Vetenskapsrådet

Polar Shifts

Sweden and the International Polar Year 2007–2008

Photo: Peter Rosén/Scanpix

The International Polar Year 2007–2008 has been a great success. Scientists from across the globe have come together to perform work that is of great importance to our common future. The polar regions are crucial to the entire planet. But obviously they are even more important to the people who inhabit them.

I'm glad that Sweden has been an active par ticipant in the International Polar Year, and that Swedish scientists have been working on research projects within all the scientific disciplines, from social sciences and the humanities to medicine and natural sciences. Along with 63 other countries our scientists have contributed to increasing the knowledge of the and thereby our entire planet.

I'm proud of the long-standing Swedish tradition of polar research. Early research and continuous data collection is now the foundation of many international research achievements. During the Polar Year I've been able to visit some of the places I've heard my father speak of on so many occasions, places of historical research. In the summer of 2008 I visited northern Lapland and the research stations in Abisko and Tarfala. During the Polar Year, the activity there has been more intensive then ever before. I was shown research projects ranging from glaciology to studies of birds and measurements of how plants are impacted by the climate change. I was also able to get an insight into the rich history of science in Lapland, dating back to the days of Carl Linnaeus.

The research stations are the home and hearth of research. They have accommodated generation after generation of researchers who have been able to build upon and expand their predecessors' work. The stations have also been where researchers have laid the foundations for radical breakthroughs in knowledge, something that happens infrequently but when it does, it opens up completely new perspectives for our world.

The Polar Year has demonstrated that polar research connects Sweden and Lapland with the part of the Arctic that lies further north – and also with the Antarctic, where many Swedish scientists have been working during the Polar Year.

Collaboration between the Sami population and researchers has been deeper during the Polar Year than previously. The unique knowledge of the local population has been utilized and research has to a greater extent taken place in communities where people live and work, in cooperation with the Sami communities and other local residents. In addition, the research has had a stated goal of reaching out to those citizens who are directly affected by the results. This is important in ensuring not only that the polar research is relevant to society but also in garnering trust among the citizens.

I've been excited to see so many young researchers participating in The Polar Year – this bodes well for future polar research! I would like to express my gratitude for the work of the Swedish Committee for the International Polar Year 2007–2008 in making the Swedish participation a success and raising the awareness of the Polar Year and the sensitive developments in the Arctic and Antarctic.

HRH Crown Princess Victoria, Patron of the Swedish Polar Year

Author Sverker Sörlin. **Editors and Project Managers** Anders Clarhäll and Hanna Zetterberg Struwe, Swedish Research Council

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Sverker Sörlin, chairman of the Swedish IPY committee, photographed at the Abisko research station during the visit of HRH Crown Princess Victoria in August 2008. Photo: Eva Barkeman

About Polar Shifts

Polar Shifts is published by Swedish Committee for the International Polar Year 2007–2008, the IPY committee. The aim is to inform all interested parties – the wider public, politicians, Arctic residents, financiers and researchers – about the Polar Year, with an emphasis on the Swedish efforts.

Author of the text and responsible for its contents is the committee's chairman, Sverker Sörlin, working under the mandate of the committee.

We would like to thank all contributors and extend a special thank you to Håkan Jorikson, Martin Jakobsson and Per Holmlund for assistance with procuring some of the photos used in this publication.

This is a translation of the Swedish original report, published in March 2009. The translated version does not include interviews with key Swedish scientists, scholars, Sami, politicians, and others which were included in the original.

The Polar Year – three images

Glacier foot in front Valley, Antarctica. Photo: Anna Krusic

March 2007 It looks like a jacket by Issey Miyake: brittle, transparent, the color of urine, or perhaps a NASA survival suit. In fact it's a parka made from seal gut. It is lighter than a fishing lure and designed to keep the hunter's clothes dry while he is seated in his kayak. The Inuit women scraped and cleaned the guts, inflated them, hung the inflated gut balloons out to dry, cut them into strips and sew the strips together.

The parka hangs in the Hood Museum at Dartmouth College in New Hampshire, USA. It's late winter 2007 and the International Polar Year has just begun. The name of the exhibition is Thin Ice. As the ice gets thinner, the foundation of the traditional livelihoods of the hunters and fishermen gets steadily narrower.

The climate speaks to us through the artfully crafted objects. One of the hind flippers from a seal, carefully attached to a wooden handle, enables the hunter, hidden under a sealskin, to pull himself along the ice and approach his prey. As long as there is ice. The miniature models of crewed kayaks that the Inuit found they could sell to tourists are poignant. They have now become an icon of a way of life that is at risk of being washed out to sea by the changes the rest of us are unintentionally causing. The tragedy of the climate dilemma is made plain and tangible.

November 1957 People crane their necks to look up. Something new is passing across the starry sky. High up there is a dog by the name of Laika. She dies after only a few hours in the small Sputnik 2 craft, from stress and overheating, but the people watching on the ground are unaware of this. For several days they believe her to be alive inside her capsule. Laika was one of the participators in the

Kayaks waiting for the next trip to sea, Ilulissat, Greenland. Photo: Malin Avenius

International Geophysical Year 1957–1958, IGY, the third Polar Year. In April 2008, during the fourth Polar Year, a monument to Laika was erected at a military research institute in Moscow in the form of a dog atop a rocket.

While Laika is traveling through space, scientist Charles D. Keeling is preparing his measurements of carbon dioxide levels in the atmosphere. Keeling is working in Antarctica and on Hawaii within the framework of the International Geophysical Year, IGY. He settles on the mountain Mauna Loa on Hawaii as the site for continuous measurements. The instrument is a part of the IGY. The resulting graph has become an icon. It demonstrates incontrovertibly that the CO_2 levels are increasing and that human use of fossil fuels is the reason.

On December 10th 2007, during the fourth Polar Year, the UN's International Panel on Climate Change, IPCC received the Alfred Nobel Peace Prize. One of the recipients is Bert Bolin, chairman of the first climate panel. Bolin was secretary of the Swedish National Commission for the Geophysical Year and was working with Keeling already in 1958 when the CO_2 measurements were established.

March 1883 It is night. Salomon August Andrée experiences a remarkable phenomenon. He is at Cape Thordsen on Svalbard, taking part in the first International Polar Year 1882–1883 as assistant head of the research station with responsibility for measurements of atmospheric electricity. What makes this night remarkable is not the cold, the most common thing of all in this place, and neither is it the windless weather. What makes it remarkable is the silence and stillness. There is no aurora borealis, which is usually seen every cloudless night at this latitude. There is no roar from the ice in the fjord below. Everything is frozen. There is not even the faintest of signals from the instruments.

Life itself is absent. There is no beating of wings, no paws in the snow. There is only ice, snow and an endless stillness. Andrée is sensing the white darkness of death. "I was in a state of mind almost akin to horror… I thought of what I would do if I were standing here alone now, bereft of everything, and I could only see one way out – the sea." He didn't know at the time that fourteen years later, in October of 1897 he would face the same situation again on White Island after a march across the ice – but that time it would be for real. He would have his gun in his hand. The sea would again stretch out before him with the same, mute question.

This March night he had rehearsed bidding his life farewell, the flight from the loneliness and the living cold that is worse than death. That existential moment is now available to us. Andréemuseet in Gränna published Andrée's journal from the first International Polar Year 1882–1883 in 2008, during the fourth Polar Year.

