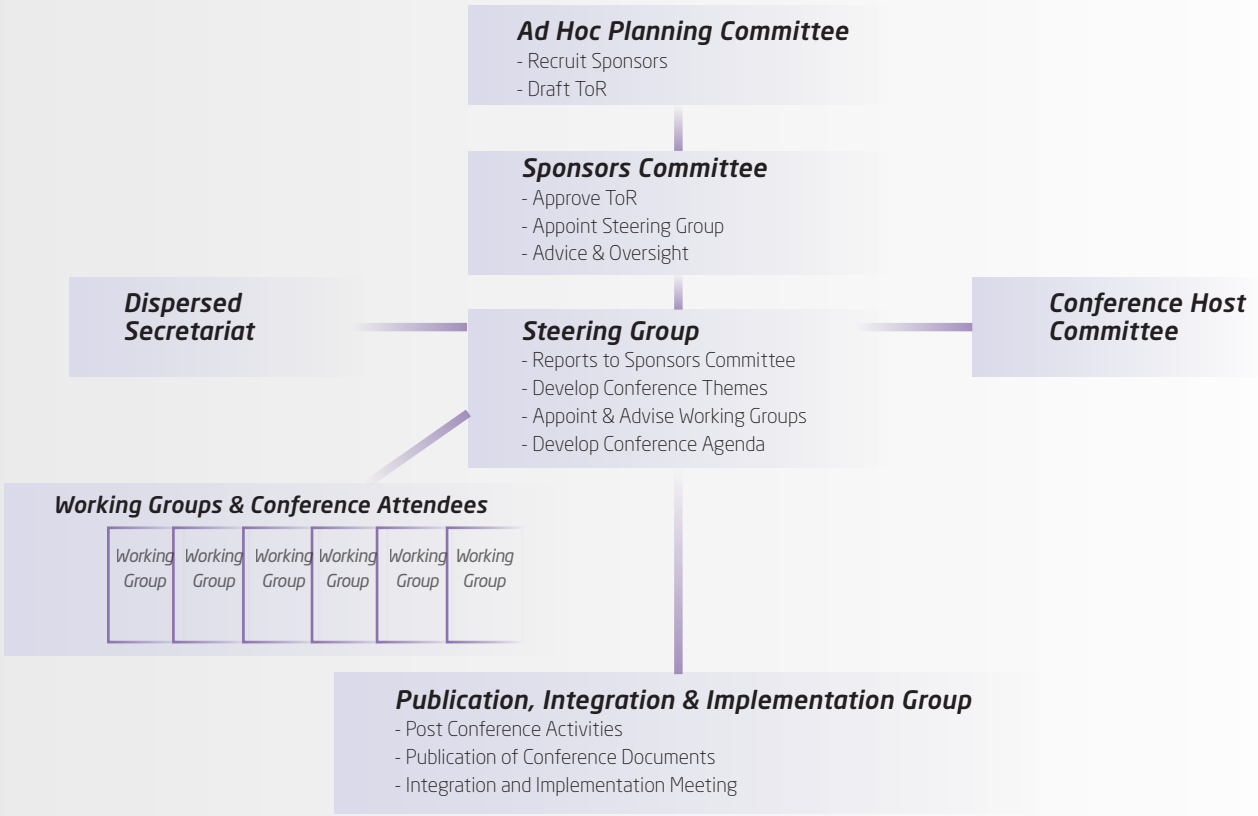
Sara Bowden
Reviewer: Kristján Kristjánsson

In spring 2003, the Arctic science community proposed a second International Conference for Arctic Research Planning (ICARP II). At that time, a number of Arctic enterprises were in the midst of critical reviews and publications, for example the ACIA was nearing completion and the Arctic Human Development Report (AHDR) was getting underway. It is important to note, however, that in the spring of 2003, the IPY was only a twinkle in the eye of a few Arctic scientists, and was not yet even on the agenda of any major science organization.

The IASC Council, at its spring 2003 meeting in Kiruna, Sweden, recognizing the need to better understand the dramatic changes in the natural and human systems and their consequences to society, decided to undertake preparations for a second ICARP to take place in 2005—a decade after the first such conference. Unlike ICARP I, however, which was planned almost entirely by IASC, ICARP II was designed to be an international and multidisciplinary effort involving the whole community and with sponsors from across the breadth of Arctic science organizations and agencies.

The organizational structure was designed to take advantage of the growing number of Arctic organizations and to bring in their skills and expertise in the conference planning process. The sponsors group included representation from more than a dozen international Arctic organizations, including Arctic Council programs, regional organizations, scientific associations, and others (see Table 1). These groups were invited to generate themes for the working groups, reflecting the interests and needs of the Arctic scientific and user communities.

Figure 1 Advisory, Management & Implementation Structure for ICARP II



The Working Group themes, as developed by the Conference Steering Committee with broad input from the conference sponsors, were:

WG 1:
Sustainable Development and Arctic Economies
(Chairs: Henry Huntington and Gorm Winther)
WG 2:
Indigenous Peoples and Change in the Arctic: Adaptation, Adjustment and Empowerment
(Chair: Jens Dahl)
WG 3:
Coastal Processes
(Chairs: Volker Rachold and Christopher Cogan)
WG 4:
Deep Central Basin in the Arctic Ocean
(Chair: Bernie Coakley)
WG 5:
Arctic Ocean Margins and Gateways
(Chair: Jackie Grebmeier)
WG 6:
Arctic Shelf Seas
(Chair: Heidi Kassens)
WG 7:
Terrestrial Cryosphere and Hydrologic Processes and Systems
(Chair: Terry Prowse)
WG 8:
Terrestrial & Freshwater Biosphere and Biodiversity
(Chairs: Torben Christensen and Terry Callaghan)
WG 9:
Modeling and Predicting Arctic Weather, Climate and Ecosystems
(Chairs: Lennart Bengtsson and Klaus Dethloff)
WG 10:
Resilience, Vulnerability, and Rapid Change
(Chair: Gary Kofinas)
WG 11:
Sciences in the Public Interest
(Chairs: Lars Kullerud and Chris Southcott)
WG 12:
Presence and Fate of Heavy Metals, Persistent Organic Pollutants, Petroleum Hydrocarbons and Radionuclides
(Chair: Lars-Otto Reiersen)

Table 1 List of ICARP II Sponsors

- Arctic Council Indigenous Peoples Secretariat
- Arctic Monitoring and Assessment Programme (AMAP)
- Conservation of Arctic Flora and Fauna (CAFF)
- European Polar Board (EPB)
- International Arctic Social Sciences Association (IASSA)
- International Geosphere-Biosphere Program (IGBP)
- International Human Dimensions of Global Environmental Change Programme
- International Permafrost Association (IPA)
- Northern Forum (NF)
- Nordic Polar Group
- Northern Research Forum (NRF)
- University of the Arctic (UArctic)
- World Climate Research Programme (WCRP)
- World Wide Fund for Nature (WWFN)

The goal of the process leading up to the conference was the development of clear research plans evolving from the discussion of critical questions identified by each working group. The working groups were responsible for identifying several priority questions that needed to be addressed over the next 10-15 years. They were asked to design research plans to address the critical questions and open those plans for review and consideration prior to and during the conference. One interesting development during the working group process involved the inclusion of early career scientists in the planning process. Each of the working groups included active participation by early career scientists identified to work on a specific science plan and help with the review and evaluation of other science plans. This early involvement of young scientists was critical to the success of the conference, and in some cases has led to early career scientist development of research programs which are now underway. Most notable of these is the Arctic in Rapid Transitions (ART) program which was developed by early career scientists involved in the marine working groups.

After a 24-month long planning process involving more than 140 Arctic scientists, residents and policy makers, ICARP II was held 10-12 November 2005 in Copenhagen, Denmark. The theme of the conference was "The Arctic System in a Changing World" and it brought together more than 450 Arctic residents, senior and young scholars, policy experts, and science and land managers to discuss and finalize the working group efforts to formulate physical, biological, and social science plans and implementation strategies.

The conference pointed to two very interesting outcomes.[1] First, it highlighted that there was a "paradigm shift to a holistic and multidimensional perspective in the Arctic. This holistic perspective integrally included the human dimension, Indigenous insights, and a more complete integration of Arctic processes in the earth system." It became clear during the conference that it was no longer easy to separate the Arctic system into conventional disciplines. The linkages between systems and to the global system could no longer be suppressed or ignored. Secondly, issues of data management, interoperability and dissemination, as well as issues related to the need for improved and expanded infrastructure were repeatedly raised. There was an urgent call for the research community to address these issues, particularly in light of the IPY, which at that point was less than two years away.

ICARP II culminated in a document entitled "Arctic Research: A Global Responsibility" summarizing the ICARP II process, detailing the overarching research themes derived from the conference and discussing emerging issues. All twelve science plans are included in the report.[2] The report played a pivotal role in identifying many significant activities and programs that would be undertaken during IPY and in subsequent years. It will be an important contribution to the third ICARP planned for 2015 in Tokyo.

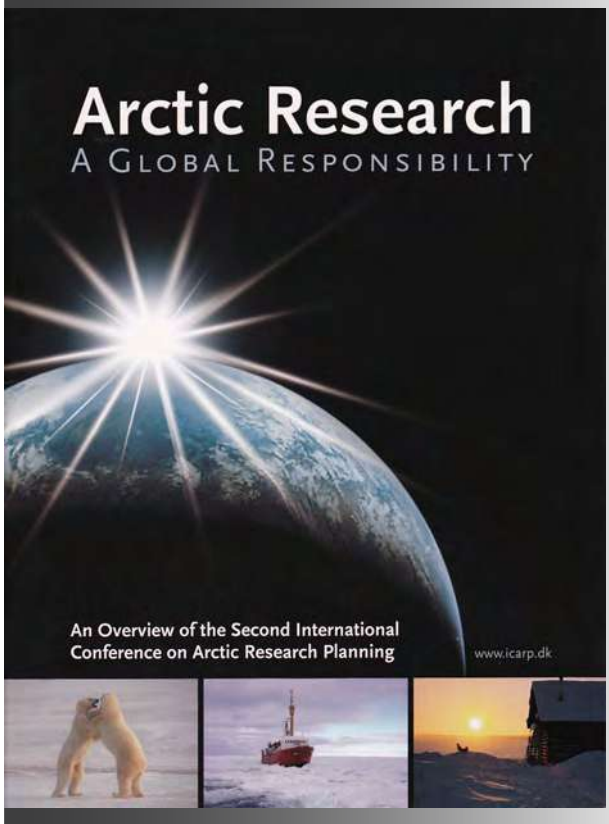
IASC Post ICARP II Actions

The ultimate goal of the ICARP II process was to create new knowledge, and initiate and implement forward-looking science plans attractive to funding agencies. With the purpose of taking the next and important step—i.e., implementing the science plans—IASC, in cooperation with several organizations, arranged an ICARP II follow-up workshop in late 2006, bringing together key scientists from the ICARP II Working Groups and potential sponsoring organizations.

The workshop brought together two to three individuals from each ICARP II Working Group (at least one was an early career scientist) and representatives of ICARP II sponsor organizations. Both Arctic organizations that had been involved in the ICARP II process and global organizations interested in contributing to its implementation were present.

The main objective of the follow-up workshop was to identify several focused and manageable projects that could enjoy the support of sponsoring organizations and to develop an implementation plan for each of these projects.

Cover: An Overview of the Second International Conference On Arctic Research Planning (ICARP II)



The main objectives were:

- To identify well-defined and manageable research projects for implementation over the next five to ten years.
- To take into account research gaps identified in the ICARP II Working Groups´ science plans.
- To take into account cross-cutting concerns of other ICARP II Working Groups and the workshop breakout groups.
- To take into account input from sponsoring organizations and other major contributors to Arctic research (such as IPY and other international programs) and priorities outlined within each WG science plan.
- To take into account the critical infrastructure needed for its implementation and 'show stoppers,' if there are any.
- To take into account recommendations from the ICARP II conference.

Based on ICARP II Working Groups or Science Plans, workshop themes were identified and members contributing to each thematic area met concurrently in 'thematic sessions' or Breakout Groups. The following Breakout Groups were established:
(1) Marine System with participation of WG on Deep Central Basin of the Arctic Ocean, Arctic Ocean Gateways and Arctic Shelf Seas.

(2) Terrestrial System with participation of WG on Arctic Coastal Processes, Terrestrial and Freshwater Biosphere and Biodiversity and Contaminants.

(3) Cryosphere System with participation of WG on Terrestrial Cryosphere and Hydrological Processes and System and Modeling and Predicting Arctic Weather and Climate and the Permafrost Forum.

(4) Social System with participation of WG on Sustainable Development: Arctic economies, Indigenous People in the Arctic and Rapid Change, resilience, and vulnerability.

The last and very important Breakout Group was:
(5) Education and Outreach with participation of WG on Arctic Science in the Public Interest.

The follow-up workshop resulted, at least in some areas, in well defined, focused and manageable projects, as was intended. Most breakout groups developed a set of general recommendations for the ICARP II process and fundamental Arctic science questions were identified. The outcome of the follow-up workshop was valuable input to the IASC restructuring process and input into the IPY process.

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[2] Bowden, S., C. Corell, S. Hassol, and C. Simon, eds. (2007). Arctic Research: A Global Responsibility. Canada: McCallum Printing Group.

2.7

IASC and the International Polar Year 2007-2008

David Hik, Volker Rachold, and Odd Rogne

Excerpt from: Krupnik, I., I. Allison, R. Bell, P. Cutler, D. Hik, J. López-Martinez, V. Rachold, E, Sarukhanian, and C. Summerhayes (2011) Understanding Earth´s Polar Challenges: International Polar Year 2007-2008—Summary report of the ICSU/WMO IPY Joint Committee. Rovaniemi and Edmonton: University of the Arctic and CCI Press, 695p.

The first informal e-mail correspondence about the possibility of a new 'International Polar Year' between Odd Rogne (then Executive Secretary of IASC) and a few individual early champions started in the late 1990s. A key correspondent was Leonard Johnson (former division head at the U.S. Office of Naval Research). During those early exchanges, Rogne argued that any initiative for a new IPY had to be taken by international organizations and required a forward-looking science vision. The IASC Executive Committee was made aware of the correspondence, but did not decide to take any further action.

The possibility of a new IPY was briefly discussed during the ASSW in April 2001 by the European Polar Board (EPB) and FARO. The IASC Executive Committee did not decide on any actions related to IPY, but had agreed to test the idea within FARO. Overall, a new IPY was seen as a major logistical challenge that would require complex, and perhaps painful, re-allocation of funding. Nonetheless, IPY was also viewed as a tremendous opportunity, for which a compelling science vision had to be developed.

An important step towards IPY planning was taken at the symposium 'Perspectives of Modern Polar Research,' in Bad Dürkheim (Germany), 24-26 June 2001, on which IASC was informed. In November 2001, the IASC Executive Committee discussed the development of ideas for IPY and noted that a major project in the Arctic Ocean as a prospective theme for IPY had been suggested.[1] Nonetheless, it was again agreed that a new IPY should be a major multi-disciplinary initiative and that the push for a new venture should come from many fields; hence no actions were taken.

Throughout 2001 and 2002, major IASC activities were focused on the development of the ACIA report[2] and on the planning for ICARP II scheduled for 2005. At that stage, it was unlikely that a new IPY would become a reality. The IPY concept was discussed by the IASC Executive Committee during ASSW in April 2002, but, again, IASC did not take any steps. Nonetheless, several developments in the ACIA and ICARP II process in 2001–2002, such as broadening the disciplinary scope of the two ventures and more active engagement of Arctic indigenous people and social scientists, were later instrumental to the IPY planning process.

At its February 2003 meeting, the IASC Executive Committee was informed that a special meeting of the U.S. Polar Research Board in October 2002 had been devoted to the concept of a new IPY (2007–2008) and that several other related activities were taking place. The Executive Committee agreed that there was a need for inspiring ideas along the lines of 'grand scientific challenges.' IASC Council and Regional Board members were encouraged to put forward such ideas or proposals for IPY for further consideration by IASC.

In April 2003, Chris Rapley gave a presentation on IPY planning by ICSU at the ASSW in Kiruna, Sweden. This time, the attitude turned 180 degrees and the debate revealed rising enthusiasm among IASC members and strong support from the IASC Council. The IASC Executive Committee was tasked to consider the role that IASC could play in further development of IPY and certain seed funding was set aside to stimulate IPY planning. It was noted that the ICARP II multi-disciplinary approach to developing long-term science plans would be beneficial to IPY. Consequently, some elements of ICARP

Meeting of the ICSU/WMO Joint Committee of the International Polar Year (IPY) 2007/2008 in conjunction with the IPY 2010 Conference in Oslo, Norway, June 2010.

Photo: IASC Secretariat

II Science Plans were directly translated into IPY Projects. Chris Elfring, Director of the U.S. Polar Research Board, was nominated to serve as the IASC point of contact for ICSU and its IPY Planning Group.

As SCAR had succeeded in promoting IPY to the Antarctic Treaty Consultative Meeting (ATCM) in June 2003, it was logical for IASC to approach the Arctic Council for similar high-level governmental support. The proposal sent to the ATCM was slightly changed for the Arctic by adding "people living in the Arctic" and "next generation of polar scientists." At its meeting in September 2003, the Arctic Council SAOs (Senior Arctic Officials) had agreed to support IPY (see below). The IASC Executive Committee had a considerable discussion about IPY at its November 2003 meeting and agreed that a clear supportive statement should be sent to the ICSU Planning Group, together with information about actions taken by IASC. The Committee also summarized some of IASC´s concerns related to IPY—namely, that the Planning Group had to clarify its coordinating role in the process and that some of the ideas for IPY currently in circulation were merely upgrades of ongoing research. According to the Committee, the emerging vision for IPY was somewhat restricted to traditional science thinking. "Create history—not repeat it" should be the slogan for IPY 2007–2008 planning, very much in line with the previous IPYs that were propelled by innovative thinking.[3] Odd Rogne and Patrick Webber (then President of IASC) were mandated to take action to expand the IASC role in IPY.

By early 2004, IPY became one of the key issues on IASC´s agenda. The IASC Council, at its meeting during the ASSW in Reykjavik in April 2004 reviewed the initial Outline Science Plan for IPY prepared by the ICSU Planning Group. It noted that the 'Human Dimension' component of the proposed science plan needed considerable improvement. Themes adopted for ICARP II were recommended as possible input. Also, Council argued for a better balance in IPY between the two Polar Regions, since the composition of the Planning Group was tilted toward Antarctica. Political support for IPY was growing at both international (Arctic Council, ATCM) and national levels, thus it was important to expand this political base for IPY 2007–2008. 'Opening the Arctic for Science' was a prospective vision for the IPY mission advanced by IASC Council. Lastly, as national IPY Committees had been established by that time in several countries, the role of IASC and other similar international organizations in IPY implementation should eventually increase.[4]

At the IASC Executive Committee Meeting in November 2004, it was agreed that the standing Executive Secretary should represent IASC on the IPY Joint Committee. Subsequently, IASC representatives took active part in all meetings of the Joint Committee and in the implementation of IPY during 2005–2010.

References

[1] Johnson, L. (2001) Symposium Melds Past and Future Polar Research—Eos, Transactions. American Geophysical Union 82, No. 51.

[2] ACIA (2005). Arctic Climate Impact Assessment. Cambridge, UK: Cambridge University Press, 1042p.

[3] IASC (2003). IASC Internal Report of the Executive Committee Meeting, 10-11 Nov 2003, Oslo, Norway.

[4] IADC (2004). IASC Internal Report of the Council Meeting, 22 April 2004, Reykjavik, Iceland.