Members of the expedition at the research station, Cape Thordsen, 1883. Identified and standing from left to right: H Stjernspetz, S A Andrée, E Solander, V Carlheim-Gyllenskiöld, E Ekholm and the hunter O Kulseth. Sitting to the left: R Gyllencreutz. Image source and copyright: Polarcenter, Grenna Museum

Searching for the unknown

Images from the Polar Years – what do they tell us? First and foremost, the search for knowledge is a search for the unknown. Research leads us to places we were unaware that we could reach; to worlds and insights we didn't think existed.

At the same time they tell us that the search for knowledge has a connection through time and

space. Polar Years do not only take place at the poles, but also in the tropics, in space, in museums and in the media all around us.

The images are gathered from three centuries. But they all revolve around the basic conditions of life: cold and warmth. They all tell the same story: if we do not maintain a balance we do not fare well. This is an insight that can be applied to all scales of life, from the atmosphere to the hunter's body in the kayak to the individual person's soul. And yes, to the hanging tongue and beating heart of the dog.

They also speak to how important the Polar Years are, how they have touched upon the deepest life issues for the planet and humanity and that they continue to do so.

Another Polar Year

The fourth International Polar Year 2007–2008 has just concluded. Yet again the world has come together to check the temperature of the planet and examine the state of the balance between heat and cold. This time with a clearer insight than ever before that this balance is also important to cultures and societies. The official end date was March 10th 2009, but many projects and activities will continue. Follow-up conferences are planned for 2010 and 2012. And the legacy will live on long after that. Experience tells us that a Polar Year never really ends.

The IPY 2007–2008 had over 60 participating countries and engaged more than 50,000 scientists and other staff. It is estimated to have had a turnover of $1.2 billion, of which at least one third comprised additional funding on top of to regular activities. It has been called the largest-ever international research enterprise. When the IPY Joint Committee invited suggestions for research projects from scientists around the world it received over 1,000 proposals. Following a review and selection process, about 250 of these were granted official status as IPY projects with permission to use the name and logo of the IPY.

About 170 of these projects have eventually been carried out after the customary competition for funding. Almost all of the projects have participators from several countries – sometimes from as many as 15 different nations – and the majority span several scientific disciplines. In addition to this there is all the work performed within the framework of national research institutes, universities, museums and long-standing international programs of research and monitoring.

Why is the Polar Year arranged?

The answer is not entirely obvious. Tradition holds a certain sway – previous Polar Years were organized in intervals of 50 (or 25) years: 1882–1883, 1932–1933 and 1957–1958. The international community of polar research was a driving force. Large projects bring opportunities, not only for hard work but also for access to extraordinary resources.

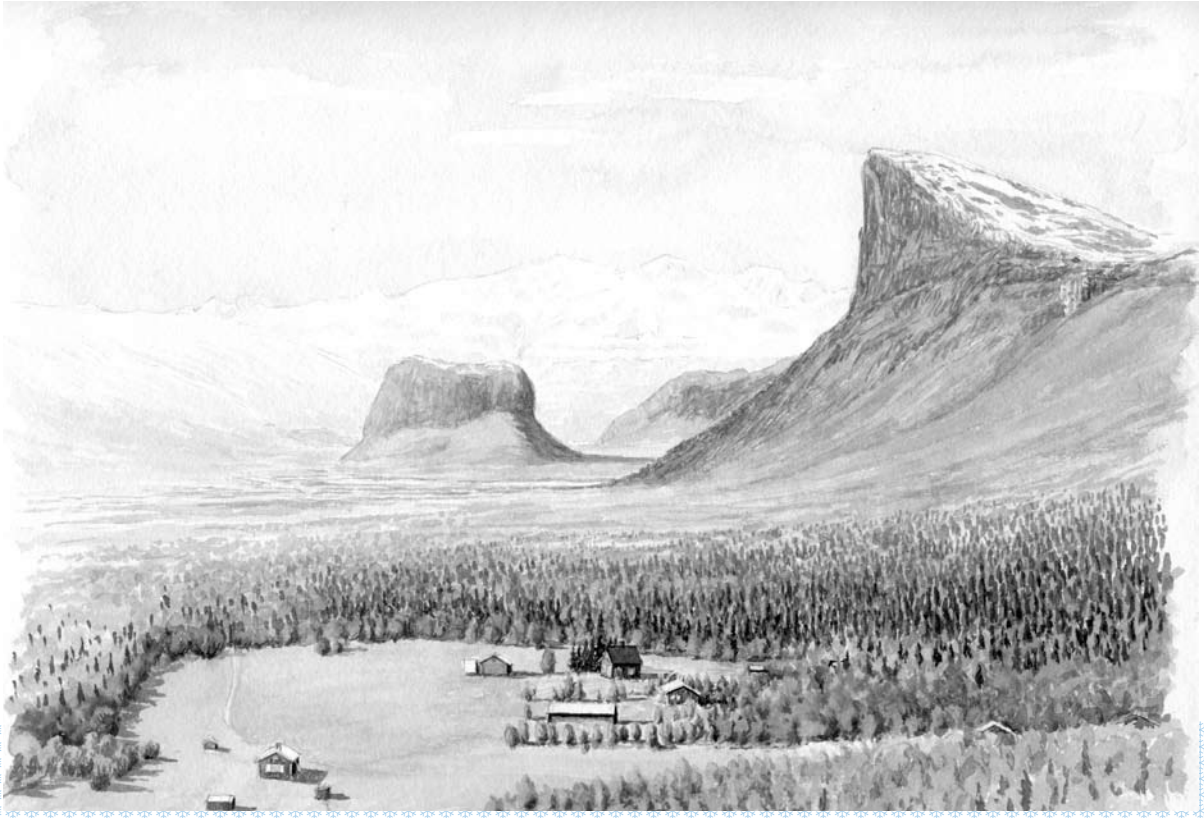
Another important factor has been the growing interest in climate change and the need for deeper knowledge about the polar regions, as their function as heat sinks are generally assumed to have a major influence on the climate of the entire planet. Greenhouse gases are released as the

IPY Joint Committee gathered fro a meeting in Longyearbyn, Svalbard. Back row: Gisbert Glaser (ICSU representative), Colin Summerhayes, Keith Alverson, Cunde Xiao (replacing regular member Prof Qin Dahe Middle row: Igor Krupnik, Cynan Ellis-Evans, Odd Rogne, Grete Hovelsrud, Jan Huber, Volker Rachold, Eberhard Fahrbach, Front row: Edith Fanta, Chris Rapley, Michel Beland, Ian Allison, Eduard Sarukhanian, Vladimir Kotlyakov, Jeronimo Lopez-Martinez, Kjell Danell. Photo: David Carlson

tundra thaws, the albedo (reflection of sunlight) decreases as areas covered by ice and snow shrink and ocean currents shift. For several years there have been convincing reports on climate change in the Arctic as happening especially fast, with a visible impact on local communities in the north and, indirectly, on other regions of the world.

The interest in arranging a fourth Polar Year was channeled through the two organizations that have also in the past been active in the polar regions, the UN World Meteorological Organization (WMO) and the International Council for Science (ICSU). In June 2003 an IPY Planning Group was formed. This group issued a report in November 2004, *A Framework for the International Polar Year 2007– 2008.* The report laid the foundations for continued work and provides the overall vision and guidance for the entire Polar Year. IPY committees were organized in various countries, to function as points of contact for national authorities, funders of research and organizations. Sweden also established an IPY committee. More than 100 Swedish scientists have participated in IPY-endorsed projects.