2.8

IASC and Sustaining Arctic Observing Networks (SAON)

by Odd Rogne and Volker Rachold
Reviewer: David Hik

The goal of the Sustaining Arctic Observing Networks (SAON) initiative is to enhance Arctic-wide observing activities by facilitating partnerships and synergies among existing observing and data networks, and promoting sharing and synthesis of data and information.

The 2004 Framework for the International Polar Year (IPY) called for a legacy of sustained Arctic observing, and the following year a new initiative sponsored by the Arctic Council (known as COMAAR - Coordination of Observation and Monitoring in the Arctic for Assessment and Research) was developed as a proposal for IPY. Although this effort was not successful, the Arctic Council recognized that it should provide leadership for these initiatives and included in its Salekhard Declaration (2006) the request to Arctic states and partners to work towards such a capability.

This need for improving Arctic observing and data management was informally discussed between the IPY International Programme Office, IASC and Arctic Monitoring and Assessment Programme (AMAP) – representing the Arctic Council (AC) in November 2006 in Potsdam, Germany. All participants agreed on the need for improved observing and data management and the timeliness of taking a joint initiative. They further agreed to promote this idea and initiative through their organizations and networks.

In January 2007 an informal SAON Initiating Group (IG), consisting primarily of representatives from several international Arctic organizations, came together and agreed that SAON should have the purpose to support and strengthen the development of multinational engagement for sustained and coordinated pan-Arctic observing and data sharing systems that serve societal needs, particularly related to environmental, social, economic and cultural issues. Odd Rogne served as the Secretary for the SAON IG which had members from 13 international organizations representing the Arctic Council, Arctic residents, the Arctic research community and operational and funding agencies. During ASSW 2007 in New Hampshire the IPY program offices from Sweden and Canada agreed to host the first two SAON workshops, and with these commitments in place the SAON IG was able to begin its work in earnest. Three international workshops (Stockholm, Edmonton, Helsinki) and two regional meetings (St. Petersburg, Incheon) were held during 2007 and 2008, with participation from more than 350 representatives of the science community, operational agencies and indigenous peoples. The SAON IG submitted a final report in December 2008 recommending that the Arctic Council, in collaboration with IASC

Participants of the first workshop on Sustaining Arctic Observing Networks (SAON) in Stockholm, Sweden, November 2007.

Photo: IASC Secretariat

and other partners, take on the formal leadership of SAON.

At the Arctic Council Ministerial meeting in spring 2009, there was agreement to establish a SAON Steering Group (SG), composed of representatives from the Arctic Council, IASC and WMO. The SG was co-chaired by John Calder of the National Oceanic and Atmospheric Administration (NOAA) and David Hik (IASC) and held several meetings, including an open session with funding agencies at the 2010 State of the Arctic conference in Miami and a workshop on data management in Oslo. Outcomes from this planning process included (1) inventories of Arctic observing activities, prepared by all Arctic countries, providing an opportunity for coordinating and improving national observing and data exchange; (2) a summary of Arctic observing needs shared by agencies, local residents and the science community; (3) promotion of the SAON concept within Arctic Council, EU, UNESCO, WMO, and a number of regions and countries; (4) initiation of 17 multinational projects (referred to as SAON tasks); and (5) agreement on a SAON implementation structure.

In spring 2011 the Arctic Council and IASC endorsed the SAON SG recommendations and following extensive negotiations, both the Arctic Council Nuuk Declaration and IASC Council meeting in Seoul, South Korea, endorsed the establishment of a SAON Board responsible for all programmatic and operational issues of SAON. The Board held its first meeting in Tromsø in January 2012. The Board has wide representation with members from the eight Arctic countries, the Arctic Council Permanent Participants and Working Groups, and non-Arctic countries and international organizations, all participating in SAON activities with an equal status. The Arctic Council nominated the Chair of the SAON Board (Tom Armstrong) and IASC nominated the vice-Chair (David Hik).

Board meetings have normally been held in conjunction with the Arctic Observing Summit (AOS), in Vancouver (2013) and Helsinki (2014). The AOS is a high-level, biennial summit that aims to provide community-driven, science-based guidance for the design, implementation, coordination and sustained operation of Arctic observing systems. The AOS functions as an international forum for optimizing resource allocation through coordination and exchange among researchers, funding agencies, and others involved or interested in long-term observing activities, while minimizing duplication and gaps.

In 2014 SAON established two Committees focused on (1) Committee on Observations and Networks (CON), chaired by Lisa Losetto; and (2) Committee on Information and Data Services (CDIS), chaired by Peter Pulsifer. These committees provide advice to the Board regarding how to secure and improve (1) the observations and networks and (2) the accessibility of information and data services. They serve as a technical platform for ongoing SAON activities and affiliated Networks. The SAON CDIS effectively merged with the IASC Data Standing Committee of IASC in fall 2014, establishing a single Arctic committee to provide coordination of Arctic data services.

The future of SAON will depend on achieving its original goals. Over the past years many other organizations have articulated similar objectives, and much progress has been made, often in partnership with SAON. However, a comprehensive pan-Arctic observing network and data system remains elusive.

Sources

All SAON reports are available on its website:
www.arcticobserving.org

Printed reports being sources for this summary are:

- Report of the Sustaining Arctic Observing Networks (SAON) Initiating Group, Oslo 2008, 12 p.
- Plan for the Implementation Phase of SAON. Final Report, Oslo 2011, 16 p.

2.9

Arctic Science Summit Week (ASSW)- History and Changes Over Time

Kristján Kristjánsson
Reviewers: Odd Rogne and Volker Rachold

The first Arctic Science Summit Week (ASSW), organized by IASC was held in Tromsø, Norway in 1999. It was the former Secretary of IASC, Odd Rogne, who proposed the idea of organizing an event that would bring together Arctic researchers and Arctic partner organizations. During the years leading up to the formation of the ASSW, several Arctic organizations existed; however, there was little or no formal collaboration between them. A few members within the organization tried to coordinate informal agreements to attend meetings held by each other´s organizations; however, this proved to be difficult to execute. Factors such as travel expenses and long distances between meeting locations impeded attendance. As a solution, Odd Rogne decided to invite a few Arctic organizations to hold their annual meetings during the same week and in one location. The IASC Executive Committee took to this suggestion immediately, and the first ASSW became a reality.

Since 1999, a total of 16 ASSWs have been held in the following locations: Tromsø (Norway 1999), Cambridge (UK 2000), Iqaluit (Canada 2001), Groningen (Netherlands 2002), Kiruna (Sweden 2003), Reykjavik (Iceland 2004), Kunming (China 2005), Potsdam (Germany 2006), Hanover (USA 2007), Syktykvar (Russia 2008), Bergen (Norway 2009), Nuuk (Greenland 2010), Seoul (Republic of Korea 2011), Montreal (Canada 2012), Kraków (Poland 2013) and Helsinki (Finland 2014).

From the outset, the central purpose of ASSW has been to provide opportunities for international coordination, collaboration and cooperation in all areas of Arctic science. Furthermore, ASSW has served as an arena for host countries to offer an insight into their own Arctic research. In the original IASC handbook it was stated that IASC should "....achieve its mission and provide additional value by: providing a forum in which other arctic science organizations may join in such effort." It can be stated, without a doubt, that IASC has effectively accomplished this through partnering with other organizations to create ASSW. Starting with a few organizations in Norway in 1999, the ASSW continued to attract more groups. Today, the membership of the ASSW International Coordination Group (ICG) includes IASC, the EPB, PAG, FARO, the University of the Arctic (UArctic) and the Ny-Ålesund Science Managers Committee (NySMAC) all which routinely hold their annual meetings during the ASSW. Several other organizations, including the International Arctic Social Sciences Association (IASSA), the International Permafrost Association (IPA), the Association of Polar Early Career Scientists (APECS) and some of the Arctic Council´s Working Groups occasionally use the ASSW for their meetings as well.

Arctic Science Summit Week 2011, held in Seoul, Korea, March/April 2011.

Photo: IASC Secretariat

IASC Council Meeting at the Arctic Science Summit Week 2008 in Syktyvkar, Russia, March/April 208.

Photo: IASC Secretariat

In the beginning, the ASSW was organized as two main events: a Science Day, organized by the host country, and a Project Day, organized by the International Coordination Group (ICG). The idea behind the Science Day and the Project Day was to increase the scientific content of the ASSW, to attract more active scientists to these meetings. The Science Day and the Project Day were often organized around certain themes such as "Adaptation to Climate Change," "Sustainable Development in the Arctic," "Arctic Science Initiatives, Developments and Ensuring Legacies," to name a few. As would be expected, and in light of certain breakthrough events/activities within the Arctic/Polar research community at the start of the 21st Century, topics and/or activities like ACIA, the AHDR, ICARP and, last but not least, the IPY were inevitably on the ASSW agenda.

There is no question but that the ASSW has been an important venue and played a key role in initiating, implementing, communicating and enhancing partnerships and cooperation within Arctic research. New ideas have emerged, new projects and programs have been initiated and new alliances have been established.

In early 2006, IASC appointed a Review and Strategy Group to study and evaluate the scope of IASC activities over the years 1996-2005. The group was asked to suggest and justify any major changes to be undertaken; and, in particular, suggest forward-looking strategic actions to be taken to fulfill the IASC mission. In 2007 the Review and Strategy Group submitted their report (International Arctic Science: A Look Forward), in which the Group recommended four major changes to the IASC strategy and activities. One of the major changes was to reorganize and revitalize the ASSW as a major cross-disciplinary venue. The Group highlighted that ASSW had become a drawn-out and repetitive event with many presentations being given multiple times to various organizations. They also noted that many of the ASSW meetings were closed or overlapped, which impeded the sharing of information between the various organizations.

The Review and Strategy Group suggested the following:

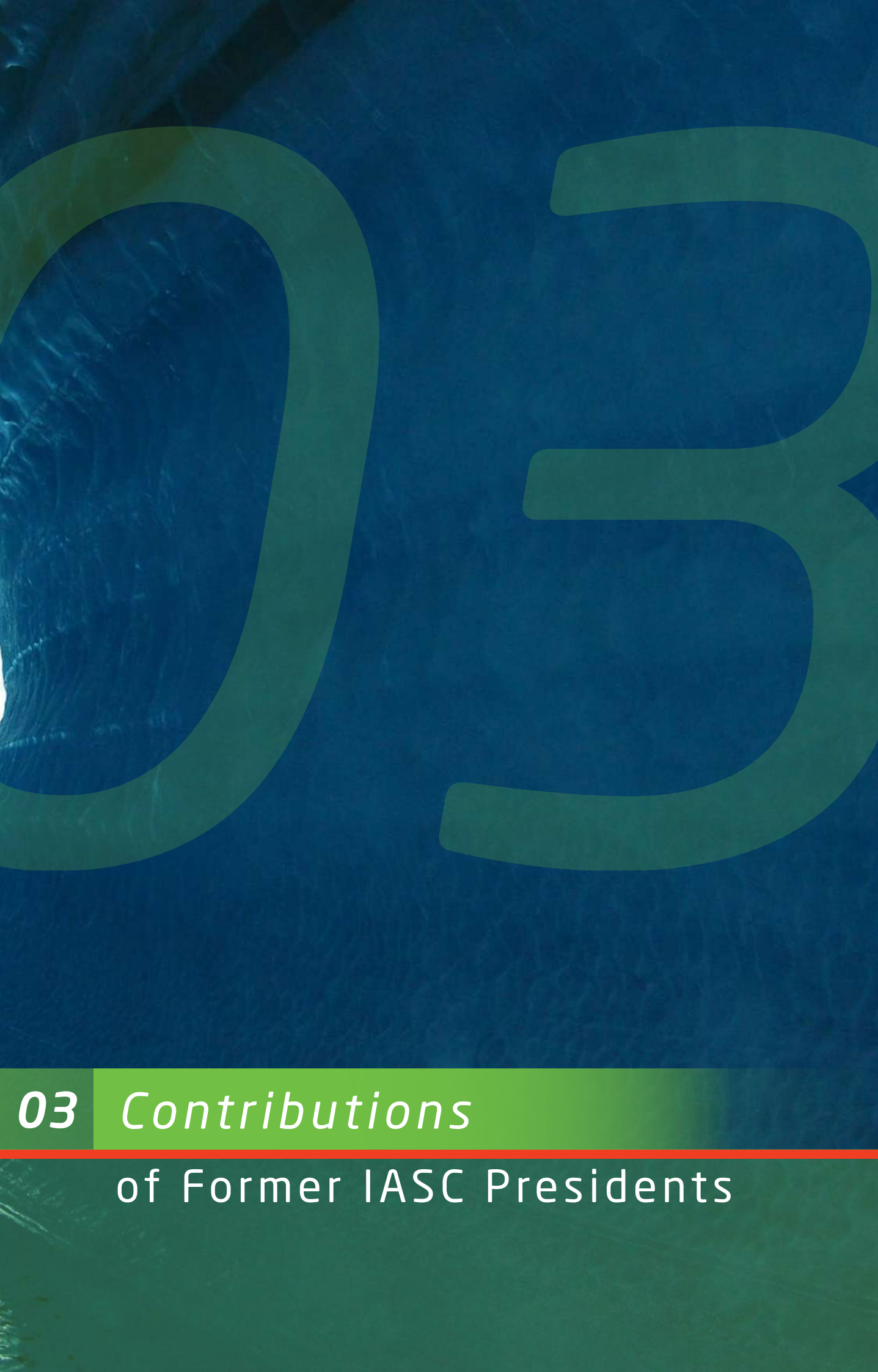
- Organize major ASSW meetings every second year. These meetings should be aimed at attracting the larger scientific community by providing a science forum meeting, replacing the project and science days and serving as a kind of 'mini ICARP' focused on strategic science issues.
- In the off years, a smaller ASSW focused on the business of the various organizations should be held. These would be run with an emphasis on inter-organizational meetings to identify critical issues and common objectives, and to plan for the next science-focused ASSW the following year.

- Move responsibility for the organization of the bi-annual, science-focused ASSW to the international coordinating group chaired by IASC.
- Invite the IASSA and organizations representing polar residents to take a more active role in planning for the ASSW, and to hold their executive sessions during that time to facilitate interactions between the scholarly community and polar residents.

In 2008, the IASC Council agreed to the changes recommend by the Review and Strategy Group. The 2009 ASSW in Bergen (Norway) was the first gathering of the arctic science organizations that included a Science Symposium. The event was a great success, attracting more than 300 scientists, students, policy-makers and other professionals. After the success of the Bergen meeting, IASC and its partner organizations involved in the ASSW, decided to arrange a Science Symposium every second year. A business-oriented ASSW is held in alternate years. Since 2014 these business-oriented ASSWs include a high-level, biennial Arctic Observing Summit (AOS) that provides a platform to address urgent and broadly recognized needs of arctic observing across all components of the arctic system. The AOS is led by the IASC Network "International Study of Arctic Change (ISAC)" (see Appendix 6.3) and is a contribution to the Sustaining Arctic Observing Network (SAON) initiative (see Chapter 2.8).

Today, the ASSW is a formal gathering of Arctic science organizations aimed at encouraging interaction and cross-fertilization between the various organizations. Experience so far shows that the ASSW provides a key arena for enhancing cooperation. Most attendees find it to be an extremely valuable opportunity for sharing information, forming alliances, and meeting collaborators. Furthermore, ASSW has been an invaluable venue for IASC to build ties with Arctic organizations. In fact, ASSW has functioned as a pathway to bring IASC out of its early years of 'isolation' and place it as the leading international organization for Arctic research. ASSW has provided attendees with the unique opportunity to learn about and experience Arctic research from host countries, establish new research contacts and exchange new ideas, and (last but not least) make friends for life.

Photo: Angus Duncan
Englacial meltwater drainage channel after a lake drainage event, Belcher Glacier, Devon Island ice cap, Nunavut.



03 *Contributions*

of Former IASC Presidents

03 Contributions of Former IASC Presidents

3.1

The Progress of Science and International Cooperation in Arctic Science

E. Fred Roots (President 1991-1993)

IASC has a background of a long evolution of the progressive growth of knowledge about the Arctic regions, and of endeavors to increase that knowledge and to relate it to the rest of the world. IASC itself is a step toward continuing world-wide advancement of that knowledge.

Early Concepts

Beginning with the Greek astronomers who, in the fourth century BCE, gave names to the constellations in the northern hemisphere sky and identified that the northernmost regions were under the constellations of the bears ARCTOS, and that all the stars seemed to revolve around a fixed point, which they called POLARIS, in the tail of the little bear (known in Latin as URSA MINOR), concepts about the Arctic and the Polar Regions were firmly embedded in the international knowledge systems of Europe.

In about 320 BCE, Pytheas made the first voyage to the Arctic for which there is a record. He travelled along the coastal regions of the eastern North Atlantic (perhaps west to Iceland), encountered sea ice—"a mixture of land, sea, and air on which one can neither walk or sail,"—noted that the hours of sunlight and darkness changed greatly with the seasons as one went north until "the Sun refused to set at summer solstice," and indeed, observed that the great white bear Arctos itself roamed on the ocean. Thus, through astronomic and field observations, aspects of the character of the Arctic were confirmed, and reasonably correctly described, by Greek and Roman scholars.[1]

Subsequent scholars built on the concepts of the Arctic based on Pytheas' exploration. The most influential was Nicholas of Lynne, of England, who in CE 1360 produced a book, in Latin, "De Inventione Fortunata—qui liber incipit a gradua 54 usque ad polum" (which book describes from Latitude 54 to the Pole), which became widely known. This book is quoted by the influential Flemish cartographer Mercator as the reference for his polar projection maps of the Arctic regions, which were revised progressively from 1538 to 1595 as further explorations added facts and detail, so that his latest map, while retaining some imaginative mythology, is truly an expression of international Arctic knowledge from exploration and scholarship (including acceptance of widely known myths) at the time.[2] That map, showing four mythical islands near the North Pole but with clear Northwest and Northeast Passages around North America and Eurasia, provided the basis for Arctic exploration, planning, and empire-building for the next several centuries, even though other cartographers in the late sixteenth century complied maps restricted to known discoveries (cf. eg. Barentsz 1598)[3] compiled maps restricted to known discoveries. Both Mercator's maps showing islands in the central Arctic Ocean, and the Barentz map, which kept blank spaces where land and seas were unknown, served as spurs to further explora-

tion. It may be noted that later maps from, eg. Petermann (1865)[4] and Nansen (1897)[5] still showed the possibility of land in the central Arctic Ocean.

The first comprehensive multidisciplinary descriptions of the Arctic Regions were published by whaling captains Zorgdrager (1720, 1727),[6] Martens (1765),[7] and Scoresby (1820),[8] who were interested mainly in the commercial aspects of exploratory voyages. However, from the sixteenth to the eighteenth century, the progression of geographical awareness and international communications also led to increasing interest in factual knowledge about the whole planet, including the Arctic regions. Universities, Academies of Learning, and Royal Societies in several countries became centers or leaders in investigation of what became known as 'science,' whose ideas and findings were openly shared or debated without regard to national borders. This was rather distinct from the nationally-based geographical societies that also were developing at the time, largely centered on geographical exploration, commerce, and empire-building. The phenomena of magnetism, the pull of gravity, tides and ocean currents, patterns of weather, the precise shape of the planet itself and its distance from the sun and the moon, were seen to be important subjects that could not be pursued only within national boundaries nor directly restricted to commercial resources. For many of these, investigations into remote parts of the planet and to the Arctic regions was necessary and logical.[9]

The Great Northern Expeditions

In the 18th century, interest in Arctic exploration and investigation was dominated by Russia and England. In Russia, Peter the Great, desirous to know the northern and eastern extent of his Empire, initiated an enterprise that became known as the First Kamchatka or Northern Expedition (1725-1730), commanded by a competent Dane, Vitus Bering, to explore, map, and describe the northeast coast of Siberia. The expedition, travelling overland across Siberia, reached the west coast of the Pacific Ocean and followed it north until Lat. 67°N, and proved that the Eurasian and North American continents were divided by a sea strait, which they named Bering Strait. A second expedition, which became known as the Great Northern Expedition (1733-1743), was sponsored by Peter the Great's successor, the Empress Anna; it included professionals from the Imperial Academy of Science. It was again commanded by Bering, and to his dismay, because of political and bureaucratic interference, it grew to involve more than 3000 people and thousands of horses.[10] The scientists made plant collections and the first scientific observations of birds and mammals in central and eastern Siberia. Upon reaching Kamchatka, Bering built new ships and crossed the North Pacific Ocean, making landfall on islands adjacent to the coast of Alaska, where the naturalist Steller made impressive first studies of plants, birds, sea and land mammals of northwest North America.[11] When the remnants of the expedition returned to Siberia after ten years, Empress Anna had died, and there was no further support in Russia for northern scientific studies for several decades. Steller's scientific records and journals were filed in the Academy of Science and not published for many years, although some of his findings made their way into European scientific literature.

In 1765 and 1766, Empress Katarina (Catherine) the Great revived Russian interest in the far north, and on the advice of the eminent scientist Lomonosov, who maintained that sea ice could not persist in the open ocean, sent an expedition commanded by Chicagov to find a northern sailing route to Asia. The three ships of this expedition were unable to proceed beyond the latitude of Svalbard, but obtained depth soundings in what is now known as Fram Strait, and useful descriptions of the topography and nature of west Spitzbergen.[12] As with Bering and Steller's work, the information was not distributed outside Russia for many decades.

The Phipps Expedition

Within a decade of the abortive expeditions sent out by Katarina the Great of Russia, the evolving focus on scientific investigation as distinct from geographical discovery resulted in an expedition led by Capt. Constantine Phipps and undertaken by the

Royal Society of Britain in 1773, "A voyage towards the North Pole to be of service to the promotion of natural knowledge,"[13] which is justly regarded as the first international truly inter-disciplinary scientific investigation in the Polar Regions. The plan was developed from a proposal by French around-the-world explorer de Bougainville, elaborated by the Swiss geographer Engel who, like Lomonosov, promoted the idea that sea ice formed only near land, and that therefore the central Arctic Ocean would be free of ice. Experienced Dutch, German, and British scientists and navigators contributed to the preparations. The detailed observational and experimental program, and the many new instruments employed, revealed the most advanced state of European science at the time.[14] The two-ship expedition probed the edge of the heavy pack ice in the north Atlantic between Greenland and Svalbard, and obtained the first reliable information on the depth, salinity profile, and currents of the sub-arctic Atlantic Ocean; the nature and chemistry of pack ice; magnetic variations and dip; the period of the pendulum at high latitudes which allowed calculations of the curvature of the Earth; the biology of the polar bear (now known by the scientific name *Ursus maritimus Phipps*), sea mammals, and of birds on the north coast of Svalbard.[15] This very fruitful expedition, whose results were disseminated widely into the scientific community but ignored by geographers and much of the public because it was not concerned with the discovery of new territories,[16] set the pattern for subsequent research in the Polar Regions. Phipps became a Lord of the Admiralty, and as a prominent member of the Royal Society played a strong role in promoting international dissemination of scientific information, such as that from the global voyages of James Cook.

The Nineteenth Century

Subsequent to Phipps' expedition, and in many ways evolving from its findings, most scientific activities in the Arctic for the next century were subsidiary to national exploratory or commercial undertakings of individual countries. The scientific investigations were often reported as addenda to accounts of explorations. Between 1800 and 1872, seven countries sent fifteen expeditions to the Arctic regions. A rich compilation of 'natural history'—geographical description, animals and plants, geology, weather phenomena and hydrology—of the North American and Eurasian Arctic grew from these separate national activities. At the same time, the advancement of world science led to, and was promoted by, investigations and speculations that were truly non-national, concerned with Earth magnetism, aurora, the puzzle of the presence of fossils of warm-water creatures and warm-climate plants at high latitudes, etc.,[17] and these issues brought Arctic investigations into the realm of international science.

Such questions, both local and planetary in scale, were very much in the minds of a number of European scientists concerned with the Polar Regions and on the return of the Austro-Hungarian North Polar Expedition 1872-74 they became focused on the need for international scientific cooperation, rather than separate competitive national explorations. The outcome, after considerable difficulties, was the first IPY.

The First International Polar Year

The first IPY (1882-1883) was a major landmark in the scientific study of the Polar Regions. Eleven countries took part directly, establishing fourteen research stations and another fifteen subsidiary observatories in sub-polar locations. There were also co-operating observations from thirty-five established scientific observatories throughout the globe and from a number of ships at sea to obtain the first simultaneous snapshot of conditions at the surface of the planet. Aside from direct scientific results, the significant legacy of IPY-I, and its pertinence to IASC was its influence on the internationalization and democratization of science. IPY, within the scientific community and in both governments and the public, led to an expectation that, henceforth, scientific knowledge should be reliable and testable, and that once released it was common property, accessible to everyone. Before 1880, despite the success of pioneers like Phipps to "open the doors of science to the world," the pursuit of science as an activity

had been strongly nationalistic, elitist, the property of the privileged. The IPY, with one event, helped achieve acceptance of the international nature and benefits of investigations of the natural world. The basic principles of the IPY[18] were tested, seen to be sound, and have proved to be long-lasting:

"The Earth should be studied as a planet (not as independent parts);

Observation stations should be selected not for geographical position but for the advantages they offer for the phenomena to be studied. The geographical pole has itself no greater significance for science than any other point in high latitude;

Coordinated and synchronized observations are necessary to provide information on characteristics, changes, and the distinctive nature of natural phenomena in space and time;

Interrupted series of observations can have only relative value;

Results of much greater scientific value can be expected if standardized observations are made by observers using similar instruments for recording phenomena at simultaneous periods throughout the year, and who exchange the results of their observations without discrimination."

The influence of the IPY spread far beyond the Arctic regions. Academies of Science, Royal Societies, and universities became international in outlook, and international scientific societies and networks quickly came into being. The IPY showed that the quality and worth of scientific observations should be determined not by who did it or who was the patron, but by the accuracy and reliability of the data or of the experiment, as openly judged by others knowledgeable in the subject. So it was that the idea of 'peer review' was born. There was also a growing acceptance and expectation that it was a legitimate government responsibility to support pure and open scientific research with public funds.[19]

International Arctic Science Developments Subsequent to IPY-I

In the decades following the conclusion of IPY-I, several proposals were made to establish an organization to facilitate continued international cooperation and involvement in Arctic investigations. None of these persisted. Then the First World War put an end to international cooperation except for 'practical' activities such as weather reporting and magnetism observations. After the war, there was a resurgence of scientific interest and experimentation; but it was not until 1927, when a number of eminent scientists in Europe and America proposed that, because of the great recent advances in the fields of meteorology and magnetism and the physics of the Earth, the time was ripe for a multi-disciplinary study of the Polar Regions, which would mark the fiftieth anniversary of the IPY. After much discussion, the Second IPY came about.

By the late 1920s international professional scientific societies had come into being; and planning for IPY-II was coordinated by the International Meteorological Organization (IMO) and the International Union of Geodesy and Geophysics (IUGG)—both international committees of leading scientists within their subjects of expertise. An ambitious and very advanced program was drafted, focusing on newly-discovered phenomena such as atmospheric jet streams, electrical charges (ionization) in the upper atmosphere, the physics of polar clouds, and the relationship of aurora to sunspot activity.

The world-wide economic depression of 1929-31 greatly reduced the scope of the planned program, but with generous help from private foundations to provide instruments and with much personal sacrifice and volunteer work, IPY-II was carried out on schedule, through 1932-1933. Forty-four countries took part; twenty-two sent special observation and research parties to high latitudes, while the others conducted the required studies at established facilities. An indication of the true international nature

of IPY-II is that instructions for the program of observations were produced in eight languages.[20]

Whereas IPY-I had been restricted to manual observations at the surface of the Earth, from stations isolated from one another but following a pre-arranged coordinated schedule, significant improvements in science and technology enabled IPY-II participants to make observations of the atmosphere and magnetosphere in three dimensions, using balloons and radiosondes, record dynamic and changing phenomena electrically and mechanically, and communicate and exchange data and information in real time via telegraph and radio. Thus IPY-II provided a whole new dimension of understanding of our dynamic planet; and by comparison with the simpler but still valuable observations of IPY-I, gave a first perspective of the rate and pattern of atmospheric, oceanic, and geophysical change.

IPY-II researchers also carried out the first biological research of the IPYs. At Ammaassalik in East Greenland, studies were made of the breeding and behavior of land birds, marking an important advance in ornithological research from observation and collecting to ethological and ecological biology.[21]

In addition to the great boost it gave to several fields of science, and to the integration of Arctic phenomena to the dynamics of the entire planet, IPY-II was of practical benefit that far outweighed its cost. As soon as the data were analyzed, the results were essential to the production of regional synoptic weather maps, and to the development of long-range radio communication and navigation networks that then became a standard of world society.[22]

The progressive awareness of the characteristics of the Arctic regions and their importance to a wide variety of national and international concerns, together with technological advances in polar shipping, long-range aircraft, navigation techniques and communication led to changes in the concept of Arctic Ocean science and investigations. The United States and Russia developed powerful ice-breakers, mainly to escort national shipping but also to serve as platforms for scientific observations. Attempts were made, with some success, to probe beneath the sea ice with submarines. In 1937 Russia established a scientific station at the North Pole to take oceanographic and weather observations as it drifted with the currents toward the North Atlantic Ocean—the first of a series of more than forty drifting stations occupied by scientists and several hundred 'un-manned' instrument stations set out by Russia, the United States, and Canada, that continued until recently.

Third International Polar Year - International Geophysical Year (IGY) - and Follow-up

The Second World War spurred a fantastic advance of science in many fields and resulted in new technologies, new materials, and new scientific interests and mechanisms for cooperation. Some of these changes and advancements had direct relevance to the Arctic and to Polar Regions generally. The whole planet, including its Polar Regions, became a field for political and economic activity. Meteorological, magnetic and seismic information was distributed on an international circumpolar basis.

By 1955, many areas of Antarctica had been visited by scientists, and an expedition sponsored jointly by three nations had shown the advantages of multi-national cooperation in research in the Polar Regions.[23] Much of the Arctic Ocean had been surveyed by aircraft with remote sensing equipment, and drifting scientific stations established on its surface. ICSU accepted a proposal from an international group of scientists that, in view of the rapid advances in science and technology and new understanding of the dynamics of the planet and its place in the solar system, it would be appropriate to undertake a new comprehensive Polar Year study, twenty-five years after IPY-II.

The idea grew, and soon it was apparent that the proposed multi-disciplinary study should embrace the whole field of geophysical sciences, and not be restricted to the Polar Regions but be global

and even extra-planetary in scope. So, after much discussion and international planning, the third IPY became the **International Geophysical Year (IGY)** 1957-58. It turned out to be by far the largest coordinated scientific enterprise ever undertaken. Sixty-three countries officially took part, involving about 13,000 scientists.[24]

This is not the place to summarize the IGY, but its relevance to the future IASC, in addition to the wealth of data and new knowledge in many subjects, was that scientific activities in the northern high latitudes became an integral part of global science. High-latitude phenomena, Arctic and Antarctic, were important to the planet as a whole and to all nations, even though at the same time political developments were placing an increasingly nationalistic and competitive character to Arctic issues.

In the south Polar Regions, the advancement of interdependent scientific knowledge and international cooperation demonstrated by the IGY led to an international, non-governmental scientific body, SCAR, as an organ of ICSU, which had overseen the organization of IGY.

The results of the IGY and the stimulus it provided for further research not only in various fields of geophysics, but also in subjects not included in the IGY,[25] such as the biological and human sciences, had the effect of broadening scientific interest in the Arctic. It also sparked the creation of a variety of networks and associations pursuing or facilitating research and data-gathering on an international scale in subject areas such as polar meteorology, permafrost, ocean chemistry, migratory birds, arctic history, and native languages.

Clean science requires tyvek suits: two science techs have been out sampling snow at Summit Station, Greenland (2010)

Photo: Ed Stockard

At the same time, there were significant changes in many countries regarding their interests in the Arctic, and changes in the decision-making structures for northern surveillance and research. The new science networks helped focus scientific efforts in various subjects, but did little to satisfy the various national political interests in the Arctic, which were based, for different countries, on strategic, military, or foreign policy, on expectation of economic return from resources, or improved transport and communication, or on some territorial or cultural/social issues. The need for some mechanism to facilitate internationally the growth of science to serve these various interests became apparent.

Committee for High Arctic Research, Liaison, and Information Exchange (CHARLIE)

The need felt by scientists themselves for better communication and exchange among researchers in various parts of the Arctic, and especially between different subject disciplines studying related Arctic phenomena, resulted in an informal communication network which, organized in 1974 at the initiative of Danish and Canadian researchers, became known as the "Committee for High Arctic Research, Liaison, and Information Exchange" or CHARLIE.

CHARLIE was an informal, volunteer network for the exchange of ideas, plans, reports of field activities, data accumulations and holdings, and news about science-related issues. Correspondents included individuals in all Arctic countries, as well as the UK, France, Germany, and Japan. The 'paper work,' such as it was, was handled informally by scientists from Denmark, Canada and the USA, whose institutions generously provided office services and postage. There was, by intention, a minimum of editorial supervision and direction. CHARLIE, with a mailing list of about one hundred active Arctic researchers or program planners, provided very useful information exchange at a time when, for political and economic reasons, international Arctic science activities were in a state of flux, and helped develop a community of Arctic and circumpolar scientists and scholars. It helped, in a non-intrusive way, to bridge the gaps between Arctic science related to government policy, science related to multi-national Arctic commercial interests, and 'pure science' investigating the high latitude regions of the planet. However, something more formally organized, with capacity to take action, was needed.

COMITE ARCTIQUE INTERNATIONAL (CAI)

The many suggestions for a more coherent and formally recognized means for coordinating and strengthening international attention on scientific needs and activities in the Arctic came to fruition through the efforts of the indomitable Swiss Arctic scholar Louis Rey who, in association with several persons active in CHARLIE, conceived the establishment of a body that became the COMITE ARCTIQUE INTERNATIONAL (CAI). The Principality of Monaco generously offered to be the host (thus ensuring neutrality during the political tensions of the Cold War), and Prince Rainier III de Monaco consented to be the Patron.

CAI was incorporated formally under the laws of Monaco as an independent international organization with the objective of:

"improving coordinated knowledge and understanding of the Arctic regions, and to that end promoting interdisciplinary research on:
- the utilization of natural resources and protection of the Arctic environment;
- industrial development and the concerns of resident populations;
- the significance of the Arctic in the perspective of global changes." [26]

The inaugural meeting, held in the principality of Monaco in May 1979, was attended by invited senior Arctic specialists, each in their individual private capacity, from Canada, Denmark, France, Iceland, Sweden, Switzerland, the UK, and the United States.

CAI grew to incorporate 50 individual and 12 corporate members from eighteen countries. It took care to retain its independent, non-government character, with a focus on knowledge and research,

and to avoid any involvement with national or international policies. Members, in their private capacity, came from universities, scientific institutions, industry, and government scientific agencies. During the pressures and tensions of the 'Cold War,' this position was needed and very valuable in furthering research and promoting cooperation in the Arctic regions; and being based in politically independent Monaco, it was felt to be in a good position to achieve communication and eventually involvement with the scientific Arctic activities of the USSR.

CAI operated mainly by organizing high-level international scientific conferences with a circumpolar theme, open to researchers from any country. In many cases the conferences were undertaken in cooperation with another international organization specializing in the subject concerned, to which CAI could bring an international and multi-disciplinary dimension. These conferences, and their locations included:

- 1980
  The Arctic Ocean: the Hydrographic Environment and the Fate of Pollutants. London.
- 1981
  The History of the Discovery of the Arctic Region, from Early Antiquity to the 18th Century. Rome and The Vatican.
- 1982
  Arctic Energy Resources. Oslo.
- 1984
  Icedive: Arctic Underwater Operations. Stockholm.
- 1985
  Marine Living Systems of the Far North. Fairbanks.
- 1985
  Arctic Atmospheric Pollution. Cambridge.
- 1986
  Restoration and succession in Circumpolar Lands, Reykjavik.
- 1987
  Noise and Marine Mammals. Fairbanks.

Each of these conferences resulted in the publication of a book which became a significant reference for Arctic science in the subject concerned.[27]

In addition to organizing international multidisciplinary conferences, CAI served as a communication and information center for discussions on major Arctic issues and the planning or progress of research in the Arctic. This was facilitated through the production and broad distribution of a periodic newsletter: CAI Commentary.

A New, Coherent and Comprehensive Organization

The success of the CAI conferences in highlighting science progress and problems on major Arctic issues led to movements toward the establishment of new scientific bodies within existing international organizations, such as the Northern Sciences Network (NSN) of the UN Educational, Scientific, and Cultural Organization (UNESCO) Man and the Biosphere Programme,[28] and to re-considerations of the advantages and problems of circumpolar or regional cooperation in light of developments for Arctic science research support in the USA, Canada, and the Nordic countries.[29] All these considerations led to a meeting in San Diego, USA in June 1986 that set in motion the planning that led to IASC.

The untimely death of Louis Rey, the then president of CAI, in 1989 caused a re-assessment of the continued viability of an independent non-government body such as CAI as a communicator for activities that had become increasingly the purview of national programs and policies. The remaining CAI executive, all of whom were also involved in and supportive of the new developments, agreed to let CAI lapse, after nine years of undoubted contribution to international cooperation in Arctic science. The role of international coordination and facilitation of Arctic science information and activities was, properly, passed to the idea of IASC.

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3.2

Thinking about Strategy

David J. Drewry (President 1997-2002)

I was fortunate to be present at the IASC Founding Meeting in Resolute Bay, NU, Canada in August 1990. I was one of several non-Arctic rim country observers attending to witness the signing of the Founding Articles. I was there on behalf of the UK alongside Claude Lorius from France, Gotthilf Hempel from Germany, Takao Hoshiai from Japan and Maciej Zalewski from Poland -all of us representing states with a history of and current involvement in Arctic science. For me, that first step was significant - it marked the creation of a new organization that would act as a forum for the discussion and development of improved cooperation in research and facilitate better sharing of information and opportunities.

At that time I was much focused upon the other end of the Earth - the Antarctic - being Director of the British Antarctic Survey. This duality of interest was a thread that ran, and indeed has continued to run, through the fabric of IASC - an ineluctable cross-fertilization between the Polar Regions. Whilst both poles have their profound differences, the very nature of scientific investigation assumes no barriers, no artificial geographical separation. I was also heavily involved in the workings of COMNAP and SCAR which gave me, along with a number other colleagues, a perspective on how such organizations might best operate. This included, naturally, the new hard-working Executive Secretary, Odd Rogne, who had been Director of the Norwegian Polar Institute (NPI). It seemed at the time, in the heady post-1989 political environment, that IASC had an opportunity to achieve much more than hitherto and forge deeper international cooperation in the North.