During the preparations for the Polar Year the interest in Arctic issues grew substantially. In 2004 the *Arctic Climate Impact Assessment Report* was published. This comprised a thorough investigation of the effects of the current and expected climate change. The same year saw the publication of a report about the developments in society and culture, the *Arctic Human Development Report.* Both of these reports highlighted serious and wide-ranging changes in the Arctic. At the same time there was a growing concern about the global energy situation. The price of oil was rising



The Arctic village Aktse by the Rapaälven delta in Lake Laitaure. Watercolor by Mats Gärling

and the Arctic oil and gas resources came into a sharper focus.

A lot of momentum was also gained from the global interest in climate issues. Al Gore's film, *An Inconvenient Truth* (2006) and the media attention it attracted increased focus on the polar regions, the ice, the snow and the polar bear. In the fall of 2006, the Stern Report was the definitive breakthrough for the climate as a highly prioritized, global political issue. Additional confirmation of the seriousness of climate change came in February 2007 when the UN panel on climate, the IPCC, released its fourth report. This was played out against the backdrop of the longstanding efforts of nations with Arctic coastlines to extend their territorial boundaries under the authority of the Law of the Sea Convention, UNCLOS. This reached a symbolic peak in the summer of 2007 with Russia placing a flag on the seabed at the North Pole. As the ice cover shrinks, exploitation of resources and new sea transport routes appear more and more viable, increasing interest further.

The Polar Year has itself become a participant and stimulated increased attention on the polar regions. For the Arctic nations and other nations with strong interests in the Arctic, the geopolitical situation has been a cause for engagement in addition to the purely scientific motives. There are of course those who believe that the nations with the largest investments in the Polar Year, relatively speaking, are the ones with the strongest interests in the region. In Antarctica national interests are less clear.

The possibilities of increased exploitation of resources are seen in a negative or positive light depending on whom you ask. Unsurprisingly there is no lack of enthusiasts in the oil, energy, mining and industrial sectors. But many representatives of cities and communities in the Arctic region have also expressed a strong interest and optimism in growing prosperity. Among the voices that are often, but not always, critical can be found representatives of indigenous populations, traditional livelihoods and environmental activists.

Sweden, polar research and the Polar Years

Sweden has a long tradition and a good reputation in the field of polar research. Carl Linnaeus traveled around Lapland in 1732 and one of his students, Anton Rolandsson Martin, briefly visited Spitsbergen as early as 1758. An intense period of Swedish research in the Arctic took place between 1850 and 1910 with leading scientists like Adolf Erik Nordenskiöld, Alfred Nathorst, and Gerard De Geer. There was also Swedish commercial activity in Svalbard, chiefly in the form of coal mining at Sveagruvan, but this quickly faded during the 1920s.

A second period of intense Swedish research started after 1930 under the leadership of the geographer Hans W:son Ahlmann, who also initiated Swedish and international research cooperation in Antarctica towards the end of the 1940s. Ahlmann modernized and professionalized polar research and worked to tone down the elements of nationalism and heroism that had previously been associated with it. His model of polar research and international cooperation had a significant influence in other countries too, especially in the UK and Norway.

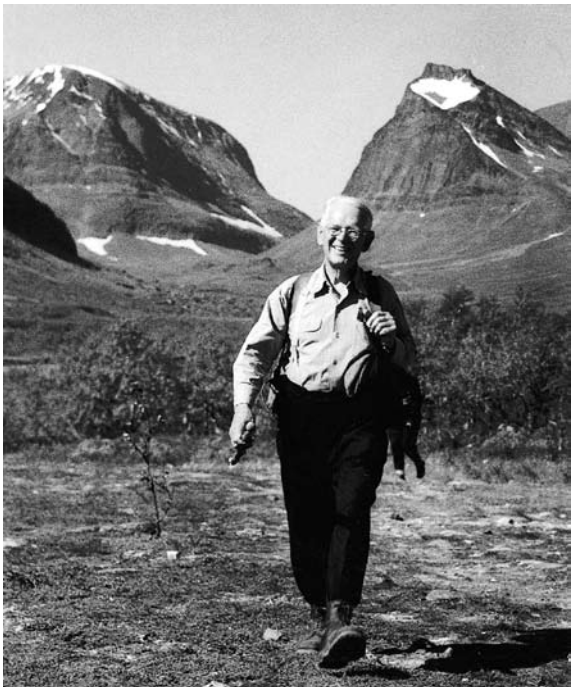
During the 1960s and 1970s geographic polar research was performed by Valter Schytt and

Remains from the period of Swedish coal mining on Svalbard. Sveagruvan was mined from 1917 and the activities ceased after a severe fire in the mine in 1925. Photo: Dag Avango

Gunnar Hoppe, amongst others, before a third intensified period of research was initiated with the Ymer expedition in 1980 led by Schytt, and the foundation of the Polar Research Committee at The Royal Swedish Academy of Science. Perhaps the widened research during the Polar Year, both in terms of research subjects and international participation, can be seen as the start of a fourth period, which has integrated polar research deeper into the common search for knowledge about nature and society.

Sweden – a nation of active polar research

Sweden is one of the Arctic countries, one of the eight members of the Arctic Council and, since 1984, one of the signatory nations of the Antarctic Treaty System. Sweden has an indigenous population in the north, the Sami, which connects Sweden with three other Arctic states (Norway, Finland, and Russia). Sweden has also had its share of the political issues that are characteristic for Arctic Countries: sparse population, regional development, the status and rights of ethnic minorities, resource exploitation, a sensitive environment and preservation of local culture.



Hans W:son Ahlmann photographed ca 1960 on a walk through Ladtjovagge to Nikkaluokta. Photographer unknown.

The Polar Years have also had an impact on the development in Sweden. The Swedish space initiative was begun during IGY 1957–1958 with Kiruna Geophysical Observatory 1957, today known as Swedish Institute of Space Physics. The institute became an important part of the Swedish space program and together with The Esrange Space Centre it has become a driving force behind development in the north with a focus on science, technology, innovation and tourism. Today the space industry employs 500 people in Kiruna.

The Polar Years have left a significant legacy that is both encouraging and obliging. During the first Polar Year about a dozen research stations were established all over the Arctic region and many of them are still in use 125 years later. The research stations, and the network of observation locations they provided, were also the first large-scale international coordination of monitoring in the polar regions. Another legacy is the Antarctic Treaty System, which was a direct result of the IGY. The treaty enabled the competition for strategic resources of the cold war and territorial claims in Antarctica to be set aside, creating a continent "by and for science" which has been a tremendous success for the world community. SCAR, the Scientific Committee on Antarctic Research, also saw the light of day during the IGY at an ICSU conference in Stockholm in September, 1957. The Geophysical Year acted as an important platform for the research and monitoring that would establish the issue of global warming.