It was a few years later, in 1995, that I found myself once more at the IASC Council table officially representing the UK (now in a role as the Director of Science and Technology at the Natural Environment Research Council). The meeting was in Roveniemi, and it was apparent to me how much IASC had matured and moved forward with a comprehensive slate of projects and in advancing its relations with other Arctic communities. Despite such growth, and maybe because of it, the Council decided that after five years it was important to review progress and map out directions for the future. I found myself appointed to chair the review group, a task only made tolerable by the strength of the other members of the Review Group and the inestimable support of Odd Rogne! I discuss the Review, what we discovered and how IASC implemented its recommendations in another section of this book. Also at Roveniemi there was a briefing on the planning for the ICARP I meeting in Hannover, NH which was entering its final phase. In December that year, Dartmouth College hosted the meeting. It was a great success in covering the broad sweep of IASC interests and engaging both scientists and administrators. It also demanded, in the brief to the participants, that we should think 'outside the box' and look to future opportunities and innovations.

Two years later, our Russian members - Igor Sergevitch Gramberg and his colleagues - generously hosted the 1997 Council in St. Petersburg. At that meeting, I had the privilege to be elected IASC President. For me this was a great honor but it also demonstrated IASC's focus on science and not simply geography, as I was from one of the non-Arctic nations. During the meeting we also initiated the process which led to the formation of FARO. We recognized the essential role that logistics and related support activities play in the Arctic and the need to have them better coordinated in support of the up-and-coming science agenda.

Several other initiatives emerged during the next few years whilst I held the Presidency. In Tromsø in 1999 we agreed to start ASSW. This was to give active scientists, as well as younger researchers, a chance to come together and present their latest investigations in support of science being nurtured by IASC, or areas that might lead to new projects.

ASSW proved immensely successful and has continued since that time. We also initiated the practice of having two or three presentations at IASC meetings by representatives—often the PIs or Coordinators—of IASC projects, once more to keep Council more closely in touch with the latest scientific developments.

Later in 1999 I took some time to reflect on the important issues facing IASC, namely (1) engagement in policy dialogue, and (2) how to generate successful IASC projects for the future. I prepared a paper for the Executive and later to the Council in 2000. The essence of my thinking at this time was two-fold: on the first matter I was convinced that attention had increasingly to be paid to the political context of science. For a body such as IASC, this would have a number organizational implications: a) **following** significant policy developments and differences in individual member countries; b) **tracking** trends more generally or within certain blocs of countries (e.g., EU, Nordic states); c) **monitoring** the translation of policy into opportunities for science and related funding; and, d) **liaising** with other international science organizations and sharing analyses. A further, and probably the most important area of the science-policy dialogue would be in e) **positioning** IASC with respect to inter-governmental agencies such as the Arctic Council. There was overall agreement that IASC should pay close attention to these matters in its work.

The second concern was around project development and oversight – to some extent an eternal question! IASC structures at the time did not easily address this question (Council being too general and projects being too specific). I suggested possible new structures and creating of two or three Strategic Standing Committees to receive, consider and evaluate ideas for new projects and to recommend new initiatives to Council. The Standing Committee would also review and monitor existing projects, report to Council, and finally consider and/or respond to strategic issues. The principal criticism at the time was that the proposal introduced a new layer into IASC and would increase the level of administration and possibly cost. Council members were not convinced and the Executive was asked to revisit the concepts.

In a follow-up paper, I proposed establishing a series of **Oversight Groups**, each under a Vice-President, with membership from three to five Council members. The groups would meet during Council to examine existing projects and make suggestions regarding future areas for development. This procedure would ensure Council members were engaged without creating excessive additional administration. It was the structure that was finally adopted at Iqaluit in 2001.

So often in life, the wheel turns full circle. So, I have been intrigued to note that in the second IASC Strategic Review the concept of Scientific Standing Committees was proposed, adopted in 2008, which then morphed into the IASC Working Groups in 2010 which were kicked-off in Potsdam in January 2011 and are the current structure. *Plus ça change, plus c'est la même chose!*

Camp on the Utokok river during a fieldtrip into the remote reaches of the National Petroleum Reserve of Alaska (June 2012)

Photo: Andrew Reed Weller

3.3

Strong Partnerships Produce Synergism

Patrick J. Webber (President 2003 – 2006)

I remain honored to have been elected President in 2002 by members of the IASC Council. I was the representative of the United States Polar Research Board to the IASC Council from 1999 to 2006 and had served as a Vice President within the Executive committee since 2001. I brought to the office my background as a 40-year veteran of arctic scientific research, teaching, and large project and institution management in universities and government. I am an old-fashioned natural philosopher in the 19th century sense and I believe, firmly, that there should be no boundaries in science between disciplines, geography, or culture. My modus as a scientist, even evangel, was to use a triad of systems science, hypothesis-based research, and synthesis. I was also an advocate of long-term studies, networking and data archiving. These convictions colored my presidency. I believe firmly that Arctic Science must be international team science and that the Arctic should be treated as a system within the Earth System. Since the IASC presidency is a fixed-term leadership responsibility, I lived by a quasi-Hippocratic Oath that one should do 'no harm' and that the organism should enjoy a long life beyond completion of the treatment.

As I began my presidency, I was aware that there was an alphabet soup of organizations, projects and institutions, and moreover the majority of practicing Arctic scientists was only dimly aware of what IASC was or how IASC might help their enquiry. This awareness led me to decide that the main thrust of my presidency would be that IASC would expand its partnerships with existing and emerging organizations and projects in order to confirm its usefulness. I believed that by strengthening and increasing its partnerships, IASC would be confirmed as the recognized leader in the pursuit of Arctic knowledge and in the solution of Arctic problems. **Therefore, espousing the value and nurturing the development of partnerships, cooperation, and inclusiveness became my persistent mantra and activity.**

At the start of each annual Council meeting I would restate my mantra. This was received quietly, perhaps because the members felt that they were already doing this; nevertheless, I never heard any objections to my platform. I am heartened to see current and abundant evidence of more and many strong partnerships between IASC and the community. This, and a number of things that I shall mention below were recommended strongly in the 2007 Review and Strategy Group report on IASC and are reflected in today´s IASC.

Below are some examples of my efforts that are germane to my mantra. None of these ideas or accomplishments were mine alone and most were not new to my term of office. IASC´s progress during this time was a team effort by elected IASC officers and dozens of active scientists and organizations. I describe these accomplishments under Championing Ongoing Activities and Sowing and Supporting New Initiatives. My screed is full of the celebrated IASC acronyms. The definition, background and status of these entities are contained elsewhere in this volume and cross-referenced to side-boxes.

Championing Ongoing Activities

IASC has Observer Status at the Arctic Council (AC) which was a continuance of its role in the Arctic Council´s forerunner, AEPS. Prior to my tenure, we had been mostly represented at the Arctic Council by the chair of the Regional Board of IASC, however, I took it upon myself to attend Arctic Council meetings and brief members at every opportunity on IASC and about its programs. This activism is necessary since the turnover rate of Arctic Council SAOs is fairly high and IASC´s place in the scheme of things bore repetition. I promoted the idea that IASC was available to be 'science advisor' to the AC and should be seen as a partner to AC working groups like CAFF and AMAP. At the time, IASC was the senior partner with the AC on the ACIA project and this serves as a good example of my mantra.

Long before my presidency, I was an enthusiastic champion of ACIA and remain so this day. ACIA was ably led by the great advocate of arctic and global change science Bob Corell and by AMAP´s trusted guru Lars-Otto Reiersen. Both Bob and Lars-Otto had long associations with the early days of IASC and the forerunner of AC and I remain grateful for their collegiality. ACIA epitomized one of the functions of IASC, which is to identify important science questions and stimulate the search for solutions to these questions. Further, ACIA addressed important science policy issues which, at that time, were largely avoided by IASC.

I embraced and championed ASSW and ICARP I which were two of IASC´s earlier creations. These remain welcomed annual and decadal events, respectively, and are a good illustration of the value of partnerships. ASSW is a team effort with leading organizations such as the EPB, AOSB, IASSA, FARO and NySMAC joining IASC to plan an annual stocktaking of the state of Arctic research. ASSW does much to maintain, strengthen, and initiate partnerships. At ASSW 2003 in Kiruna, I led the call for ICARP II (2005), which would be another stock-taking but, more importantly, a pan-arctic science planning effort. We were immediately able to gather partners for ICARP II to help raise the necessary funds and begin the process of identifying study themes and leaders. Bob Corell agreed to lead the project and this ensured that the legacy of ACIA would segue to ICARP II. Jörn Thiede and Sara Bowden and Kristján Kristjánsson were stalwart supporters of ICARP II from its inception through to the final reports.

It was at ASSW 2003 that the Fourth IPY (2007-2008) also crystallized and ICARP II led the way for identifying several of the themes for IPY research. I have a clear recollection that social sciences were being forgotten in the IPY agenda at ASSW 2004 in Reykjavik. Our austral colleagues seemed unaware that the social sciences had a place in a modern IPY. I was able to lead IASC´s strong stand for the inclusion of social sciences. Naturally, colleagues from IASSA endorsed this stand and the omission was redressed and embraced by all IPY partners. The principal IPY partners with IASC were AC, the Arctic Treaty Consultative Meeting (ATCM), WMO, Intergovernmental Oceanographic Commission (IOC) and ICSU. ICARP II and the 4th IPY introduced IASC to hundreds of contributing scientists.

Another of my activities was the successful application to ICSU for Associate membership. Membership in ICSU had been discussed since IASC´s inception but had languished for lack of unanimous support from Council. I saw ICSU membership as a way of neutralizing a criticism that was often leveled at IASC that it was not recognized among national and international scientific bodies. This membership also strengthened our credentials for being a leader in IPY planning and execution and in forging a stronger partnership with our south polar twin SCAR which had been a long-standing member of ICSU.

Finally, under this heading, I list IASC´s support for APECS and for improving the rigor of scientific proposals. These efforts blossom and bear fruit today. Many of IASC´s senior scientists still act as mentors to APECS, an organization that ensures that there is a bright future for those who wish to be part of the next generation of polar investigators. Much credit for raising the quality of proposals lies with my predecessor David Drewry who emphasized the need to develop and promote sharp ideas and questions. IASC´s efforts to fund only the best and most clearly formulated seed ideas contributed to the high quality of many of the more than 800 Expressions of Intent submitted to the IPY Secretariat when IPY was in the planning stages.

Sowing and Supporting New Initiatives

Several new initiatives were launched during my presidency, which I enthusiastically supported and championed. Two efforts in particular were ISAC and SAON. Credit for seeding these ideas, respectively, began with Tom Pyle of OPP NSF and Odd Rogne; however, I believe that I helped nurture their development by going to bat for them at every opportunity. ISAC and SAON are still developing and have a growing list of participants. Support for these

endeavors was natural for me since I was among the founding PIs of the US Long-Term Ecological Research project and the International Tundra Experiment (ITEX). Further, I was an officer at the US NSF, OPP when the US Study of Environmental Arctic Change (SEARCH) program, an analog of ISAC, was being envisioned. Both involved my predilection for systems science and maintaining and expanding capabilities for long-term observation with the necessary data archiving and the increasing awareness of global change.

I was delighted to have championed the formation of PAG within the IASC umbrella (see Chapter 2.4). John Calder, Martin Bergman, and Zhanhai Zhang led this effort which brought a Pacific Rim dimension to ASSW deliberations. PAG provided, with the growing Asian membership of IASC, a way of balancing what, heretofore, had been a rather amphiatlantic, Eastern Arctic, North Atlantic, and European Arctic bias in climate and ocean issues.

Since IASC´s inception, there had been quiet discussion about merging with AOSB. AOSB had preceded IASC by some half dozen years and was a highly successful Arctic science organization concerned with understanding marine ecosystems. As such, IASC itself effectively concerned itself with terrestrial, cryospheric, and social issues. AOSB, in my view, was always the strongest partner with IASC in endeavors like ASSW and ICARP. I had particular enjoyment for many years at being welcomed, even as a landlubber, at AOSB meetings and I can assert that the best science reporting of ASSW occurred at these meetings. I recollect how much I enjoyed the various polynya programs as they evolved over the years. I was active in the discussions that were the prelude to the AOSB merger with IASC. I was able to assure the leadership of AOSB that being part of IASC would not detract from their independence and would add the strength and economy to the organization of Arctic science.

Perhaps my largest challenge as President was to assure the recruitment of a new Executive Secretary and deal with the relocation of the Secretariat. This was triggered during 2004 with the pending retirement of Odd Rogne, who had been with IASC from its conception and through its formation and entire existence and brought his energy, diplomacy and total understanding of international science administration to the Committee. He had counseled each successive president with unflagging skill and energy. During the international search for a new Executive Secretary it became apparent that IASC should explore other ways to host and fund the Secretariat. For fifteen years, the Norwegian Ministry of the Environment and the Norwegian National Committee on Polar Research had generously underwritten the costs of the Secretariat´s physical space, salaries, and travel costs. Our problem was solved when an offer from the Royal Swedish Academy of Sciences to fund and host the Secretariat, at least for a few years while other solutions could be explored, was accepted. Our next great good fortune was to recruit Volker Rachold as the new Executive Secretary. Thus, in 2005, the Secretariat moved from Oslo to Stockholm. The physical and management changes were seamless thanks to the continuing drive and mentoring by Odd, the pre-adapted skills of Volker and the warm welcome to Sweden by Anders Karlqvist, Director General of the Swedish Polar Research Secretariat.

Reflections and Acknowledgements

The IASC partnerships I have described led, and I feel sure will continue to lead, to productive research planning and science synthesis for the Arctic. Problems of a complex and geographically dispersed nature, such as those encountered in the Arctic, require team efforts. Success will be judged under the 14th century English proverb "the proof of the pudding will be in the eating." We can see from the websites of IASC, the Arctic Council, and SCAR how much store is being put into partnerships. There is a veritable pantheon and taxonomy of agreements, understandings, affiliations and joint ventures. Nevertheless, I must admonish that listing and collecting partners is only valuable if they are functional and more than window dressing. It is my observation that most successful partnerships depend on the leadership and motivation of a few individuals

to make them function. Fortunately IASC has been blessed with colleagues with vision and who are also committed movers and shakers. I am confident that the growing strength of IASC as an organization makes it second to none.

None of these accomplishments would have been possible without the brilliance, mentoring, industry, and dedication of Odd Rogne and my colleagues on the Executive Committee. I thank and acknowledge the counsel and support of the Executive Committee, the Council, and dozens of active scientists and science leaders. In particular, Peter Johnson, Louwrens Hacquebord, Kristján Kristjánsson, Dieter Fütterer, and Byong-Kwon Park spent many hours in thought, writing and travelling on behalf of the Committee. I was preceded by the thoughtful and perceptive David Drewry who led the first IASC review and I was followed by Kristján Kristjánsson who took IASC to a new level with the second review and into active participation in IPY. I salute their leadership and volunteerism.

I endeavored to contribute positively to IASC´s early years. It was an honor to serve my science community and to be the first recipient of the IASC Medal in 2010. I look forward to the 25th Anniversary celebrations of IASC.

Orientation during the Juneau Icefield Research Program in Alaska, 2012

Photo: Allen Pope

3.4

IASC in Transition

Kristján Kristjánsson
(President 2006-2010)

I joined the IASC family in 1999 as the official representative for Iceland on IASC Council. However, the first IASC meeting I attended, was ICARP I held at Dartmouth College, New Hampshire, USA in 1995. The main reason for my participation in ICARP I and my somewhat premature encounter with IASC was simply that Magnús Magnússon, the IASC President at that time and my fellow countryman, decided to introduce me to IASC and coach me in replacing him as the Icelandic representative on IASC Council. As I am a rather slow learner; it took Magnús nearly four years to coach me and prepare me for formally joining the IASC family. Magnús Magnússon was a fantastic mentor; he did a marvelous job and I am forever grateful for his patience and dedication to safeguarding my participation and awakening my interest in IASC. ICARP I was in many ways an interesting event for me to attend, as it was an important milestone in IASC´s history. For the first time in the history of Arctic research planning, IASC managed to bring together, not only Arctic researchers from all over the World, but also representatives of the community of funders, managers and users. The conference was a huge success and unquestionably elucidated in many ways the future and complex role of IASC in Arctic research.

As mentioned above, I became the official Council representative for Iceland in 1999 and a few years later, in 2002, I was elected Vice-President. From 1999 to 2006, I participated quite actively in many significant IASC contributions to arctic research, such as the establishment of PAG, the creation of ASSW, ACIA, the planning and coordination of ICARP II, the creation of ISAC, and the planning of IPY. I am particularly proud of taking part in engaging more young scientists in IASC and supporting the establishment of APECS. It was, however, in 2006, that my participation in IASC went up a notch, when I was quite unexpectedly elected as President at the ASSW in China. At that time, the scientific, economic and political realities of the North had changed dramatically and several distinctive research frameworks had already outlined a wide array of topics requiring research attention—ICARP II, ACIA, AHDR, and IPY, for example. Furthermore, and in the more political arena, the Arctic Council, established in 1996, was promoting cooperation, coordination and interaction in issues of sustainable development and environmental protection, which required growing attention from IASC. In this period of changes, IASC was faced with many challenges but fortunately it managed to develop and maintain its role as the leading Arctic science organization which, to some extent, was due to good chairmanship by highly competent persons like David Drewry and Patrick Webber.

The new problems and challenges arising through the decade 1995-2005 called for new or improved scientific knowledge, and an increased need for knowledge about the Arctic region made international cooperation more essential. It was therefore evident and necessary for IASC to meet these grand challenges, and in order to do this it needed to change its strategy. The most vital transition IASC has undergone since it was established was from 2006 to 2010. During this period, IASC went through the most extensive changes in its structure, and consequently managed to strengthen its position as the leading international organization of scientific expertise in the Arctic. I had the privilege of leading IASC through this transitional period. Many controversial decisions were taken, and approved by Council, and I am convinced they were necessary in order for IASC to survive and advance.

In early 2006, IASC appointed an international group of experts, the Review and Strategy Group, to evaluate IASC activities from 1996 to 2005, and to recommend strategies for the future. Members of this Review and Strategy Group were Tom Pyle (Chair), Hajime Ito, Anders Karlqvist, Igor Krupnik, Hanne Petersen, Jörn Thiede and Sara Bowden (Secretary). The group´s main recommendations were that IASC needed to adopt a new organizational

structure to reflect the progressively more integrative nature of today´s polar science; expand its functions to embrace various science policy issues such as new technology, data management, education and public outreach; strengthen its relations with the Arctic Council, social science organizations, and other global organizations interested in the science of the Arctic region; and, lastly, reorganize and revitalize the ASSW as a major cross-disciplinary venue. In addition, the group suggested some internal changes to IASC to improve its public image and efficiency. Following the above recommendations, the IASC Executive Committee and the IASC Secretariat, with approval from Council, began in 2006 to implement major structural changes to IASC and its way of operating. Many of the implemented structural changes were highly controversial, but in my view it strengthened its organizational structure and its position as the leading scientific organization in Arctic research. A discussion of all the structural changes implemented during this period would be too vast for this paper; however, I would like to mention just a few.

During this transitional period, IASC strengthened its relationship with several polar and global organizations, including SCAR, AOSB, IASSA, the World Climate Research Programme (WCRP) and others, as well as with the Arctic Council and its Working Groups. IASC also intensified its outreach activities such as a new website and the IASC Bulletin, all of which contributed substantially to raising the level of global knowledge and public awareness about the Arctic. ASSW 2009 in Bergen, Norway was the first annual gathering of Arctic science organizations that included a Science Symposium, attracting over 300 scientists, students, and policy-makers. The symposium was a huge success and consequently IASC and its partner organizations decided to arrange such a Science Symposium every second year, where science would be the primary focus of the biannual ASSW and include at least three days of science meetings.