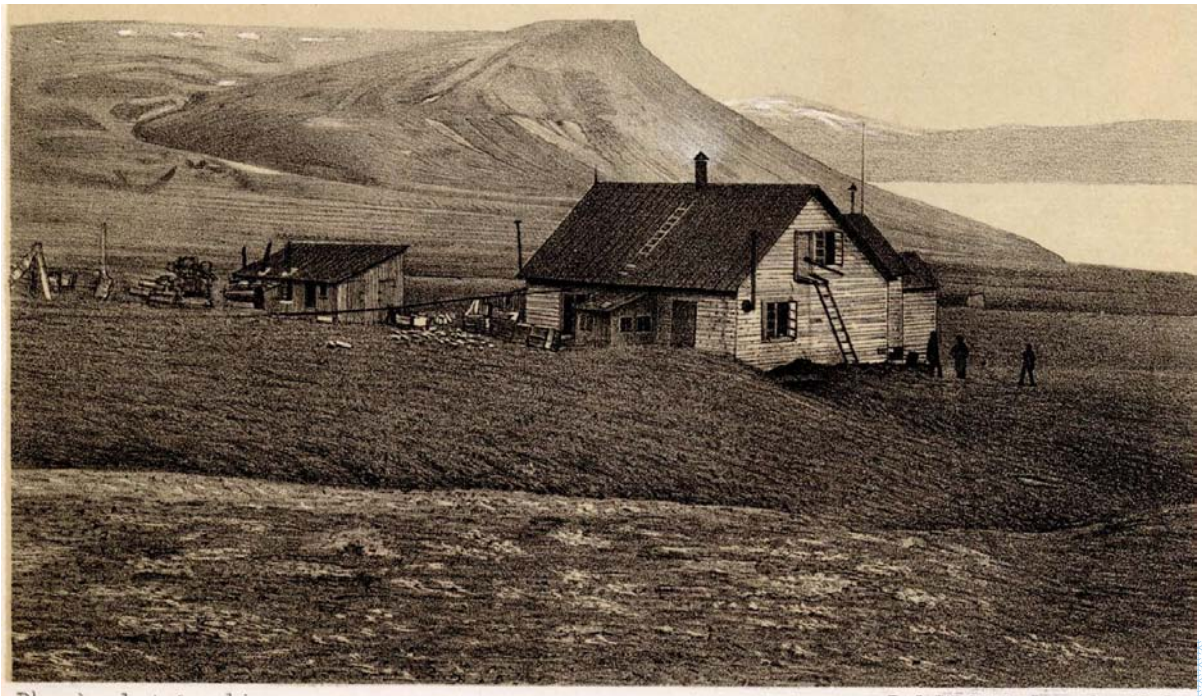
The History of the Polar Years

Gösta H. Liljequist takes notes sitting in a temporary research station dug into the snow at the top of the ice cap Västisen, 550 meters above sea level. Four researchers lived and worked here for two weeks during late winter 1958. While the wind howled outside the members of the expedition claimed to be able to work "comfortably" inside. The temperature stayed at a constant minus 13 degrees Celsius. Photo: Sven-Eric Molander

The man who first came up with the idea of a dedicated Polar Year was Carl Weyprecht, a Lieutenant in the Austrian-Hungarian navy, who in his 30s had already spent a lot of time on the Arctic Ocean and who discovered Franz Josef's Land during the expedition of 1872–1874. To simply compete in the discovery of new land and breaking geographic records was too trivial a task for polar research according to Weyprecht. He also pointed out that single expeditions only provided isolated series of measurements. This was especially true for meteorological observations. What was needed was systematic and synchronous observations in the polar regions and with that aim he advocated international cooperation. A critical task was the establishment of permanent research stations in the Arctic.

Weyprecht presented his ideas at the German meeting of natural scientists in Graz in September 1875. He argued for a network of monitoring stations for meteorological and magnetic measurements around the North Pole for at least a year. His vision was expressed succinctly in the motto "For- schungswarten statt Forschungsfahrten" – research stations instead of research expeditions. Before the plans for a Polar Year beginning in 1881 could be realized Weyprecht died, which contributed to the program being delayed by a year. Some countries, Denmark and Norway among them, quickly assigned the necessary funding. In other countries, including Sweden, there was hesitation. In the end it was the businessman L. O. Smith, also known as "Brännvinskungen" (The King of Spirits) who guaranteed Swedish participation with his own money.

The first International Polar Year comprised twelve research stations in the Arctic and two in the Antarctic. A Swedish expedition that had initially intended to use Nordenskiöld's wintering house from 1872– 1873 in Mosselbukta on northern Svalbard was forced by the ice conditions to land at Cape Thordsen. The location was well



D'après photographie. Lith. W. Schlachter, Stockholm.

Observatoire du Cap Thordsen vu de l'ouest.
AOÛT 1883.

placed for the Swedes, who during the second half of the 19th century and through a few decades into the 20th had a strong presence on Svalbard, both in the form of research and mining.

The first Polar Year pushed the norm towards international scientific cooperation, but in practice things did not quite keep up with this development. Instead the decades around the turn of the 19th century became the golden age of Arctic exploration as a heroic sport, with races for both poles. In addition, the security related and military implications of science had become more obvious and internationalism had been going through a rough time, especially as a result of the wartime patriotism of the First World War.

The second polar year had a much broader scope than the first, with 40 participating nations. The research would lead to great advances within meteorology, magnetism, atmospheric science and the mapping of ionospheric phenomena that underpinned the development of advanced radio technology. A particular task was the study of the importance of the recently discovered jet streams. No fewer than 40 permanent monitoring stations where established in the Arctic. In the Antarctic Admiral Richard Byrd conducted his second expedition and established the continent's first inland station, an all-year monitoring station for observation of the weather.

The hut on Nordenskiöldsfjället, used during the second Polar Year. 1932–33. Photo: Per Holmlund

At the same time the conditions for the second Polar Year were less than ideal. The troubled economic situation had made it difficult for most of the nations to participate as actively as originally planned, making results delayed and incomplete. Efforts by Sweden were limited to a yearlong series of measurements on Nordenskiöldfjället at Longyearbyen on Svalbard and increased activity at some locations in Sweden, such as the Abisko research station. The Swedish contribution during the second Polar Year also included a geomagnetic research station in one of the disused but still Swedish-owned buildings at the Sveagruvan Mine on Svalbard. The station was in use throughout the entire second Polar Year.

During the International Geophysical Year (IGY) 1957–1958, Sweden was all the more active. The Second World War had demonstrated the potential of vast amounts of new technology, from radar and rockets to jet airplanes and atomic energy and now there was a desire to take advantage of these resources, especially in the study of the upper atmosphere. Among other things, the research would lead to the discovery of the Van Allen Belts and the possibility of confirming the controversial theory of continental drift by employing geomagnetic methods. Charles D. Keeling's series of measurements of the levels of carbon dioxide on Mauna Loa and the first ice drillings on Greenland were also results of the IGY.

The IGY was characterized by the cold war between the two superpowers and the research had elements of competition for prestige. The Soviet Union launched its Sputnik spacecraft in 1957, initiating the space race. The USA utilized many of its Western European partners for research of importance to security policy. The motivations for bringing the North and South Poles into the IGY were both scientific and secu-

rity related. The Soviet Union and the USA had, for several years, been building up military capacity in the Arctic with bases and strategic planning for missile warfare. There was a struggle for position in the Antarctic and the impressive number of research stations established during this period should be viewed in light of the geopolitical situation. However, there was still good cross-border cooperation between scientists and, among other things, a clearer picture of the thickness of the Antarctic ice sheet emerged.

The Swedish effort was clearly escalated in comparison to the lackluster second Polar Year. Leading the Swedish National Commission for the Geophysical Year, was the dynamic meteorologist Carl-Gustaf Rossby who had previously had a long career in the USA. He was the discoverer of the jet streams that were so important to the second Polar Year. The two secretaries were Nicolai Herlofson of The KTH Royal Institute of Technology and Bert Bolin of Stockholm University College. With time, and with the death of Rossby in 1957, Bolin became the most influential.

The Swedish Geophysical year is chiefly remembered for the yearlong expedition stationed at Kinnevika in northeastern Svalbard in cooperation with Finland and Norway, under the leadership of the meteorologist Gösta H. Liljequist. However, the Swedish contribution was much more extensive than that. Amongst other things it covered sun observations on the island of Capri; ionospheric research and observations of the aurora borealis; radio star research; construction of instruments for registering cosmic radiation; and photography of the aurora borealis.