Based on the recommendations of the IASC Strategy Groups and Council Members received at ASSW 2007 in Hanover, and subsequent discussions, Executive Secretary Volker Rachold and I developed an outline for the new IASC structure and funding strategy. The Executive Committee discussed the outline in great detail and mandated us to revise the structure. The final document was presented to Council at ASSW 2008 in Syktyvkar, Russia for discussion, together with financial plans for the future. The new IASC structure and strategy to support science development, which includes Working Groups and Action Groups, are now the core working elements of IASC. The new structure and strategy of IASC embraced more scientific fields and involved more international cooperation, and included an increase in the science development budget that was evidently required. Consequently, the secretariat had to be enlarged and support to Working Groups improved. In early 2009, this broadening of the IASC secretariat was undertaken and the secretariat was relocated to Potsdam, Germany. The secretariat was hosted by the Alfred Wegener Institute (AWI) for Polar and Marine Research and co-financed by the German Science Foundation. It was mostly the dedication and work of the IASC secretary, Volker Rachold and the Director of AWI, Karin Lochte that enabled IASC to enlarge the secretariat and to secure the required funding for increased scientific development. Relocating the secretariat from Stockholm, Sweden to Potsdam was highly controversial, but in retrospect it was strategically a splendid idea.

In the period 2006-2010, IASC did indeed change significantly; the secretariat was enlarged and moved to Potsdam, the form of ASSW was changed to a 'Business week' every second year and a 'Science week' every other year, and formal contacts and signed agreements were established with several international organizations. Today IASC works closely with many organizations on various issues concerning Arctic and/or Polar research. Furthermore, IASC strengthened its relationship with the Arctic Council, and is now collaborating with its working groups on several projects/programs. IASC also strengthened its outreach activities during this period, with the establishment of a new website in collaboration with the Arctic Portal and the publica-

tion of an annual IASC Bulletin, which has been very well received. Finally, IASC negotiated an agreement with AOSB to become an IASC WG on Marine Science and it has established an IASC secretariat for IASC Working Groups in the USA.

I have not only been fortunate to take part in this transitional period, I have also been extremely privileged to work with many colleagues that have contributed extensively to the successful development of IASC. It would fill three to four pages to name them all, but I feel obliged to mention some. Organizations like IASC will never survive without an effective secretariat, and a competent and dedicated secretary plays a vital role. Since its establishment, IASC has been extremely fortunate in having two secretaries, Odd Rogne and Volker Rachold, both whom have played a vital and significant role. I worked closely with both of them for several years, and their contribution to the development and success of IASC will never be recognized enough.

During my time as Vice-President (2002-2006), I worked closely with one of IASC's Presidents, Pat Webber. He was an extremely good mentor and many things he taught me I practiced later in my position as IASC President. As already stated, I was a member of the Executive Committee from 2002 to 2010, first as a Vice-President and then as IASC President. During this period I had the privilege to work with great and dedicated minds such as Byong Kwon Park, David Hik, Dieter Fütterer, Jackie Grebmeier, Louwrens Hacquebord, and Peter Johnson. I can never thank them enough for all the wonderful time we had together and all their support and contributions during my presidency. I also would like to thank the IASC Council as a whole for all their support and contributions, especially during the controversial transitional period 2006-2010. Lastly but not least, I would like to recognize my fellow country man, Niels Einarsson, who through all my IASC years supported me not only professionally, but mentally as well.

Central Arctic: Scientists sampling a melt pond with RV Polarstern in the background

Photo: Mar Fernández-Méndez

Photo: Mario Hoppmann
Measuring light under sea ice in the central Arctic

04 Cooperation

with other Organizations

04 *Cooperation* with other Organizations

4.1

Cooperation with other Organizations - Overview

Volker Rachold

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 duplication of efforts, IASC has always strived for close cooperation with other groups interested in Arctic research. Today IASC maintains excellent relations with many other polar and global science organizations.

IASC has been an accredited observer of the Arctic Council from its very beginning, and in this function it is in the position to provide independent scientific

Table 1 List of Formal Partnership Agreements

Organization	*Type*	*Signed*	*Comment*
Association of Polar Early Career Scientists (APECS)	MoU	2008 renewed 2013	Jointly with SCAR
Circumpolar Health Research Network (CirchNet)	LoA	2011	
European Polar Board (EPB)	MoU	2014	Jointly with SCAR
Forum of Arctic Research Operators (FARO)	MoU	2013	
International Arctic Social Sciences Association (IASSA)	LoA	2008 renewed 2013	
International Association of Cryospheric Sciences (IACS)	LoA	2008 renewed 2013	
International Council for the Exploration of the Seas (ICES)	MoU	2011	
International Permafrost Association (IPA)	MoU	2009 renewed 2014	Jointly with SCAR
Pacific Arctic Group (PAG)	LoA	2009 renewed 2014	
Scientific Committee on Antarctic Research (SCAR)	LoA	2006 renewed 2011	
University of the Arctic (UArctic)	LoA	2011	Jointly with IASSA
World Climate Research Program (WCRP) Climate and Cryosphere (CliC)	MoU	2008 renewed 2013	Jointly with SCAR

MoU: Memorandum of Understanding **LoA:** Letter of Agreement **MoA:** Memorandum of Agreement

advice to the main political body in the Arctic. IASC is supporting the work of the Arctic Council, its Working Groups and Permanent Participants by providing scientific expertise from all its members, including the non-Arctic countries, and IASC´s contributions have resulted in a number of very successful joint ventures (see Chapter 4.2).

As an International Scientific Associate of the overarching non-governmental science organization ICSU, IASC is well connected within the broader ICSU family (see Chapter 4.3). In particular, cooperation with its Antarctic sister organization SCAR resulted in various bipolar science activities and has led to the formation of a joint Action Group (see Chapter 4.5).

Over the past years, IASC signed formal partnership agreements with several other Arctic or Polar organizations, which have resulted in numerous joint scientific and/or outreach activities. Table 1 provides an overview of the organizations with which IASC is formally cooperating.

To provide opportunities for coordination, cooperation, and collaboration between the various scientific organizations involved in Arctic research and to economize on travel and time, IASC initiated the ASSW (see Chapter 2.9). An additional partner in organizing the ASSW is NySMAC.

4.2

Arctic Council

Odd Rogne and Volker Rachold, with contributions from Robert Corell
Reviewer: Lars-Otto Reiersen

The need for intergovernmental cooperation in the Arctic has varied over time, and has been closely linked to the geopolitical situation. Like most of the world, the Arctic was divided in an eastern and a western part. There were some short thaw periods, and one of them led to the Polar Bear Treaty.[1] The next step was bilateral cooperation in the North (USSR-Canada, USSR-Norway).

The discussions on and planning of circumarctic cooperation among scientists, seem to have stimulated governmental people to think about intergovernmental cooperation. The first document expressing the potential need for arctic intergovernmental cooperation was in a paper by Roots, Rogne and Taagholt (1987),[2] suggesting an "Intergovernmental Forum on Arctic Science Issues." During the IASC planning process, this 'forum' evolved into the IASC Regional Board, whereas the need for it was taken over by the AEPS.

However, we should take one step back and start with the 'Finnish Initiative.'[3] How this initiative came about, is described in Chapter 1.1. Although its start lacked some enthusiasm by some countries, the AEPS as an intergovernmental cooperation was agreed at a meeting on 14 June 1991 in Rovaniemi, Finland. Over the years, a broadening of the scope of the AEPS to encompass all areas was suggested, ending with the Ottawa Declaration of 19 September 1996 that laid the foundation for the establishment of the Arctic Council. IASC was invited to become an accredited official observer of the Arctic Council at the formational meeting.

In the early years of the Arctic Council, IASC undertook several efforts to represent science to government and permanent participant communities, and in 1998 the role of science became clear. At a meeting chaired by the Canadian Minister of Foreign Affairs, an exercise to understand the connection between the Arctic Council´s policy agenda and IASC´s research priorities clearly showed that IASC, representing Northern Hemisphere scientific capabilities for research in the Arctic, was an important and legitimate addition to the Arctic Council's agenda. It should be noted that, during this time, conversations began between IASC and the two leading scientific working groups of the Arctic Council—AMAP and CAFF, which led significantly toward the development ACIA established a few years later (Chapter 2.5).

Arctic Council Ministerial Meeting in Kiruna, Sweden, May 2013.

Photo: IASC Secretariat

As an accredited observer of the Arctic Council, IASC has been supporting the work of the AC, its Working Groups (WGs) and Permanent Participants (PPs) by providing scientific expertise from all its members, including the non-Arctic countries.

The interactions between IASC and the Arctic Council resulted in a number of very successful cooperative projects and activities. Two of these activities, namely the above-mentioned ACIA and SAON (Chapter 2.8), can be considered joint ventures. Additionally, over the years, IASC has substantially contributed to several Arctic Council projects, in particular by coordinating the peer-review process of the SWIPA report,[4] the Arctic Resilience Report (ARR),[5] and the 2nd Arctic Human Development Report (AHDR II).[6] At the same time, the Arctic Council and its WGs and PPs were involved in a number of IASC activities and projects, including ICARP II (see Chapter 2.6) and the State of the Arctic Coasts 2010 report.[7] Consequently, the ASSW (see Chapter 2.9) has become more important as a venue for Arctic Council WG and PP activities.

References

[1] IUCN (1973). The Polar Bear Treaty: Agreement on Conservation of Polar Bears (Canada, Denmark, Norway, the USSR and the USA), Oslo.

[2] Roots, E.F., O. Rogne, and J. Taagholt (1987). International Communication and Co-ordination in Arctic Science – A Proposal for Action. Ottawa, Oslo, Copenhagen, , 21p. (see Historical Document #4 at http://iasc25.iasc.info/)

[3] Finnish Initiative (see Historical Document #6 at http://iasc25.iasc.info/)

[4] *http://www.amap.no/swipa*

[5] *http://www.arctic-council.org/arr*

[6] *http://www.svs.is/AHDR%20II/AHDR%20II.htm*

[7] Forbes, D.L., H. Lantuit, V. Rachold, and H. Kremer (2011). State of the Arctic Coast 2010–Scientific Review and Outlook. International Arctic Science Committee (IASC), Land-Ocean Interactions in the Coastal Zone (LOICZ), International Permafrost Association (IPA), Arctic Monitoring and Assessment Program (AMAP): 168p.

4.3

International Council for Science (ICSU)

Odd Rogne

The International Council for Science (ICSU) is an international NGO devoted to international cooperation for the advancement of science. Its members are national scientific bodies and international scientific unions. ICSU comprises about 120 multi-disciplinary national scientific members, associates and observers representing 140 countries and 31 international, disciplinary Scientific Unions. ICSU membership also includes 22 Scientific Associates.

ICSU´s *mission* is to strengthen international science for the benefit of society. To do this, ICSU mobilizes the knowledge and resources of the international science community to:

- Identify and address major issues for science and society
- Facilitate interaction amongst scientists across all disciplines and from all countries
- Promote the participation of all scientists - regardless of race, citizenship, language, political stance, or gender - in the international scientific endeavor
- Provide independent, authoritative advice to stimulate constructive dialogue between the scientific community and governments, civil society, and the private sector.

For many members of IASC, becoming a member of the ICSU family was a logical step to connect to international science. SCAR, the sister organization for the Antarctic, had been established by ICSU, and during the IASC planning period SCAR was used as a model. Many members of IASC were national delegates to SCAR or otherwise involved in Antarctic research, and knew what worked well in the SCAR system, and could easily agree on solutions that would be relevant for the future IASC. Relevant parts of the SCAR organizational structure, rules of procedure etc. could be copied or adapted to IASC.

However, there were several differences: SCAR had been initiated by ICSU and was by definition an ICSU body, whereas IASC was born by science 'parents' under governmental scrutiny. Some countries were skeptical to IASC seeking a relationship to ICSU based on a fear that they would lose control.

As there was not an urgent need to seek a relationship to ICSU, more than a decade of maturation passed before there was internal agreement to apply for a partnership with ICSU. In the ICSU system, IASC could not become a regular ICSU body as it was not born by ICSU, so the solution was an application to become an International Scientific Associate of ICSU.

The application form requests a description of why an organization is seeking membership, or association with, ICSU. The IASC application contained the following description:

We interact with ICSU bodies informally and as already mentioned, SCAR, our sister organization concerned with Antarctic research, is a body of ICSU. As an organization concerned with international Arctic research, we need to have contacts with the global research issues as Arctic phenomena often is a part of global systems and there is a two way interaction. The outcome of many of our projects is fed into global programmes.

An application to ICSU was made in 2004, and confirmation was received on 12 January 2005 that IASC had been accepted as an International Scientific Associate of ICSU.

4.4

History of the Arctic Ocean Sciences Board (AOSB) and Cooperation with other Organizations

Naja Mikkelsen
Reviewer: Dieter Fütterer

At a meeting in Bremerhaven in May 1984, a group of scientists and scientific managers from five countries, after reviewing ongoing and proposed national and international scientific activities including the Marginal Ice Zone Experiment (MIZEX), the Fram Strait Project, the proposals from existing international scientific organizations related to activities in the Arctic Ocean and adjacent seas, agreed that there should be formed a body known as the Arctic Ocean Sciences Board (AOSB). This non-governmental body, with members from research and government institutions – in *soon* 16 countries – met annually to promote scientific and technical coordination and establish joint priorities and programs (see Table 1).

From 2001 onward, the AOSB has met as part of the joint ASSW and was a member of the planning

and coordination team. The AOSB secretariat was supported by the US NSF.

Over the years, AOSB maintained liaison with other international organizations involved in marine Arctic research, namely IASC, the Scientific Committee on Oceanic Research (SCOR), ICES, WMO, the European Committee on Ocean and Polar Sciences (ECOPS) of the European Commission (EC) and European Science Foundation (ESF), and the Nansen Arctic Drilling Project (NAD).

AOSB has many accomplishments. The Greenland Sea Project was the first major program undertaken in two phases over the years 1987-1993. It was aimed at observing and modeling the atmospheric, ice, oceanic and biological processes relevant to understanding the role of the Nordic Seas in the climate system.

Recognizing the unique role that polynyas play in the Arctic system, the AOSB initiated the International Arctic Polynya Program (IAPP) in 1989. This long-term program has resulted in a wealth of data and observations over 15 years, beginning with the Northeast Water Polynya project (NEW), followed by the North Water Polynya Project (NOW), which was succeeded in 2001 by the Canadian Arctic Shelf Exchange Study (CASES), and finally evolving into a self-sustaining new program called Polynyas in a Changing Arctic Environment (PACE).

In 1996, the AOSB initiated a new multidisciplinary and international research program on river discharge and its change through time, called Arctic Paleo-River discharge (APARD). The APARD science plan was published in 1998 and during subsequent years, a large number of APARD-related research activities and projects were performed in the western as well as eastern Arctic continental margins, such as the Laptev Sea System off the Lena River, and the project Siberian River Run-off (SIRRO) of Ob and Yenissei and its influence to the Kara Sea.

In 1999, AOSB initiated the Arctic-Subarctic Ocean Fluxes (ASOF) program that coordinated and set priorities for various projects to monitor the long-term heat exchange between the Arctic Ocean and the adjacent seas.

The Shelf Basin Exchange (SBE) WG was formed in 2001 as the Board recognized the need to coordinate and set priorities for the many national shelf basin exchange programs that were developing around the Arctic basin. This important activity led to several cooperative activities, including some that were included in the ICARP II research plan on gateways and margins.

AOSB, along with other Arctic organizations, played a role in bringing about the 2007 IPY. In response to IPY planning, AOSB developed a coordinated Arctic marine proposal entitled "The Integrated Arctic Ocean Observing System (iAOOS)" which became a flagship activity.
An AOSB initiative that the Board was particularly pleased to promote was the creation of an initiative entitled 'New Research Generation' (NRG) aimed at promoting the inclusion of early career Arctic scientists and engineers in the Arctic marine science planning process. This initiative has developed into a very successful program for early career scientists

Meeting of the Arctic Ocean Sciences Board (AOSB) in Tokyo, Japan, 1999.

Photo provided by Dieter Fütterer

Table 1 **AOSB Meetings**

1984	01 Bremerhaven, Germany
1984	02 Ottawa, ON, Canada
1985	03 Washington, DC, USA
1986	04 Oslo, Norway
1986	05 Helsinki, Finland
1987	06 Dartmouth, NS, Canada
1987	07 Santander, Spain
1989	08 Washington, DC, USA
1990	09 Cambridge, UK
1991	10 Copenhagen, Denmark
1992	11 St. John´s, NFLD, Canada
1993	12 Seattle, WA, USA
1994	13 Scheveningen / The Hague, NL
1995	14 Bremerhaven, Germany
1996	15 Helsinki, Finland
1997	16 Sopot, Poland
1998	17 Oslo, Norway
1999	18 Tokyo, Japan
2000	19 Cambridge, UK (ASSW)
2001	20 Iqaluit, NU, Canada (ASSW)
2002	21 Groningen, NL, (ASSW)
2003	22 Kiruna, Sweden (ASSW)
2004	23 Reykjavik, Iceland (ASSW)
2005	24 Kunming, China (ASSW)
2006	25 Potsdam, Germany (ASSW)
2007	26 Hanover, Germany (ASSW)
2008	27 Syktyvkar, Russia (ASSW)
2009	28 Bergen, Norway (ASSW)

Since 2010, AOSB is the Marine WG of IASC, which meets at the ASSW (see Chapter 2.9).

and helped finance the participation of early career scientists in the earliest phases of ART, a flagship program of AOSB (and now IASC) which is led entirely by early career scientists.

Starting with the ASSW in Kunming (2005) AOSB, as part of its strategy, sought to strengthen its relationships with other ASSW organizations, especially – but not only – with IASC. Further discussions in Potsdam (2006) and Hanover (2007) and the restructuring of IASC in the light of a recent review and strategy report (see Chapter 1.4) the AOSB was merged with IASC in 2009 – despite some reluctance by AOSB members. Under IASC, AOSB became the Marine WG of IASC. Three years after the merger, most agree that bringing AOSB into the IASC family was a worthwhile effort which has led to better coordination between research disciplines through cross-cutting initiatives involving the marine sector and a steady source of funding for planning and coordination activities.

4.5

Bi-Polar Cooperation

Colin P. Summerhayes, Odd Rogne, Volker Rachold and Mike D. Sparrow
Reviewer: Karin Lochte

When Jörn Thiede, the Director of Germany´s Alfred Wegener Institute for Marine and Polar Science, was both President of SCAR (2002-2006) and a national representative to IASC, he persuaded SCAR´s Executive Committee (EXCOM) to agree at its meeting in Brest in July 2003 that SCAR should seek to have a formal representative at IASC meetings with a reciprocal invitation for IASC to be represented at SCAR meetings. The rationale was that IASC´s establishment in 1999 of the ASSW was providing opportunities for coordination, collaboration and cooperation in all areas of Arctic science, and some of that science was complementary to that taking place in the Antarctic – particularly where bipolar topics like glaciology and climatic studies were concerned. There were bound to be some benefits from pooling resources. Although the topic was revisited at SCAR´s EXCOM meeting in Bremerhaven in January 2004, the SCAR Secretariat´s time was occupied with SCAR´s reorganization, and with planning for the first SCAR Open Science Conference due to take place in Bremen in July 2004.

Formal discussions between SCAR and IASC were initiated by Summerhayes, the new Executive Director of SCAR, in a January 2005 e-mail message to Rogne, Executive Secretary of IASC, with a view to improving collaboration in areas of common interest, by holding a joint SCAR-IASC forum in association with SCAR´s proposed 2008 meeting in St. Petersburg, and considering the implications of the IPY for both organizations. Summerhayes and Rogne met in the margins of the IPY Planning Meeting in Paris in March 2005. Given that both bodies had polar interests, and both were associated closely with ICSU (SCAR as an Interdisciplinary Science Body, and IASC as an International Scientific Associate), there were strong grounds for supposing that a closer linkage between the two organizations would bring benefit to both parties, not least in an exchange of views and experience on important scientific topics. A SCAR and IASC Letter of Agreement was developed, and duly signed in July 2006. Through it, SCAR and IASC agreed to combine their efforts in selected fields and activities so as to raise the level of impact of both organizations in terms of making scientific advances, advising policy-makers, and avoiding duplication. The development of the IPY was an important driver for the two organizations coming together, though not the only one; the partnership would have developed, regardless. A joint presentation announcing the linkage of the two organizations "*The science legacy of IPY: Antarctic and Arctic Research Partnership Opportunities*" was made by Summerhayes and Rachold on 16 March at ASSW 2007 in Hanover, New Hampshire, USA. An update *Post-IPY Scientific Cooperation – Ongoing and Planned Joint SCAR/IASC* Bipolar Activities was presented by Thiede and Rachold at the next ASSW in Syktyvkar, Russia, on 29 March 2008.

The association proved successful, notably due to the amicable and cooperative linkages between SCAR Executive Directors, Summerhayes (2004-2010) and Sparrow (2010-) and IASC Executive Secretaries Rogne (1991-2005) and Rachold (2006-). These officers are in regular contact, and, along with SCAR and IASC Presidents or their representatives, attend each other´s annual administrative meetings.

Cooperation is now happening in key areas of science. These include joint sponsorship of the Ice Sheet Mass Balance and Sea Level (ISMASS) group, cooperation between the Social Sciences and History groups, and the inclusion of bipolar perspectives in most new science programs and groups, as well as SCAR and IASC jointly representing ICSU at, e.g., IPCC workshops and various steering committees.

As an interdisciplinary body of ICSU, SCAR is eligible to bid for ICSU grants. These grants have always been bipolar in character and therefore have been submitted in partnership with IASC. Despite the stiff competition for these grants the two organizations have (to date) had a 100% success rate with their applications. These grants have been on topics such as IMASS (2007 and 2012), Lessons Learned in Education and Outreach from the IPY (2009), and on Circumpolar Integration of Permafrost Microbiological Studies (2009). The latter was led by the International Union of Geological Sciences (IUGS), and IPA.

In July 2008, SCAR and IASC co-signed a Letter of Agreement on cooperation with the new International Association of Cryospheric Sciences (IACS) of ICSU´s IUGG. In March 2009, they co-signed a Letter of Agreement with the IPA, which was already co-sponsor of SCAR´s Permafrost science group. In July 2008, IASC joined SCAR as a co-sponsor of the WCRP´s Climate and Cryosphere program (CliC). These various agreements effectively bind together the main polar bodies of ICSU. SCAR and IASC were concerned that the polar sciences did not have a higher profile within ICSU´s global programs (Earth System Science Partnership – ESSP, and International Geosphere-Biosphere Program – IGBP), though recent experience – for example, a joint presentation by Rachold, Sparrow and Baeseman (from APECS) to the 2010 ICSU General Assembly – suggest that this is no longer the case.

Joint meeting of the Executive Committees of IASC and the Scientific Committee on Antarctic Research (SCAR) at the IPY 2010 Conference in Oslo, Norway, June 2010.

Photo: IASC Secretariat

SCAR and IASC worked closely together as members (ex officio) of the IPY Joint Committee that planned and implemented IPY 2007-2008. Both organizations encouraged the development of the ocean observing systems called for by the IPY - an integrated Arctic Ocean Observing System (iAOOS) and a Southern Ocean Observing System (SOOS) - which will be important contributions to understanding and forecasting polar climate change. SCAR invited IASC to jointly sponsor SCAR´s planned Open Science Conference in St. Petersburg, Russia (8-11 July 2008), which was eventually adopted and co-sponsored by ICSU and WMO as the 1st IPY conference. SCAR and IASC continued to work together as co-sponsors (with others) of the 2nd IPY science conference (Oslo, Norway, June 2010), and of the 3rd IPY conference (Montreal, Canada, April 2012). To manage the St Petersburg meeting, SCAR and IASC created an international scientific organizing committee chaired by Chuck Kennicutt (USA) for SCAR and Louwrens Hacquebord (Netherlands) for IASC. The SCAR Director and IASC Secretary were invited to participate on similar organizing committees, under the chairmanship of Olav Orheim (Norway), for the Oslo meeting, and of Peter Harrison (Canada) and Karl Erb (USA), for the Montreal meeting.

The end of the IPY in 2009 begged the question of how SCAR and IASC might contribute to sustaining the IPY legacy. To address that question, in January 2008 the organizations formed the Joint IASC/SCAR Bipolar Action Group (BipAG), chaired initially by Heinz Miller (AWI, Germany) to advise both bodies on (a) how best to develop collaborative bipolar activities in the future, and (b) how best to nurture the IPY 2007/2008 legacy. BipAG met in St Petersburg on 8 July 2008, and in Oslo on 15-16 October 2009, and prepared advice for the management bodies of its two parents. In 2010, BipAG´s terms of reference were modified to focus on bipolar issues, while the SCAR and IASC EXCOMs agreed to jointly address IPY legacy issues.

To effectively address the challenges and efficiently use available resources, a new and novel framework for long-term cooperation between stakeholders with a mandate and interest in the Polar Regions, entitled the "International Polar Partnership Initiative" (IPPI), is under development. An International Steering Group, consisting of representatives of a range of polar bodies and organizations (including IASC and SCAR) is currently developing the concept for this long-term initiative. Under this framework, a common IPPI Implementation Plan will be prepared for the development of observing systems, research, services, related education and outreach, and practical application of scientific knowledge in the Polar Regions. The IPPI is intended to optimize the use of existing resources and identify areas where new investments in polar activities are necessary.

The IPPI Framework Agreement will create a platform enabling efficient cooperative response to existing and future challenges. The IPPI Implementation Plan will turn existing polar activities into a coordinated series of highly productive interagency initiatives to address the identified challenges. SCAR and IASC are actively working with ICSU to explore synergies between ICSU´s new Future Earth initiative and the IPPI.

An important spin-off from the IPY was the development of APECS, which was jointly sponsored by SCAR and IASC since 2008. APECS is a worldwide association for undergraduate and graduate students, postdoctoral researchers, early career faculty members, educators and others with interests in Polar Regions and the wider cryosphere. It grew out of the IPY´s International Youth Steering Committee. Sponsorship recognizes the need to stimulate and nurture the next generation of polar researchers so as to ensure a legacy of continued polar science. Primary objectives include creating a network of polar researchers across disciplines and national boundaries to meet, share ideas and experiences, and develop new research directions and collaborations; providing opportunities for career development and promoting education and outreach to attract future generations of polar researchers. APECS encourages senior researchers to register on the APECS website and serve as mentors. SCAR and IASC provide advice to APECS and co-sponsor initiatives such as workshops and brochures on relevant topics. APECS is invited to send an observer to SCAR and IASC administrative meetings and to attend SCAR and IASC science meetings.

SCAR and IASC worked hard together to ensure a higher profile for the polar sciences in the post-IPY world. After the IPY Joint Committee was disbanded in 2010 there was no formal mechanism for polar issues to be brought to the attention of ICSU. However, recognizing the importance of the poles to the global environment, ecosystems and society, ICSU has continued to work closely with its polar bodies to ensure that such issues are considered.

4.6

Preparing Future IASC Leaders by Laying the Foundation of the Association of Polar Early Career Scientists (APECS)

Jenny Baeseman
Reviewer: Hugues Lantuit

IPY 2007-2008 created the framework for many levels of international and interdisciplinary grassroots collaboration. As one of the leading bodies of the IPY, IASC facilitated and encouraged many of these efforts.

In preparing for the IPY, a group of like-minded early career researchers joined forces in 2006 to create an international and interdisciplinary network for people at the beginning stages of their careers in polar research. The aims of the network were not just meant to engage other young researchers, but to learn from senior professionals and create a continuum of knowledge of the Polar Regions. This network became the Association of Polar Early Career Scientists (APECS) and is often referred to as one of the greatest legacies of IPY.

Several of the early career researchers involved in establishing APECS were also involved in the IASC-led ICARP II process. Because of these connections, strong links between APECS and IASC were in place from the early stages. Initial discussions on how IASC might assist these early career researchers in their APECS mission included both supportive advice and hesitation on the role that IASC could play for such a network on an international level. These discussions resulted in APECS developing a stronger platform for their organization, more meaningful activities and ties to established senior level professional bodies, including both IASC and SCAR.

In 2007, IASC supported APECS in holding their first official career development activity at the

ASSW in Hanover. Not even a major snowstorm could stop the warm welcome APECS and its members received from the many mentors involved in this activity. In a session dedicated to early career researcher presentations, IASC senior members voluntarily filled the seats, engaged in discussions and supported these young people. The lively and productive informal mentor session with pizza and beverages held after the science session included several IASC presidents and organizational leaders. They began to demonstrate how a network of early career researchers working with senior mentors could help form an important continuum of international polar science knowledge, and solidify the importance of these activities within the polar science community and facilitate the desire for a more formal tie between the organizations.

In 2008, IASC and SCAR signed a memorandum of understanding with APECS at the first IPY conference in St. Petersburg, Russia. The agreement underlined the common goals of the parties in working internationally and across disciplines to increase understanding of the Earth´s Polar Regions and their connections to the global system. It also recognizes their joint commitment to the professional development of early career researchers and the need for a continuum of leadership in polar research. The agreement did not include financial support for the operation of the organization, but has been a critical component in garnering both moral and financial support for literally thousands of early career researchers, in polar research and other concentration areas.

In the years since, IASC has made a strong effort to include APECS in their activities, from welcoming them to the organizing committee of the ASSW to sharing the stage in discussing the future of polar research with ICSU. IASC has provided financial support for many early career researchers to participate in their events (most recently for the ASSW in Poland, the requirements to receive such funding have included being a member of APECS). This recognition by ASSW of the importance of being involved with APECS has helped to strengthen APECS' position as the leading organization for early career polar researchers around the world.

APECS members and mentors have helped change the role of early career researchers within IASC and infused it with new energy, talent, and ideas. The shift from inclusion of early career researchers to more meaningful engagement can be illustrated in several ways. The first APECS activity at ASSW 2007 included a separate session for early career researchers to present their work; now it is thought of as commonplace to have science sessions with both early career and senior researchers. Session chair positions used to be reserved for only those at the pinnacle of their careers; now senior leaders are paired with those just starting their careers, shar-

Left to right: Kristján Kristjánsson (then President of IASC), Chuck Kennicutt (then President of SCAR) and Jenny Baeseam (then Executive Director of the Association of Polar Early Career Scientists, APECS) at the SCAR/IASC Conference in St. Petersburg, Russia, July 2008.

Photo: IASC Secretariat

ing the experience in developing and facilitating a science conference session. The inclusion of early career researchers in IASC working groups is also starting to occur. It is now 'normal' to have people from all career stages involved in IASC activities.

An example of how including early career researchers can help to stimulate IASC activities can been seen with the ART Project, of which many early APECS leaders were part. The founding group of ART included many early career people involved with ICARP II. They have gone on to formally establish ART as an international and interdisciplinary science project within IASC´s framework and are now in the mentorship role and supporting students of their own. This group of people will be familiar with IASC throughout their careers, and thus are positioned to shape the organization´s activities for many years to come.

In addition to having an influence on the incorporation of early career researchers in IASC activities, APECS has also helped push for a shift in what defines IASC outreach at the organizational level. IASC´s outreach used to center on brochures, pamphlets, and bulletins about the organization's activities; now IASC is actively engaging in the creation of videos, promoting the role of teachers and educators in science conferences and expeditions, supporting science communication training activities, and reaching out to a broader audience. Where APECS cannot take sole credit for this change as many of the IASC leaders also pushed this, the sharing of ideas and tools used by APECS has helped create many new IASC outreach efforts including videos and a Facebook presence. This shift to engage more in science outreach can also be demonstrated by IASC´s involvement in the APECS-led 'Lessons Learned from IPY Education, Outreach and Communication Assessment,' funded by ICSU and also supported by SCAR. This assessment is seen as a major achievement in setting forth new standards for science outreach – not just with polar science, but globally.

IASC has been instrumental in supporting the development of APECS, its activities and the career development of thousands of early career researchers. The foundation for the continuum of knowledge in Arctic science is strong, thanks to IASC´s encouragement in the development of the Association. We are only beginning to see the changes this collaboration has made within IASC and science as a whole. We look forward to the next chapters in IASC´s history, which will be written by today´s APECS members.

Photo: Jeff Bowman
Sampling frost flowers for microbiological analysis during summer in Lomrogll.

05 *The IASC* Secretariat

05 IASC Secretariat

5.1

The IASC Secretariat

Odd Rogne and Volker Rachold

Any international organization needs a strong secretariat in order to get work done. For a new organization like IASC, it was especially important. The key issue was "Who is willing to fund it"? We were in a lucky situation as the IASC planning process had attracted a good deal of governmental attention (and actually IASC served as 'John the Baptist' for circumarctic governmental cooperation).

In the IASC planning process, the need for a staffed and well-equipped secretariat was recognized early on, and the planning committee indirectly made arctic countries aware of "the opportunity to become the host country." This tactic served IASC well and even resulted in a competition to become the first host country (see Chapter 1.1). We mention this type of thinking, because it may be old wisdom that the next generation can learn something from; or in other words one shouldn't have to beg, but rather present an idea to possible funders as an attractive opportunity!

Elected members of the various bodies of the organization (such as Council, Executive Committee, and other bodies) are serving the organization in an honorary capacity since they all have other full-time positions. Thus, a secretariat with salaried staff members is central to the organization and serves as its working arm.

For the first years, the initial needs were related to:

- Drafting and preparing the organizational structure
- Building networks to both national and international organizations
- Making the organization known and visible in relevant fora
- Implementing the new bodies of the organization (such as working groups)
- Serving as a managerial advisor to working groups and other groups
- Stimulating brainstorming activities on timely and new initiatives (FARO, ISIRA, ASSW can serve as such examples; see other parts of this report).

With national science organizations as members (adhering bodies), IASC is well placed to detect international science needs. Scientists are also alerted to societal needs and, through their studies in the field, observe changes of importance to societies. Some societal needs are also addressed through intergovernmental cooperation (AEPS and later the Arctic Council), which depends on the science community providing data of good quality.

Funding is a constant challenge for international science cooperation, as funds available for science are mainly provided by national funding agencies; and based on national priorities. Through national membership fees, IASC manages a small fund that can be used as seed money for science planning activities, e.g., for bringing people together for initial planning, including agreeing on a strategy for coor-

dinating applications to national (and multinational) funding opportunities. In addition to managing the seed money, the IASC Secretariat has served as a funding advisor (see Chapter 1.3).

IASC Medal

Since 2010, IASC awards a Medal in recognition of exceptional and sustained contributions to the understanding of the Arctic. A maximum of one award is made annually and each year the nominations received are reviewed by an IASC Medal Committee, comprising three IASC Council members. The award of medals is normally made by the President of IASC during the ASSW, or exceptionally at another major international meeting. The Medal has become a very prestigious award and each year IASC is receiving a number of outstanding nominations.

2010

The first IASC Medal was awarded in 2010 to **Patrick Webber**, Professor Emeritus of Plant Biology at Michigan State University and former IASC President. Patrick Webber was recognized for his life-long scientific contributions as well as for the promotion of Arctic research in general through inspiring mentorship and leadership.

2011

The 2011 IASC Medal was awarded to **Martin Jakobsson** (University of Stockholm) who represents a new generation of Arctic scientists for whom multinational and cross-disciplinary science comes naturally. His view that data should be open and accessible for research is part of his success as illustrated by the wide use of the International Bathymetric Chart of the Arctic Ocean (IBCAO).

2012

The 2012 IASC Medal was awarded to **Igor Krupnik** (Smithsonian Institute) for making scientists, decision-makers and the general public aware that the Arctic is not only about ice and polar bears but also about its inhabitants; for bridging between natural and social sciences as well as to the knowledge of the indigenous Arctic residents; and for invaluable contributions to the success of the IPY.

2013

In 2013, **Leif Anderson** (University of Gothenburg) was honored for his pioneering work on the functioning of the Arctic Ocean and his groundbreaking scientific contributions to understanding the chemistry and carbon cycle of this very special ocean system.

2014

The 2014 Medal was awarded to **Julian Dowdeswell** (Scott Polar Research Institute at University of Cambridge) as a World leader in the field of Arctic glaciology, recognizing his outstanding and unique contributions to the understanding of glacier dynamics and ocean-ice sheet interactions.

The IASC Secretariat has always advocated close cooperation between the science community and national governmental agencies (constituting most of the members of the Arctic Council working groups). Examples of such cooperation are ACIA and SAON (see Chapters 2.5 and 2.8).

Today the IASC Secretariat, with its Executive Secretary and staff, is responsible for the daily operations of IASC, including:

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

The responsibilities of the Executive Secretary include:

- Preparing budgets, the administration of IASC finances;
- Preparing for, attending and reporting on all Council and Executive Committee meetings;
- Representing IASC at meetings of other organizations as directed by the Executive Committee;
- Hiring, dismissal, and overseeing secretariat staff;
- Responding to duties assigned by the Executive Committee.

Other responsibilities of the staff of the Secretariat include:

- Preparing for, attending, and reporting on all Working Group and Action Group meetings as requested by Chairs of these bodies;
- Facilitating communication between Working Groups.

The host countries for the IASC Secretariat have been:

1991-2005:
Norway, financed by the Norwegian Polar Institute; Executive Secretary: Odd Rogne, Administrative Assistants: Maryanne Rygg and Margaret Davies.

2006-2008:
Sweden, hosted by the Swedish Polar Secretariat and financed by the Swedish Research Council; Executive Secretary: Volker Rachold, Administrative Assistants: Anna Sundin, Charlotte Teglgaard-Pålsson.

2009- present:
Germany, hosted by the Alfred Wegener Institute and co-financed by the German Science Foundation. Additional support provided by the US National Science Foundation (2009-2013), the Korean Polar Research Institute (2013-), the Canadian Polar Commission (2014-) the Japanese National Institute for Polar Research (2014-) and the Polish Polar Consortium (2015-). Executive Secretary: Volker Rachold, Executive Officers: Mare Pit (2009-), Sara Bowden (2009-2013), Yoo Kyung Lee (2013-), Susan File (2014-), Tetsuo Sueyoshi (2014-) and Maja Lisowska (2015-), Communications Officer: Ursula Heidbach, Administrative Assistant: Heike Midleja.

IASC Fellowship Program

Promoting and involving the next generation of scientists working in the Arctic is of major importance for IASC towards achieving its mission of encouraging and facilitating cooperation in all aspects of Arctic research, in all countries engaged in Arctic research and in all areas of the Arctic region.
Since 2014, IASC maintains a Fellowship Program to engage Early Career Scientists (ECS) in the work of the IASC Working Groups (WGs). IASC Fellows are doctoral or postdoctoral researchers who actively participate in selected activities of the IASC WGs. IASC Fellows are expected to contribute scientifically, but also to help organize specific activities, including reporting to the IASC Secretariat. Thus, the Fellowship program provides the opportunity for ECSs to become involved in leading-edge scientific activities at a circum-arctic and international level, to build an international network of contacts and also to develop management skills.
IASC supports one Fellow per WG for a period of one

IASC Fellows at the Arctic Science Summit Week 2014 in Helsinki, Finland
Left to right: Yoo Kyung Lee (IASC Secretariat), Elena Kuznetsova, Volker Rachold (IASC Secretariat), Paul Suprenand, Louis-Philippe Roy, Noemie Boulanger-Lapointe, Candice Lys, Emily Choy and Malgorzata Smieszek. Not on photo: Jeffrey Ross.