In addition there was a major investment in The Kiruna Geophysical Observatory. It was inaugurated on July 2, 1957 on the second day of the Geophysical Year. Among the guests were two of the leading Americans of the IGY, Lloyd Berkner and J. Wallace Joyce. This hints at the importance of the event but also at the important role the Americans played at the institute during the early years. The USA provided some of the most important instruments, contributed more than half the research budget during certain years, and received assistance from the Swedes on important mapping of the movements of Sputnik and the Soviet nuclear tests on Novaja Zemlja and in Semipalatinsk.

The Kinnivika Station in northeastern Svalbard built during the third Polar Year 1957–1958. The flags of Sweden, Switzerland and Finland fly over the station to mark the multilateral cooperation that made the project possible. Photo: Sven-Eric Molander

Preparations for the Polar Year 2007–2008

Photo: Jakob Halaska

The Swedish Committee for the International Polar Year formally commenced its work on January 1, 2006 and was given a mandate stretching all the way through the Polar Year to the summer of 2009. The IPY Committee, as it is usually referred to in conversation, was instituted by The Swedish Research Council, which in 2005 was assigned the task of coordinating the Swedish efforts by the government.

About half of the committee was made up of scientists, chiefly from the natural sciences but including several members from social science and humanities. The second half consisted of representatives from government departments, agencies, museums and the Sami community. The chairman was Sverker Sörlin, professor of environmental history at KTH Royal Institute of Technology. His background includes membership of the Polar Research Committee at the Royal Swedish Academy of Sciences since 1996. The makeup of the committee signaled that the message of the action plan for the Polar Year, *A Framework for the International Polar Year 2007–2008* (published in November 2004) had been heard. The majority of the members represented the natural sciences. But education and outreach as well as the focus on society, culture and local populations under the banners of "Arctic Residents" and "Human Dimension" also had several representatives. This was a new development for a Polar Year.

The committee appointed four working groups: outreach activities, infrastructure/logistics, data management, and culture, society and humanities. During 2007 the working group for logistics was expanded to include scientific research in natural sciences. The committee was supported by a secretariat at the Swedish Research Council consisting of a deputy secretary and a public information officer.

One fundamental difference in the Swedish effort compared to countries such as Norway and Canada was the absence of dedicated funds for research during the Polar Year. It was evident from the start that it would not be meaningful to divide the limited budget of the IPY committee (SEK 10 million) for research. It would be a drop in the ocean. Funding of a completely different magnitude had to be procured from funding agencies, the universities and international partners. The research funding would have to be raised by a traditional bottom-up method, regardless of the difficulties this would entail with regards to logistic planning, early information and other work.

Making the Polar Year visible

Another reason not to divide the research funds was that research councils or other sources of funding could not to a significant extent fund the outreach activities. Any effective information programs would have to be funded through the budget of the IPY Committee itself. The outreach activities have supported the overall aim of increasing interest and awareness around the important issues associated with the polar regions. With this in mind the IPY committee has prioritized visibility. In the same vein, the committee decided early on to ask the heir to the throne, HRH the Crown Princes Victoria, to become a patron of the Polar Year. HRH Victoria participated in several events including the conference on coordinated monitoring in the Arctic held by the IPY committee in November 2007, a trip to Svalbard with Crown Prince Fredrik of Denmark and Crown Prince Håkon of Norway in June 2008 and, in conjunction with the program of coordinated logistics in northern Sweden, Arctic Sweden in the summer of 2008.

One of the major ambitions was to broaden the polar research to include new disciplines and a new generation of scientists. In aid of this representatives of young scientists were invited to the early meetings of the committee.

The organization The Youth Steering Committee for the IPY was reconstituted in 2006 to form a new international organization for young scientists, the Association of Polar Early Career Scientists APECS. The organization has amongst other things held an international meeting in Sigtuna, Sweden. The IPY Committee has supported APECS, and several of the members participate as field assistants, Ph.D. students or postdocs in regular research projects.

In Olympus Range, Antarctica there are remains of an ancient desert landscape formed during millions of years and the product of a climate regime very different from today. Photo: Anders Clarhäll

People, Culture and Society

A man with a bundle of Ptarmigans in Ilulissat harbor, Greenland. Photo: Malin Avenius

Research in social sciences and the humanities was previously rare in the field of polar research but it did exist, chiefly by ethnographers and anthropologists, and to some extent by scientists of religion and linguistics. However they did not have the same tendency to label themselves as "polar researchers" as the natural scientists.

The first Polar Year included some research about the people of the polar regions. The German mathematician and physician Heinrich Abbes, working at the German research station in the Kingua Fjord at the northern end of the Cumberland Sound on Baffin Island, observed the Inuit in the area. His sketches of a kayak were published in the popular geographical magazine *Globus* in 1884. The most well known ethnographer at the German station was otherwise Franz Boas who initiated his famous studies of the Baffin Island inhabitants during the first Polar Year. Boas later became deputy editor-in-chief at the magazine *Science*, emigrated to New York and became famous as the founder of cultural anthropology in America.

In his aurora borealis observatory in Norway, Sophus Tromholt amassed a large collection of anthropological information about different groups of Sami, information that would prove much more important than his research on the aurora borealis. In the same way Lucien Turner's later famous photographs of the Innu and Inuit peoples and the large collection of ethnological specimens that he sent to the Smithsonian Institution in Washington was a sideline to his actual work for the US Army Signal Corps. His ethnographic observations, published in 1894, are considered to be extremely valuable. During the same

Three boys in Barrow, Alaska take a break on their bikes. Photo: Malin Avenius

time John Murdoch was studying the Inupiat, an Inuit group near Point Barrow, Alaska.

During the two following Polar Years this sort of research was practically non-existent, as it was no longer considered as being polar research. This did not improve when the entire subject of geophysics, with satellites, radar and rocket probes, was included during IGY 1957–1958. Historians, archeologists and sociologists were as rare as penguins at the North Pole.

A place for social sciences

In view of this the fact that social and cultural sciences had such a prominent position during the Polar Year 2007–2008 marks a virtual Polar Shift in arctic research. It was not inevitable that this would happen. During the early attempts to bring up the issue of a fourth Polar Year, which originated in several different places, there were few voices heard from these sciences. Although there were some instances of social scientists joining the national committees formed in 2002 and 2003, for instance in Canada and the USA. Likewise, the Arctic populations were largely absent from the early planning stages of the Polar Year. Canada was one of a small number of nations with ambitious talk of culture, indigenous populations and issues of education.

At the same time it was obvious that this was an exception and amongst scientists outside the field of natural science a debate grew up around how best to act to avoid another case of marginalization. Would it be best to create a separate "Social science IPY"? Or would it be more fruitful to try to broaden the program of the Polar Year to give society and culture a recognized position? Would there finally be a challenge to the "Arctic exceptionalism" that legitimized the Arctic becoming a place for natural science research without much attention to society, even though it was home to four million people? The latter model was chosen and it was decided that the way forward was through cooperation across different scientific disciplines. After much effort an area with the title "Human Dimensions" was included in the official program.

Was there really enough research to fill such a program? There were doubters, but it soon became evident that there was no shortage of researchers or ideas. Of the 1,100 or so Expression of Interests submitted to the IPY Joint Committee, about 15% belonged to "Human Dimensions". As the proposals were combined into larger clusters and other proposals fell by the wayside due to lack of funding or quality, the proportion grew. Of the projects that were eventually approved as IPY projects 20% were based on social sciences and humanities.

Sweden – a leader in Human Dimensions

The Swedish Polar Research Committee, later converted to the IPY committee, drafted a plan for the IPY to include "the entire scope of scientific disciplines". The IPY committee, through its working group for culture, society and the humanities, also took special initiatives to spread awareness of IPY and facilitate the mobilization of researchers from the humanities. It also encouraged projects with close ties to local communities in northern Sweden.

In the end there were numerous projects based on culture and social sciences during the Polar Year. Swedish scientists participated in eight approved research projects (of a total of about 30 focused on the humanities) and led three of these. By comparison Swedes participated in about 50 (of ca 120) and led eight of the natural science projects, which obviously reflects the long tradition and strong position of natural science based polar research in Sweden. The countries with

stronger representation in the humanities, like Denmark (9 projects) and Canada (17), were countries with large Arctic populations. In the case of Denmark, there has been a long standing tradition of anthropology and "eskimology" within the framework of the country's old North Atlantic Empire.

Swedish social sciences during the Polar Year

One of the major social science projects is LASHIPA, Large Scale Historical Exploitation of Polar Areas, which brings together researchers from the Netherlands, Norway, Russia, Sweden and the USA. It focuses on the escalating hunt for fossil fuels in the Arctic and the attempts of certain nations to secure exclusive rights to exploitation of the natural resources. These attempts are not new and, within the framework of LASHIPA, industrial archeologists and historians examine how the exploitation of natural resources in the polar regions has changed since the 17th century. The project also includes documentation of areas of exploitation such as Svalbard, South Georgia and South Shetland, where whale, seal, walrus and other large marine mammals were hunted and where remains of the industrial processing facilities can be found. Another aspect of the work is the analysis of the geopolitical and environmental consequences.

Swedish researchers examined the history and anthropology of field research and research stations, especially in the context of the Polar Years, in the project Polar Field Stations and IPY History: Culture, Heritage, Governance: 1882–

The Grumant City coal mine facilities on Svalbard – previously a supplier of raw materials to Murmansk and a Soviet geopolitical marker in the strategically sensitive High Arctic. Today the site is abandoned but it provides a rich source of materials for the historians and archeologists of the LASHIPA project. Photo: Dag Avango

Present, a joint project of seven nations, coordinated by KTH Royal Institute of Technology in Stockholm and Scott Polar Research Institute in Cambridge. Arctic Human Health Initiative is from an international perspective, by far the largest project of the Polar Year, both in terms of staff and resources. The project focuses on research into how the health of the Arctic populations can be improved and has Swedish Sami participation. History of the International Polar Years is a joint project of historians from Germany, Russia and Sweden. Another project, The Arctic 'Other', is a study of the image of the Sami people in scientific literature, chiefly from the 19th century.

In cooperation with Umeå University, the IPY committee held a conference in Umeå with the title Human Dimensions of the Circumpolar North. It attracted some 300 participants from around 30 countries and thus became one of the Polar Year's largest individual research conferences with a focus on the humanities.

Channeler - a machine for quarrying marble - at the abandoned settlement and marble quarry at New London, Kongsfjorden, Svalbard. The facility was operated by the British mining company The Northern Exploration Company in the 1910's and is one of the facilities being studied within the framework of the LASHIPA project. Photo: Dag Avango

Observe, Measure and Collect

Winter view of the Kebnetjokka Plateau Photo: Anders Clarhäll

Until recently the polar regions were inaccessible, making observations from them all the more desirable. Indeed the aim of the first Polar Year was to facilitate reliable observations. At that time the preferred method of collecting data was to use research stations. The difficulties involved in determining exact geographic positions using the available methods during ambulating expeditions at sea or on land, meant that such logistics had a limited value to many branches of science. During the Geophysical Year 1957–1958 the data issues were tied into the international cooperation. International World Data Centers, were established for storing and managing data. This was a big change from the location specific "station books" that had previously been used. It also meant that the latest medium for storing data – computers – could be used.

Since then data management has been revolutionized. The volume of data managed during the Polar Year 2007–2008 was many times higher than the combined volumes of all previous Polar Years and data management was a high priority. There is a Data Committee attached to the IPY Joint Committee. Most of the major polar research countries have their own Data Committees and national data management plans. There is also a data policy that all endorsed IPY projects are obliged to follow. Data management is still a big task, but the work has been simplified in some ways. The databases are no longer tied to specific locations thanks to the possibility of storing data on servers across the world and quickly sending it over the Internet.

This is also about a new perspective on the character of research, where producing data and making it available is akin to publication and worthy of merit. Data sharing is extremely important to the Polar Year, partly to add value to individual projects and partly to promote outreach activities and education. Another necessary requirement is the organization of data in a way that makes it useable. All data is to be available within a year of the end of the Polar Year and it is to be stored and useable after three years.

A new perspective on research data

The Polar Year has contributed to new perspectives on what research data really is. The data policy of the Polar Year establishes that not only

Andrew Mercer from Stockholm University conducts measurements with a survey instrument during Arctic Sweden, the collective name of a coordinated effort of research in northernmost Sweden during the summer of 2008. Photo: Per Holmlund

measurement data should be included, but also photographs showing the change in glaciers over time, anthropological observations, field notes, journals, interviews, correspondence, archive materials, i.e. the type of material that is collected and used by researchers in the field of social science. There is a growing interest among research funders to have data management included in yearly progress reports and in some countries, such as the Netherlands and Australia, reports on data management are becoming a requirement for funding. It's reasonable to assume that this model will spread to more countries.

Data is a "common good" and its value increases with the volume and the sharing of the data. Nonetheless it becomes an extra burden on the individual scientists to store and provide data according to the established standards. This is a classic problem inherent in large, shared projects. Scientists often, and not without reason, have different priorities. On July 8, 1957, during the recently launched IGY, the secretary of the Swedish National Commission for the Geophysical Year, Bert Bolin wrote to Valter Schytt, who was responsible for glaciological studies during the IGY:

> "A detailed set of instructions for distribution of data during the International Geophysical Year has been produced … and it is of course important that the Swedish data that is collected is distributed according to the international agreements." Data collection progressed slowly and in December Bolin wrote: "I hereby forward the request from the General Secretariat that you ensure that collected data is forwarded to the data center as soon as possible."

He also encouraged the Swedish Meteorological and Hydrological Institute to forward meteorological data to the WMO. In many ways the situation is similar even today. Dedicated efforts are required to enable coordinated long-term data management. The issue has been approached in different ways in different countries. In Sweden

Photo: Scanpix Creative

the IPY Committee arranged a IPY Data Repository in collaboration with Swedish Meteorological and Hydrological Institute.

Overview of swedish measurements

Data issues in research are often closely associated with data from monitoring. This concerns data that is often collected over long periods and constitutes invaluable time series. The Swedish IPY Committee's working group for data issues initiated an inventory of Swedish monitoring that, for certain data such as temperature, hours of sunlight and wind speed, has been undertaken for close to a hundred years at the Abisko research station. The study S*wedish Environmental Monitoring North of 60°N* was carried out by Professor Harald Grip and co-author Professor Håkan Olsson. The aim was to provide an overview of Swedish monitoring relating to the natural environment, including the atmosphere, in northern Sweden. The study showed that Sweden complies with the environmental monitoring requirements of the American AON study, *Arctic Observing Networks* (2006) as well as GCOS, Global Climate Observing System, which has been established within the UN framework (WMO, UNESCO, UNEP) and the International Council for Science, ICSU.