Photo: IASC Secretariat

year, from one Arctic Science Summit Week (ASSW) to the next. The coordinator of IASC´s mechanisms to promote Early Career Scientists is overseeing the program. The selection process is managed by the IASC coordinator and conducted in close cooperation with the Association of Polar Early Career Scientists (APECS). A call for applications is released each year in October through the IASC and APECS mailing lists, websites and Facebook. Any doctoral or postdoctoral researcher from IASC member countries can apply. The required qualifications include demonstrated scientific interest and skills within a field that is relevant to the respective WGs and a good command of English. The selection process will be coordinated with the APECS Secretariat, in consultation with the WG Steering Groups.

To enable the participation in two consecutive WG meetings, IASC Fellows receive travel support to attend two ASSWs, so that at each WG meeting there is one outgoing and one incoming IASC Fellow. Additionally, IASC Fellows can receive travel funding to participate in selected workshops or other meetings of the WG, provided that they facilitate the meeting and follow-up activities, including reporting. IASC Fellows are introduced on the IASC website and receive appropriate certificates confirming their positions.

Photo: Bruce Forbes
Nennet Reindeer Herders during field research in the Yamal Peninsula, West Siberia in the summer of 2010.

The IASC Evolution and Lessons Learned

The IASC Evolution *and Lessons Learned*

The IASC Evolution and Lessons Learned

by Odd Rogne, Volker Rachold, Louwrens Hacquebord and Robert W. Corell

The IASC mission is to encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research, and in all areas of the Arctic region.

Writing about the history of IASC involves not only looking back but also looking forward. 'What did we learn from the past?' and 'What can we do with this experience in the future?' are the main questions of this last chapter. This calls for attention to issues that some contributors and reviewers felt were not sufficiently covered elsewhere in this publication, or that deserve to be highlighted. Further, there were words of wisdom from individuals that are considered important lessons learned. These last contributions are featured in separate boxes.

The Changing Arctic Political Landscape

Some of the content from the very early IASC planning made its way into the speech that President Gorbachev delivered on 1 October 1987 in Murmansk. The speech mentioned "the need to coordinate research in the Arctic" and "setting up a joint Arctic council." This was a remarkable political signal, which was elaborated at the Summit meeting between presidents Gorbachev and Reagan in Reykjavik, Iceland in June 1988. One could say that IASC planning had served as "John the Baptist" for emerging pan-Arctic cooperation.

Pan-Arctic governmental cooperation was soon to follow, starting with The Finnish Initiative in 1988, which led to the signing of the AEPS in 1991. The Working Groups of AEPS (and later the Arctic Council), in particular AMAP and CAFF, were charged with preparing assessments of the Arctic environment. As a scientific organization, IASC did not play an important role in preparations for the earliest assessments, but joined with the ACIA Working Groups, and since then with other scientific assessment programs such as SWIPA. As such, assessments are, to a large extent, based on scientific findings by the Arctic science community, and it makes sense for a scientific organization like IASC to continue and further develop this cooperation into the future. ACIA can certainly be considered a milestone both in

by Odd Rogne and Patrick Webber

Creativity and Stubbornness

« In life you encounter the pessimists telling you that your idea cannot be implemented. The reason for this negative response can range from "it can't be done," to "it has been tried before." The IASC leadership has been fortunate to have individuals with creativeness, problem-solving skills, drive and stubbornness who overcome such negative thinking and obstacles. The qualities needed for such leadership are charisma, tolerance, industry and enthusiasm. IASC must continue to recruit leaders with such characteristics.»

terms of scientific understanding of the Arctic and in terms of making the public aware of the changing Arctic.

This governmental cooperation had, in turn, an impact on IASC, as tasks initially intended for the IASC Regional Board were assumed by national governmental agencies working cooperatively under the AEPS and later the Arctic Council. This caused a separation between scientific and environmental research but it also, though IASC, engaged Arctic scientists in the work of the Arctic Council.

Arctic versus non-Arctic countries

From the very beginning, the IASC planning group had invited all potentially qualified participants to join, but at the same time it needed to find an agreeable organizational structure as well as criteria for qualification. Some non-Arctic countries have a much longer research tradition in the Arctic than Arctic countries and have large collections of scientific data and information stored in archives and databases. The research foci for Arctic and non-Arctic countries may differ but they overlap, especially on global science (such as global warming), which then offers excellent opportunities for cooperative projects and programs. At the first IASC Council Meeting (1991), five non-Arctic countries became IASC members; today, 14 non-Arctic countries are members.

There is a difference in the research agendas of the two categories of countries, however. Arctic countries have direct needs for data and information to manage their Arctic areas (ecosystem management, human health, resources, etc.), whereas non-Arctic countries focus their Arctic research on global issues (although scientists from Arctic countries do so as well). Both agendas reflect the interest of the societies they come from and that fund them. It should be mentioned that some non-Arctic countries have larger Arctic research programs than some of the Arctic countries. IASC brings in the science from all countries and thus provides additional benefit to the work of the Arctic Council.

Arctic Peoples

The involvement of Arctic peoples was increasingly talked about, and explicitly mentioned in the communiqué from the Gorbachev-Reagan Summit Meeting (Reykjavik 1988). Scientists associated with IASSA were undertaking some studies, whereas IASC increased the number of human and social science projects, including the involvement of indigenous peoples. This involvement developed further in IASC initiatives such as ASSW, ICARP II and ICARP III, SAON etc. IASC´s cooperation with the Sustainable Development WG (SDWG) of the Arctic Council and its contribution to the AHDR I and II and the ARR should also be mentioned in this context. Later, the formation of the IASC Social and Human Sciences WG and partnerships with IASSA and UArctic resulted in even more interactions with Arctic peoples.

A similar development occurred in the pan-Arctic governmental cooperation during AEPS and its successor, the Arctic Council.

by Oran Young

Building strong and enduring partnerships

«If you want a lasting contribution to a particular area of research and especially if doing so involves field research on an ongoing or multiyear basis, it is helpful (perhaps even essential) to build effective partnerships. These partnerships must not only involve scientific colleagues but also extend to local people who often have a lot to contribute and to administrators who can generate bureaucratic obstacles if you don't build lasting relationships with them. This advice applies to all multiyear efforts; it is essential in cases involving Russian and western scientists desiring to engage in field research in each other's countries.»

Broadening Cooperation and Inclusiveness

Many science initiatives and organizations existed prior to IASC. Some of them were disciplinary in scope and had earlier covered only a part of the Arctic.

IASC, with its broad mission, faced the challenge of inviting and motivating them for a broader cooperation. Such an effort is not accomplished overnight. However, initiatives such as the ASSW, ICARP I-III, SAON, ACIA, etc. presented opportunities to further this broad cooperation (see Chapter 4). A central recommendation of the IASC Review 2006-2007 was "Positioning IASC as THE focal point for arctic research." Today IASC is very well positioned to be this focal point, and by partnering with many Arctic, bipolar and global organizations over the last few years, it has come a long way toward achieving this goal.

Since approximately 50% of the Arctic region lies within Russian territory, IASC should continue to stimulate Russian scientists to cooperate with scientists of other Arctic and non-Arctic countries. IASC provides the opportunity to set up common research projects in the Arctic.

International Cooperation Leads to Mutual Benefits and Scientific Progress

The basic reason for engaging in international cooperation is that it brings benefits to the participants. Some IASC member countries recognize the benefits of participation and increase their endeavors, while for others there is hesitation or neutrality. Why the difference? The answer lies in national organization and preparations.

National organizations adhering to IASC are, ideally, expected to have a national arctic (or polar) sciences committee covering all fields of polar science. This national committee should be proactive in discussing projects/programs/issues that would benefit from international cooperation. The national Council member has the opportunity to present national proposals at a Council meeting. Being a national Council member means that you have to be

by Terry Callaghan

"Rain-dance" for Meetings and Organizations

«We all know that hundreds if not thousands of North American Indians came together to dance ritualistically to make it rain. Of course it did not. Too many scientists come together at meetings to discuss and plan, but the implementation does not follow: It has been a rain-dance.

My privilege in life has been to lead a network of research station managers and others whose job it is to help others and each other. This resulted in the formation of a network of friends (INTERACT) that is growing at a great rate. The younger generation will prosper if they network as friends rather than colleagues who can help them implement research plans, and prevent the rain dance. They need the old generation to help identify funding and increased visibility opportunities. »

by Terry Callaghan

Back to the Future

« I have had the personal experience of running the Back to the Future project in which old guys took young students into the field to find their old research sites from 40-50 years ago, to see how the environment had changed and to hand over site-stewardship and data to the next generation.

When asked what I would do differently if I had my time again, my answer was to place my study sites in valleys and not at the mountain summits. When I started, I did not think ahead to old age, so my message to the next generation is to think ahead. »

proactive at the national level in stimulating your committee, promoting the outcome at IASC Council meetings, and reporting back to your national body and pointing to opportunities you may have observed at the Council meeting. Member countries that have done that job properly will succeed. Regrettably, some Council members have served only as 'seat warmers.'

Engaging Young Scientists

Well-established scientists tend to be nominated for all sorts of tasks both at national and international levels. Their experience and wisdom is respected and highly valued. However, the dilemma is that they are over-committed and hence short on time. It was for this reason that IASC, from the very beginning, included and actively recruited young scientists to participate in its activities. This approach is proving to be very effective, as young scientists took the burden of reporting and adding new ideas, whereas older scientists served as councilors or mentors. Young brains can also bring new views and knowledge to a group, and thereby challenge 'old truths.' Where possible, Council members should stimulate job possibilities for excellent young scientists.

This practice was further developed during IPY by initiating APECS, which is further described in Chapter 4.6

IASC Reviews

In its statutes, IASC should undergo regular reviews. Such independent reviews are important tools for improving the organization's performance, tasks and structure. It is up to its leadership to work out a plan and strategy for implementing suggested improvements. Past reviews are summarized in Chapter 1.4 and the next review will be conducted in 2016. Reviews provide important lessons, and earlier reviews deserve being studied both as to the success of the implementation of suggested improvement, and tasks still missing and still relevant.

Arctic and Antarctic Research

Both Polar Regions have some common research interests. Some research groups that were active in both Polar Regions have cooperated. However, formalizing and increasing this cooperation, i.e., a partnership between IASC and its southern hemisphere counterpart SCAR, actually occurred during the last IPY. Cooperation with SCAR resulted in various bipolar science activities and led to the formation of a joint Action Group. Another joint conference, 10 years after the SCAR/IASC Open Science Conference 2008 in St. Petersburg, is being discussed. As a science organization, IASC should stimulate and finance scientific cooperation on the level of the working groups of both organizations.

Photo: P. Blass
The Polish Polar Station Hornsund, Spitsbergen, Svalbard
in the afternoon light, March 2005.

06 Appendices

06 Appendices

Appendix 6.1 List and Addresses of IASC´s National Adhering Bodies

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

List of IASC Council and Regional Board Members

Council Members

AUSTRIA	2014-	Wolfgang Schöner
CANADA	2007-	David Hik *Vice President 2008-2010, President 2010-2014*
CANADA	2006-2007	R. Grant Ingram
CANADA	1999-2005	Peter Johnson *Vice President 2000-2004*
CANADA	1995-1998	Barrie Maxwell *Vice President 1997-2001*
CANADA	1991-1994	E. Fred Roots *President 1991-1993*
CHINA	2010-	Huigeng Yang *Vice President 2012-*
CHINA	1996-2010	Liqi Chen
CZECH REP.	2012-	Josef Elster
DENMARK	2009-	Naja Mikkelsen *Vice President 2010-*
DENMARK	2001-2009	Tom Greiffenberg
DENMARK	2000	Morten Meldgaard
DENMARK	1999	Claus Andreasen
DENMARK	1994-1998	Jens Peder Hart Hansen
DENMARK	1992-1993	Martin Ghisler
DENMARK	1991	Isi Foighel
FINLAND	2004-	Kari Laine
FINLAND	2000-2003	Boris Segerståhl
FINLAND	1998-1999	Juhani Hassi
FINLAND	1991-1997	Pentti Mälkki
FRANCE	2012-	Yves Frenot
FRANCE	1999-2011	Gérard Jugie
FRANCE	1991-1998	Claude Lorius
GERMANY	2010-	Karin Lochte
GERMANY	1994-2010	Dieter Fütterer *Vice President 1994-1997, 2002-2010*
GERMANY	1991-1993	Gotthilf Hempel *Vice President 1991-1993*
ICELAND	2010-	Thorsteinn Gunnarsson
ICELAND	1999-2010	Kristján Kristjánsson *Vice President 2002-2006, President 2006-2010*
ICELAND	1991-1998	Magnus Magnusson *President 1993-1997*
INDIA	2013-	Rajan Sivaramakrishnan
INDIA	2012	Rasik Ravindra
ITALY	2010-	Carlo Barbante
ITALY	2008-2010	Carlo-Alberto Ricci
ITALY	2006-2008	Roberto Azzoloni
ITALY	2002-2006	Marcello Manzoni
ITALY	1997-2001	Bruno Battaglia
JAPAN	2012-	Tetsuo Ohata
JAPAN	2006-2011	Hiroshi Kanda
JAPAN	2005	Yoshiyuki Fujii
JAPAN	1997-2005	Okistugu Watanabe
JAPAN	1995-1996	Nobuo Ono
JAPAN	1991-1994	Takao Hoshiai
KOREA	2002-	Byong-Kwon Park *Vice President 2004-2012*
NETHERLANDS	1992-	Louwrens Haquebord *Vice President 2000-2008*
NETHERLANDS	1991	Johannes Oerlemans
NORWAY	2008-	Susan Barr *Vice President 2010-2014, President 2014-*
NORWAY	2007	Fridjof Mehlum
NORWAY	2002-2006	Rolf Anker Ims
NORWAY	1998-2002	Alf Håkon Hoel *Vice President 1998-2002*
NORWAY	1994-1997	Arnoldus Schytte Blix
NORWAY	1991-1994	Anders Omholt *Vice President 1991-1993*
POLAND	2006-	Jacek Jania
POLAND	1991-2005	Krzysztof Birkenmajer
RUSSIA	2001-	Vladimir I. Pavlenko *Vice President 2014-*
RUSSIA	1991-2000	Igor S. Gramberg *Vice President 1991-1998*
SPAIN	2009-	Manuel Catalan
SWEDEN	2013-	Mats Andersson
SWEDEN	2006-2012	Magnus Friberg
SWEDEN	2005	Olle Stendal
SWEDEN	2000-2005	David G. Gee
SWEDEN	1993-2000	Bert Bolin *Vice President 1993-2000*
SWEDEN	1991-1992	Gunnar Hoppe
SWITZERLAND	2010-	Martin Luethi
SWITZERLAND	2009-2010	Hubertus Fischer
SWITZERLAND	2002-2009	Thomas F. Stocker
SWITZERLAND	1996-2001	Atsumu Ohmura
SWITZERLAND	1994-1995	A. Clottu Vogel
UK	2010-	Cynan Ellis-Evans
UK	2003-2010	Julian Dowdeswell
UK	1995-2002	David J Drewry *President 1997-2002*
UK	1991-1994	Eileen Buttle *Vice President 1993-1994*
USA	2014-	Larry Hinzman *Vice President 2014-*
USA	2006-2014	Jackie M. Grebmeier *Vice President 2006-2014*
USA	2000-2006	Patrick Webber *President 2002-2006*
USA	1994-2000	Oran R. Young *Vice President 1997-2000*
USA	1991-1994	Norbert Untersteiner *Vice President 1991-1993*

Regional Board Members

CANADA	2002-2008	Steven Bigras *Chair 2006-2008*
CANADA	2000-2001	Valoree Walker
CANADA	1999-2000	Peter Johnson
CANADA	1997-1998	Barrie Maxwell
CANADA	1993-1996	Gerald Lock *Chair 1994-1996*
CANADA	1992	Gilles Breton
CANADA	1991	Richard Bill
DENMARK	2002-2008	Hanne Petersen
DENMARK	1996-2001	Morten Meldgaard
DENMARK	1995	Gunnar Martens
DENMARK	1991-1994	Jens Peter Hart Hansen
FINLAND	2000-2008	Paula Kankaanpää *Chair 2000-2002*
FINLAND	1999-2000	Juhani Hassi
FINLAND	1997-1998	Sven-Erik Hjelt
FINLAND	1992-1996	Elisabeth Helander
ICELAND	1999-2008	Niels Einarsson *Chair 2002-2004*
ICELAND	1991-1998	Magnus Magnusson
NORWAY	2006-2008	Jan-Gunnar Winther
NORWAY	1994-2005	Olav Orheim *Chair 2004-2006*
NORWAY	1992	Nils Are Øritsland
NORWAY	1991	Odd Rogne
RUSSIA	2005-2008	Nikita B Bantsekin
RUSSIA	2002-2004	Boris A Morgunov
RUSSIA	1993-2000	Boris Melnikov
RUSSIA	1991-1992	Yuri B. Kazmin
SWEDEN	1992-2008	Anders Karlqvist *Chair 1991-1994, 1996-1997*
USA	2000-2008	Karl Erb
USA	1994-2000	Robert W. Corell *Chair 1997-2000*

IASC Projects

Recognizing the need to come up with tangible outcomes within a reasonable period of time, in the early 1990s IASC being a new organization agreed to follow a project-oriented structure. A set of international projects with clearly defined content and objectives as well as a timeline and reporting mechanism was established.

BASIS: Barents Sea Impacts Study

Year of approval: 1996

BASIS aimed to provide an integrated assessment of global change impacts on cultural and socio-economic systems dependent on renewable and non-renewable resources in the Barents Sea region.

BESIS: Bering Sea Impacts Study

Year of approval: 1994

The objective of this interdisciplinary research project was to assess the nature and magnitude of changes in the Western Arctic/Bering Sea region as a consequence of global change; predict/assess the consequences of these changes on the physical, biological and socio-economic systems in the region; determine the cumulative impacts of these changes to the region, including assessment of past impacts; and investigate possible policy options to mitigate these cumulative impacts.

UVIRC: Effects of Increased Ultraviolet Radiation in the Arctic

Year of approval: 1993

To study the impacts of increased ultraviolet B radiation, due to depletion of the stratospheric ozone over the Arctic. This study included: Monitoring and modeling of UV climatology. Effects of UVB radiation on human health; aquatic ecosystems; terrestrial ecosystems; and social sciences.

MAGICS: Mass balance of Arctic Glaciers and Ice sheets in relation to the Climate and Sea level changes.

Year of approval: 1996

This was the scientific program and implementation plan of the IASC Working Group on Arctic Glaciology. This WG was also very active in creating linkages to related scientific groups (e.g. ICSI) and bringing younger scientists to their annual meetings/workshops.

FATE: Feedbacks and Arctic Terrestrial Ecosystems

Year of approval: 1996

A project of the IASC-GCTE Arctic Working Group. FATE was actively promoting, coordinating and initiating the development of proposals to national and international funding bodies with the aim of carrying out truly international research concerned with the key science questions outlined in the FATE document.

LOIRA: Land-Ocean Interactions in the Russian Arctic

Year of approval: 1995

The LOIRA science plan was modeled around the international LOICZ science plan as well as the European ELOISE, but adapted to science priorities in the study area. The primary objective was to obtain an understanding of the fundamental science concerning physical, chemical, geological and biological processes under the influence of global change and anthropogenic impact in the Russian Arctic in order to develop the scientific and socio-economic basis for integrated management of the coastal environment.