Dennis Darby washes a sediment sampler on board the icebreaker Healy during the Beringia/HOTRAX expedition in 2005.
Photo: Martin Jakobsson

Modern monitoring includes local population

There is also a need for developing new types of monitoring, including methods that leverage experience of the local population. This is also taking place through the Polar Year. The awareness of the value of local observers has increased significantly during the Polar Year 2007–2008. The anthropologist Igor Krupnik from the Smithsonian Institution in Washington, DC has, during the Polar Year, studied local ecological knowledge in Alaska and northern Canada. He has been able to demonstrate how older Inuit individuals have been able to spot signs of a warmer climate for decades. The sea ice settles later in the fall. It's wetter and cracks more often. The whirlwind of the dog team has to be replaced with the dragging of boats over open leads and ice walls; an entire culture struggles towards an uncertain future. A comparison of the observations of the Inuit with data from satellites and scientific instruments show a clear corroboration. The only difference is that the Inuit saw the picture clearly much earlier.

The lesson, of course, is that natural scientist should work more closely with the local populations. To some extent this is now happening. The EALÁT, IPY Arctic Reindeer Herders' Vulnerability Network Study, sees Norwegian and Swedish scientists and Sami working together, collecting data on snow, reindeer grazing and vegetation.

Historians are also participating in the collection of data. A German-led project collects data going back all the way to the first twelve research stations from the Polar Year 1882–1883, extending the time series and availability of the data from these locations. But in many areas, mainly within the fields of social statistics, health and cultural history, there is only very limited data collection taking place even under the huge research umbrella of the Polar Year. Environmental data and field data from natural sciences still dominate.

The Arctic Council and coordination of monitoring

The major initiative on international coordination of monitoring during the Polar Year strives to work across all fields. It is called Sustaining Arctic Observing Networks, SAON. It was initiated by the Arctic Council, which in its declaration at the ministerial meeting in Salekhard, Russia in October 2006, instructed its own working group AMAP, Arctic Monitoring and Assessment Program, to lead the efforts to produce a proposal for coordinated long-term data management for the entire Arctic Region during the Polar Year. The aim was to have a plan for international coordination of monitoring, data management and social statistics in place in time for the Council's meeting of foreign ministers in Tromsø in April 2009. AMAP gathered some 50 international organizations, including the International Polar Year, in an Initiating Group which has been pursuing the work since January 2007.

Sweden has played an important part in the SAON process through active consultations, not least with Canada, about the makeup of the organization and the process. The first of three SAON Workshops was held in Stockholm in November 2007, organized by the Swedish IPY Committee and opened by HRH the Crown Princess Victoria. About 120 participants from the entire Arctic community took part in discussions that mainly revolved around two main issues: What monitoring is performed today? What gaps are there? The next workshop was held in April 2008 in Edmonton, Canada and focused on the question: How should monitoring and information systems be organized and maintained in the long term? A third workshop was held in Helsinki in October 2008. This time the main focus was on how to shape a final report of recommendations to the Arctic Council. In addition there were two smaller meetings; in St Petersburg in July with representatives of Russian authorities; and in Incheon, South Korea, with representatives of Japan, South Korea and China, three nations with growing activities, including research, in the Arctic.

There is no doubt that the work on SAON has been well established and thoroughly discussed. This is not the first attempt of the Arctic Council to strengthen the region's information systems, but this time the attempt is far more ambitious. That is not to say that there are no difficulties. Information and data can touch on conditions that have military or security policy implications, something that has become clear as tensions between Russia and the western powers have increased again. The USA has been quick to point out that it already has a national process in place (AON) and to emphasize the importance of moving forwards in small steps without binding obligation, a standard American attitude in these kinds of circumstances. Russia has kept a low profile, but in the end appears to have adopted a positive view of the SAON process and what it might lead to. Another factor that tempers the will to cooperate is obviously the conflicts about resources.

120 people from 18 countries participated in the first IPY workshop on Sustaining Arctic Observing Networks. The Workshop was held at the Nordiska Museet and the Hasselbacken Hotel in Stockholm. Photo: Anders Clarhäll

A continued political process in the Arctic Council

At the time of writing, at the end of the Polar Year, the prospects for SAON look good. The

final report of SAON to the Arctic Council, Observing the Arctic (2009), is a transparent product with several clearly stated recommendations. The first of these is that the Arctic Council should have a leading role in facilitating an international cooperation on all levels to promote a sustainable Pan-Arctic observation system. To realize this, the Arctic Council will, together with other parties, create an Arctic Observing Forum, AOF, with representatives from local populations, authorities and the scientific community.

The governments of the individual member states, Sweden among them, will commit to maintaining or preferably expanding their efforts and to create a data dissemination protocol that sets out how data will be made available at a low cost to a large number of users. In addition the cooperation will be opened up to non-Arctic states and other organizations that already have a presence in the Arctic or want to contribute to the Arctic observation system. First amongst these are obviously the nations that have already requested status as observers on the Arctic Council, such as the UK, Japan, South Korea, China and the EU, which applied for status as an observer on behalf of all the 27 member states in November 2008.

The Arctic Council decision

It is obviously difficult to know how the SAON process will fare in the long run. The experience of history is not always encouraging. Strong economic interests and security policy have often caused the Arctic countries to keep valuable information secret. Since the end of the cold war there has been a gradual thawing of old positions and over the last

Scheuchzer's Cottongrass (Eriophorum scheuchzer) on the shoreline of Lake Luspasjaure, northern Sweden.
Photo: Annika Berntsson

two decades there has been a period of increased cooperation. But since the middle of the 2000s the competition for resources has again made its presence felt. The attempts to expand the economic zones in the Arctic Ocean are entirely nationalistic with each Arctic coastal state promoting its own interests. At the same time the five coastal states– the USA, Canada, Russia, Norway and Denmark – appear conscious of being under the scrutiny of the world and of the fact that they need each other to create legitimacy for a resource exploitation process that large parts of the world look askance upon. At a gathering in May 2008 that attracted a lot of attention and media coverage, Foreign Ministers of the five countries demonstrated this by signing an agreement in Illulissat in Greenland. The agreement aims to demonstrate that the five countries will follow international treaties and laws and act responsibly in relation to the environment and the rest of the world. But above all it signals that the five can manage their own affairs without interference from other parties.

However, there are signs of transparency and cooperation. The steadily strengthening efforts of the EU to play a part in the Arctic signals that a party with potentially large resources may be entering the Arctic observation systems. The USA has also developed a new policy for the Arctic, one of the last acts of President Bush in January 2009. This demonstrates the importance the Americans now assign to the race for resources in the north, but it also contains positive words on the role of the Arctic Council, about research cooperation and the strong need for collaboration on data management and monitoring. Even though the American initiatives are emphasized, it can be interpreted as openness in relation to the SAON process, where many American organizations and individuals have made important contributions.

A decision by the Arctic Council will have repercussions on individual member states' planning and funding for research and monitoring infrastructure. This would include broadening monitoring and statistics to include areas that have partly been underdeveloped (such as society, health, culture) while strengthening, repairing and expanding systems within traditional monitoring areas (weather, climate, environment, oceans, snow and ice). On Sweden's part this could mean changing and expanding the mission to different branches of the government. Most importantly it could bring about deeper international cooperation and an (continued) integration of the observation systems within the framework of international obligations and networks. Globally there is already an element of overall coordination through the Group of Earth Observations (GEO/GEOSS).