Sustainable Development – Caribou/Reindeer Grazing Systems

Year of approval: 1995

(Title changed later to: Human Role in Reindeer/Caribou Systems, and finally (2005) to CARMA: Circum-Arctic Rangifer Monitoring and Assessment)

The aim of the project is to provide for the comparability of previous, current and newly established research programs that focus on caribou/reindeer grazing systems in Alaska, Canada, Russia, Greenland and the Nordic countries and to facilitate exchange of information, ideas, research results, and scientific projects. It also aims to provide a forum for integrative planning for future research on arc-

tic grazing systems, including the human, economic and social dependencies on them.

SULMAR: Sustainable use of living marine resources in the Arctic

Year of approval: 1996

Study the sustainable practice of selected resources use complexes in the Arctic, with a view to improving our understanding between people, animals and habitat, bearing in mind that environmental change can affect the interactions

Environmental and Social Impact of Industrialization

Year of approval: 1996

An international workshop was held on 'Environmental, Economic and Social Impacts of Large Scale Energy Projects in the Arctic (oil, hydro, nuclear). However, this project idea did not develop into an implemented project.

IBCAO: International Bathymetric Chart of the Arctic Ocean

Year of approval: 1997

The aim of this project is to promote and oversee the development of a coherent database of all available bathymetric observations north of the 64 degree N.

Contaminants and Human Health in the Arctic

Year of approval: 1997

This project aims to study the effects of environmental contaminants on the health of people living in the Arctic with a special emphasis on indigenous peoples.

It is undertaken in cooperation with AMAP (Arctic Monitoring and Assessment Programme) and IUCH (International Union for Circumpolar Health)

Rapid Cultural and Social Change in the Circumpolar North

Year of approval: 1997

The goal of this program was the development of international, comparative, interdisciplinary and co-managed projects on the following themes: Indigenous and local environmental knowledge; Social viability and cultural continuity; Political dynamics, governance and collective rights.

COASP: Cooperative Arctic Seismological Project

Year of approval: 1995

This project involves seismological research, including Arctic seismicity studies. It uses the generalized Beam forming method invented by NORSAR for processing Arctic earthquakes. It also involves the systematic use of other data in cooperation with the International Seismological Data Center.

ADD: International Arctic Environment Data Directory

Year of approval: 1995

This is an ambitious project engaged in establishing an authoritative and user-friendly directory of environmental data sources covering the Arctic region with several partners. However, after several meetings and tests, IASC decided to withdraw from this project because of its limited outcomes.

Tundra-Taiga Initiative

Year of approval: 2000

The objectives of this project are to understand past and present change in the tundra/taiga boundary and to predict future changes at a range of geographical scales.

It also aims to assess the implications of current and predicted future changes for land use; biodiversity and conservation; ecosystem function and feedbacks to climate and to formalize the output in a GIS framework.

Problems of Indigenous Peoples in the Russian Arctic

Year of approval: 1999

This project aims to cover three topics: Land tenure and use of natural resources; Living conditions and quality of life; Abuse of alcohol, with several sub-projects.

ACD: Arctic Coastal Dynamics

Year of approval: 2000

The overall objective of ACD is to improve our understanding of Circum-Arctic Coastal Dynamics as a function of environmental forcing, coastal geology and cryology and morphodynamic behavior.

MAST: Marine Arctic Sediment Thickness

Year of approval: 2000

This project focuses on the recovery, preservation, and rationalization of seismic and potential field observations, to construct a digital data base and maps that describe the nature and distribution of sedimentary material underlying the deep ocean basin and the continental shelves of the Arctic Ocean.

ACIA: Arctic Climate Impact Assessment

Year of approval: 2000

This assessment is expected to lead to the development of fundamental and useful information for the nations of the Arctic region, their economy, and peoples. It was implemented in partnership with the Arctic Council represented by their AMAP and CAFF working groups.

Arctic Hydrology

Year of approval: 2002

This project involves the synthesis of water balance data from northern experimental watersheds.

CEON – The Terrestrial Circum-arctic Environmental Observatories Network

Year of approval: 2002

This project focuses on promoting environmental observations in the Arctic and dissemination of these to Arctic researchers whilst encompassing and building on the strengths of existing observatory platforms and networks active in the Arctic.

Marine Transportation and Changing Access in the Arctic Ocean

Year of approval: 2003

This project involves a comprehensive assessment of recent (and future) Arctic sea ice changes, and a focused analysis on how these changes may impact marine transport routes in the Arctic Ocean and the Baltic Sea.

CAT-B: The Circum-Arctic Terrestrial Biodiversity Initiative – Causes and consequences of changing biodiversity in Arctic and Alpine Terrestrial Ecosystems

Year of approval: 2003

The broad goal of this program is to quantify and understand the role of biodiversity in Arctic and alpine ecosystems, and to evaluate both actual and potential threats to biodiversity.

NUHIP: Nutrition and Health of the Northern Indigenous Peoples – the interactions with ethnicity, social status and environment

Year of approval: 2001/03

This is a multidisciplinary study of the interaction of environmental factors, socio-economic status and nutrition among the indigenous peoples in the circumpolar countries and on assessment of these impacts on the survival of ethnical groups, their style of life and health.

ACBio – Arctic Coastal Biodiversity

Year of approval: 2005

This is an integrated multi-scale, multi-theme assessment of Arctic coastal biodiversity as a logical, cost-effective, and essential research framework with the goal to facilitate coastal management and planning using an approach based on the integration of the physical, biological and social sciences.

IASC Networks

Addressing a main recommendation of the 2006/2007 Review and Strategy Group, IASC Council decided that ongoing IASC Projects would be finalized in 2007, but given the opportunity to re-apply as IASC Networks. Networks are IASC-endorsed, thematic groups with a specific scientific mission enhanced by affiliation with IASC. IASC networks are international, address specific scientific issues on a circum-arctic scale and strive to involve early career scientists.

Network on Arctic Glaciology (NAG)

Year of approval: 2007

The NAG, formed out of the MAGICS Project (see above), aims to address rapid change in arctic ice masses by initiating scientific programs and facilitating international cooperation between glaciologists and climate modelers in order to develop an understanding of arctic land ice and its role in global climatic and environmental change.

Polar Archaeology Network (PAN)

Year of approval: 2010

The PAN, encompassing Arctic, Subarctic, and Subantarctic archaeology, is a forum to meet the need for addressing scientific issues, research policies, education, public outreach, cultural heritage and other questions relating to archaeology and early history of the Arctic and Antarctic.

Arctic Coastal Dynamics (ACD)

Year of approval: 2007

The ACD Network is the continuation of the former ACD Project (see above).

Circum-Arctic Lithosphere Evolution (CALE)

Year of approval: 2010

CALE is a multinational and multi-disciplinary research program investigating the most important questions currently associated with understanding circum-Arctic lithosphere evolution.

Arctic Climate System Network (ACSNet)

Year of approval: 2011

The ACSNet aims, through the coordination and networking of existing or emerging fieldwork, to implement an intensive cross-disciplinary study of the role of the polar seas in climate.

Palaeo-Arctic Spatial and Temporal Gateways (PAST Gateways)

Year of approval: 2012 (2007 for APEX)

The scientific goal of PAST Gateways is to understand Arctic environmental change during the period preceding instrumental records and across decadal to millennial timescales. It builds on the former IASC Network Arctic Palaeoclimate and its Extremes (APEX).

Arctic in Rapid Transitions (ART)

Year of approval: 2013

ART is an initiative developed by early career scientists as a continuation of the ICARP II Marine Roundtable, an initiative of the AOSB, now the Marine Working Group of the IASC. ART aims at studying the impact of environmental changes on the Arctic marine ecosystem, focussing on bridging across time-scales, by incorporating paleo-studies with modern observations and modeling.

Arctic Freshwater Synthesis (AFS)

Year of approval: 2013

AFS is conducting a scientific synthesis that focuses on the various Arctic freshwater sources, fluxes, storage and effects. The range of sources and fluxes to be assessed include: atmospheric vapour transport, precipitation-evaporation, river flow, ablation of glaciers and ice caps, sea ice formation/ablation and marine (low-salinity water) exchanges.

International Study of Arctic Change (ISAC)

Year of approval: 2013

ISAC is an arctic environmental change program initiated by IASC and AOSB in 2003. ISAC's vision is one of timely, relevant, and accessible scientific information for responding to rapid arctic change. ISAC is an open ended, international, interdisciplinary arctic environmental change program. To succeed, ISAC requires observation and tracking of arctic changes, understanding their nature and causes, and the feedbacks and connections among them. ISAC encompasses pan-Arctic, system-scale, multidisciplinary observations, synthesis and modeling to provide an integrated understanding of arctic change and projections of future change. The ISAC Science Plan provides a vision for integrating research among diverse fields and varied users and stakeholders. ISAC is motivated by environmental changes that are already large enough to affect life in the Arctic. Future system states are uncertain and the lack of predictability hinders efforts to develop strategies for adapting to and managing a changing Arctic.

IASC Action Groups

IASC Action Groups (AGs) provide strategic advice to the Council and Working Groups on both long-term activities and urgent needs. They are dynamic groups that act within a limited timeframe of two years.

Joint IASC/SCAR Bipolar Action Group (BipAG and BipAG II)

Years: 2008-2012

BipAG was initiated by SCAR and IASC to explore options for effective cooperation concerning bipolar issues and the development of mechanisms to nurture the International Polar Year legacy. The two-year mandate for BipAG was prolonged in 2010 and BipAG II concentrated first and foremost on bipolar scientific opportunities for ooperation.

IASC Data Policy Group

Years: 2012-2013

To reinforce IASC's commitment to robust data management and sharing activities, IASC Council decided to form a small advisory group of external experts and interested Council members to develop and recommend a data policy, including steps toward implementation of the policy, that provide guidance for IASC supported activities.

IASC Action Group on Geosciences

Years: 2012-2013

Two years after the formation of the five IASC Working Groups, it became apparent that geological research is underrepresented in the current WG structure. To address this issue, IASC Council agreed to form AGG with the terms of reference to provide strategic advice to IASC Council and WGs on both long-term opportunities and priorities in the field of Geoscience research in a broader sense. Since geosciences embrace a wide variety of scientific disciplines, emphasis is given to the overarching aspects of research.

Scope of the IASC Working Groups

The core elements of IASC are its Working Groups (WGs). IASC WGs identify and formulate science plans, research priorities, encourage science-led programs, promote future generations of Arctic scientists and act as scientific advisory boards to the Council.

Atmosphere Working Group

The geographic scope of the Atmosphere Working Group shall be the Arctic but will also include the Arctic´s responses to global change processes (arctic amplification) and impacts of arctic changes on the northern hemisphere atmospheric circulation. The scientific scope of the Atmosphere Working Group includes scientific research toward understanding and prediction of arctic change, and considering the fate of perennial sea ice and the global atmospheric consequences of its disappearance. This includes past climate states, investigation of arctic processes across datasets and approaches, and climate model projections. The scope includes local and regional impacts of arctic change.

Cryosphere Working Group

The geographic scope of the Cryosphere Working Group shall be those areas of the Arctic and contiguous areas of the sub-Arctic where one or more element of the cryosphere (including the Greenland ice sheet, mountain glaciers, ice caps, icebergs, sea ice, snow cover and snowfall, permafrost and seasonally frozen ground, and lake or river ice) plays an important role in surface climate interactions and/or the fresh water budget. It will normally include the Arctic Ocean and surrounding seas (including the Baltic), Alaska, Canada's northern Territories, Greenland, Iceland, Svalbard and the Russian Arctic archipelagos, and parts of Canada, Scandinavia, and northern Russia that lie polewards of the southern limit of discontinuous permafrost. The scientific scope of the Cryosphere Working Group shall include any scientific or engineering research relating to the arctic and sub-arctic cryosphere, including its interactions (past, present and future) with the climate, oceans, and biosphere. It shall also include the promotion of sound practices for the management of scientific data relating to the arctic cryosphere and its interactions with other components of the arctic system.

Marine Working Group (former Arctic Ocean Sciences Board)

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

Terrestrial Working Group

The scientific scope of the Terrestrial Working Group shall include any scientific research on arctic terrestrial and freshwater environments, landscapes and biota, and their responses to, and interactions with, other components of the Earth system. The remit encompasses the dynamics of the arctic system; past, present and future. Geographically, the main area of interest encompasses lands and freshwater within the area north of the latitudinal treeline with arctic climate and arctic vegetation. Several adjacent areas are included where highly relevant for certain disciplines and projects (a) boreal oceanic tundra (e.g., the Aleutian Islands, North Atlantic islands), (b) alpine tundra that is continuous with the arctic tundra (e.g., the central highlands of Iceland, the Scandes Mountains, the Polar Urals), (c) the forest tundra, and (d) drainage basins to the south that connect with freshwater and marine areas of the Arctic.

Social and Human Sciences Working Group

The geographic scope of the Social und Human Sciences Working Group shall be the Arctic as defined in the map accompanying the Arctic Human Development Report (AHDR). The geographic scope can be extended south where it is appropriate for an understanding of arctic social and human processes. The scientific scope shall include all aspects of social sciences and humanities research in the Arctic, as well as their connections with other IASC Working Groups. The actual work of the Social & Human Sciences WG will be determined by a dynamic list of scientific focus areas.

Appendix 6.5 List of Acronyms Used in the Text

Acronym	Full Name
AARI	Arctic and Antarctic Research Institute
AC	Arctic Council
ACIA	Arctic Climate Impact Assessment
ACSYS	Arctic Climate System Study
ADD	Arctic Environment Data Directory
AEPS	Arctic Environmental Protection Strategy
AGCPO	Arctic Global Change Program Office
AHDR	Arctic Human Development Report
ALIAS	Arctic Logistics Information and Support
AMAP	Arctic Monitoring and Assessment Programme
AOS	Arctic Observing Summit
AOSB	Arctic Ocean Sciences Board
APARD	Arctic Paleo-River Discharge
APECS	Association of Polar Early Career Scientists
ARICE	Arctic Research Icebreaker Consortium for Europe
ARR	Arctic Resilience Report
ART	Arctic in Rapid Transitions
ASOF	Arctic-Subarctic Ocean Fluxes (program)
ASSW	Arctic Science Summit Week
ATCM	Antarctic Treaty Consultative Meeting
AWI	Alfred Wegener Institute
BASIS	Barents Sea Impact Study
BCE	Before the Common/Current/ Christian Era
BESIS	Bering Sea Impact Assessment
BipAG	Bipolar Action Group (of IASC and SCAR)
CAFF	Conservation of Arctic Flora and Fauna
CAI	Comité Arctique International
CASES	Canadian Arctic Shelf Exchange Study
CDIS	Committee on Data and Information Services (SAON)
CE	Common/Current/Christian Era
CEON	Circumarctic Environmental Observatories Network
CHARLIE	Committee for High Arctic Research, Liaison, and Information Exchange
CHARS	Canadian High Arctic Research Station
CliC	Climate and Crysophere (program)
CirchNet	Circumpolar Health Research Network
COMMAC	Coordination of Observations and Monitoring in the Arctic for Assessment and Research
COMNAP	Council of Managers of National Antarctic Programs
CON	Committee on Observations and Networks (SAON)
DBO	Distributed Biological Observatory
EC	European Commission
ECOPS	European Committee on Ocean and Polar Sciences
EEZ	European Economic Zone
ELOISE	European Land-Ocean Interaction Studies
EPB	European Polar Board
ESF	European Science Foundation
ESSP	Earth System Science Partnership
EU	European Union
EXCOM	Executive Committee (of SCAR)
FAR	First Assessment Report
FARO	Forum of Arctic Research Operators
FATE	Feedbacks from Arctic Terrestrial Ecosystems
FRG	Federal Republic of Germany

Acronym	Full Name
GKNT	[Soviet State Committee on Science and Technology]
GOSCOMSEVER	[State Committee for Social and Economic Development of the North]
IACS	International Association of Cryospheric Sciences
iAOOS	Integrated Arctic Ocean Observing System
IAPP	International Arctic Polynya Program
IASC	International Arctic Science Committee
IASSA	International Arctic Social Sciences Association
IBCAO	International Bathymetric Chart of the Arctic Ocean
ICARP	International Conference on Arctic Research Planning
ICES	International Council for the Exploration of the Seas
ICG	International Coordination Group (of ASSW)
ICSU	International Council for Science
IG	Initiating Group (SAON)
IGBP	International Geosphere-Biosphere Program
IGY	International Geophysical Year
IHDP	International Human Development Program
IMO	International Meteorological Organization
INTERACT	International Network for Terrestrial Research and Monitoring in the Arctic
IOC	Intergovernmental Oceanographic Commission
IPA	International Permafrost Association
IPCC	Intergovernmental Panel on Climate Change
IPPI	International Polar Partnership Initiative
IPY	International Polar Year
IRISEN	Integrated Regional Impact Studies in the European North
ISAC	International Study of Arctic Change
ISIRA	International Science Initiative in the Russian Arctic
ISMASS	Ice Sheet Mass Balance and Sea Level (group)
IT	Information Technology
ITEX	International Tundra Experiment
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Science
LOIRA	Land-Ocean Interactions in the Russian Arctic
LOICZ	Land-Ocean Interactions in the Coastal Zone
MIZEX	Marginal Ice Zone Experiment
NAD	Nansen Arctic Drilling Project
NEW	Northeast Water Polynya (project)
NGO	Non-Governmental Organization
NOAA	National Oceanic and Atmospheric Administration (USA)
NOW	North Water Polynya (project)
NPI	Norwegian Polar Institute
NRG	New Research Generation (initiative)
NSF	National Science Foundation (USA)
NSN	Northern Sciences Network
NUHIP	Nutrition and Health of Northern Indigenous Peoples
NySMAC	Ny-Ålesund Science Managers Committee

Acronym	*Full Name*
OPP	Office of Polar Programs (of US NSF)
PACE	Polynyas in a Changing Arctic Environment
PAG	Pacific Arctic Group
PAN	Polar Archaeology Network
PCSP	Polar Continental Shelf Program (Canada)
PI	Principal Investigator
PP	Permanent Participant (of the Arctic Council)
RAS	Russian Academy of Science
RRT	Roots, Rogne, and Taagholt (report)
SAO	Senior Arctic Official
SAON	Sustaining Arctic Observing Network
SBE	Shelf Basin Exchange (working Group)
SCANNET	[Scandinavian Network of field research groups]
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SEARCH	Study of Environmental Arctic Change
SIRRO	Siberian River Run-Off (project)
SOOS	Southern Ocean Observing System
SWIPA	Snow, Water, Ice, and Permafrost in the Arctic
UARCTIC	University of the Arctic
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
USSR	Union of Soviet Socialist Republics
WG	Working Group (of IASC)
WCRP	World Climate Research Program
WMO	World Meteorological Organization
WWFN	World Wildlife Fund for Nature
WWW	World Wide Web

Photo: Adam Nawrot
Svalbard reindeers in Wedel Jarlsberg Land , South West Spitsbergen.

Supporting Documents

Supporting Documents

Available at
http://iasc25.iasc.info/

01	*IASC Handbook*
02	*Selected Historical Documents*
03	*Council Reports (1990-2014)*
04	*IASC Reviews*
05	*Brochure: IASC History at a Glance*
06	*Interviews (a 15-20 minute film)*

The „Akademik Fedorov" in an ice opening, taken during the 2014 IARC NABOS and Summer School collaborative expedition.

Photo: Ioana Colfescu

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