Rock Ptarmigan in alternate plumage. Photo: Mats Gärling

Research on Sites and Expeditions

Photo: Magnus Elander

Extreme diversity in space and time characterizes polar research in Sweden. The scientists represent a wide range of disciplines and research areas across the entire scientific spectrum, from the natural sciences – the core area – to medicine and to the humanities and social sciences. These scientists are also spread out across many universities and higher education institutions. Many of them study polar areas as part of their research, while others are involved in polar research exclusively. Some of the research takes place in large international consortiums engaging tens of researchers and at least twice as many support staff. Other research takes place in small groups, or is conducted by a single individual, e.g. ethnologists or language researchers. As a rule, much of the research is done in the field. The situation is similar elsewhere, although other countries may organize their polar research in different ways, e. g. consolidated institutes or broad-based and long-term research programs.

In Sweden, the organization of polar research has, to a great extent, been based on the initiatives of individual scientists and temporary financing from the research council. The advantage of this model is that the individual projects must maintain a high level of quality to be implemented. The disadvantages are irregularities and difficulties in planning and even in recruiting researchers. The involvement of many geographically distant institutions unavoidably leads to fragmentation and does not give universities the incentive to invest in doctoral programs that would attract young scientists to polar research and careers that promise stability and continuity. Coordination and consolidation become more difficult.

Importance of research stations

Research infrastructures are one way to overcome the problems. They involve long-term investments that create opportunities for researchers and motivate engagement by funding bodies and institutions. Research stations and larger expeditions have a stabilizing effect, particularly in a system like Sweden's where stability in polar research is generally low.

For a time, stations and expeditions were said to be a thing of the past since new logistics and communication technology would enable scientists to tailor individualized solutions. This has not happened. Instead, research stations have experienced a renaissance, and their former role as markers of geopolitical interest has persisted. During the Polar Year, Canada planned for a large new research station, or what appears to be a net-

Drills collect snow to take home for analysis. The chemical composition in each year's snow layer enables researchers to reconstruct air and precipitation conditions year-by-year. JASE, Antarctica 2007. Photo: Per Holmlund

work of stations. The decision is clearly a part of the ongoing race for resources around the Arctic Ocean. In 2008, France decided to establish a new Arctic research station on Svalbard. The initiative could be viewed both as a French project and as an expression of the European Union's Arctic ambitions; the decision was made during the French EU Presidency. Russia and the United States are also modernizing their stations.

Likewise, expeditions are showing no signs of decline. During the Polar Year more ship-based research expeditions have been conducted to polar regions than at any time in history. Of course, it helps that the conditions for expeditions have improved enormously in recent decades. The Swedish Kinnvika Expedition during IGY 1957–1958 lasted more than a year and included staying through the winter. During the long polar night the station was for all intents and purposes physically isolated from the rest of the world, with infrequent radio contact being the only option for private communication. Today, polar scientists are linked to the rest of the world through e-mail and satellite phones irrespective of their location. We can almost call it a globalized laboratory that stretches across the vast ice sheets and to the poles. This facilitates research and speeds work processes. Availability of better support from icebreakers, helicopters, and air support, particularly to Antarctica means that seasons in the field can be shortened and more research staff can work in the field each season, often flying in and out in shifts.

The world's driest desert is not warm, as people might expect, but extremely cold. Tent camp near Stocking Glacier Dry Valleys, Antarctica. Photo: Anna Krusic

Ships, all-terrain vehicles, and research stations

During the Polar Year 2007–2008 several of the large research programs have taken the form of national or international expeditions, e.g. the multinational European DAMOCLES project. This also applies to several of the largest Swedish research projects, or perhaps we should say Swedish-led projects, since nearly all projects have participants from several countries. Another strong Swedish component consists of the operative support from the Swedish Polar Research Secretariat that organizes everything from preparatory courses and field training to collaborating with the Swedish Maritime Administration concerning the icebreaker Oden and also equipment including all-terrain vehicles, helicopters, communications, and other services that expeditions might need.

Many of the larger expeditions have been directed at the Arctic. Swedish researchers, in collaboration primarily with Finland and Norway, are involved at the Kinnvika station, thereby reusing the historic research platform from IGY 1957-1958. The Kinnvika program, Change and Variability of the Arctic System – North East Land, Svalbard, includes a wide range of larger and smaller research projects involving researchers from 15 nations. In addition to taking new measurements, researchers use historical data from IGY and other studies in the area. The goal is to study how climate change and other global processes affect the Arctic environment. For example, the program covers glaciology, geochemistry, and geophysics, with investigations of natural archives of pollution, climate history, and human impact.

On board icebreaker Oden, marine geologists Martin Jakobsson and Jan Backman cut a sediment core from the Lomonosov Ridge in the Arctic Ocean. Photo: Magnus Elander

Researchers have received support from the local authorities on Svalbard. The Governor's office is collaborating with project leaders to rebuild and refit the Kinnvika station.

The icebreaker Oden has been used in several larger projects during the International Polar Year. One of these is LOMROG (Lomonosov Ridge off Greenland), which involves marine geology and oceanography research in the difficult-to-access, ice-covered sea northeast of Greenland. During the summer of 2007, Oden sailed these waters along with a Russian atomic icebreaker to conduct a combination of geophysical investigations and take sedimentation specimens to gain answers to key questions on glacial history and the development of the Arctic Ocean. Geographically, the main interest in this IPY program concerns an area north of Greenland where the western spur of the Lomonosov Ridge extends down toward Greenland and Ellesmere Island. The project is financed in part by the Danish Ministry of Finance, which has an interest in mapping the continental shelf, e.g. using seismic studies. A prerequisite for this collaboration is Oden's new multibeam echosounder, which was financed by the Swedish Research Council and the Wallenberg Foundation and used during the IPY. Concurrently, other projects involving oceanography research and research on land were conducted through fieldwork on northern Greenland and Svalbard.

Another Oden-based project is the Arctic Summer Ocean-Cloud Study, ASCOS, an integrated, Swedish-coordinated research program in the Arctic. ASCOS is an interdisciplinary project involving oceanography, marine biology, atmospheric chemistry, aerosol chemistry, physics, and meteorology. It is also a multinational consortium with over 30 researchers and doctoral students. During the field phase in summer of 2008 they set up an ice-drift camp near the North Pole. The program is part of an international collaborative project to study air-ice chemical interactions. The project focuses on climate processes and studies of the boundary layer and cloud formation. Clouds play a key role in the Arctic climate by regulating energy flow at the surface, which affects the freezing and melting of ocean ice. Cloud formation is also connected to the microbiologic life in the ocean and the ice.

International collaboration on infrastructures

Swedish researchers cannot depend only on their own research platforms. In the same way that scientists from other countries come together on Oden, and even comprise the majority of researchers at the Abisko station, Swedish researchers are likewise frequent users of other countries' infrastructures. Such infrastructure collaboration involved a trip eastward along one of the sea routes that could possibly soon be open to regular ship traffic if Arctic warming continues its current trend. During the late summer of 2008, the International Siberian Shelf Study (ISSS-08) followed the Russian Arctic Ocean coast eastward from Kirkenes with the Russian research ship Jacob Smirnitskyi. The scientific focus was to study the

Two icebreakers, Oden and Healy, during Beringia/HOTRAX 2005. Photo taken near the North Pole. Photo: Martin Jakobsson

flow of carbon, material, and water from the Siberian tundra to the Arctic Ocean. Already during the expedition in 2008, scientists could report on extensive methane emissions from the thawing permafrost in the tundra, yet another sign of ongoing climate change. Climate models have shown that in the future, the greatest temperature increases will take place in the Siberian Arctic. This will result in a reduction in the sea-ice sheet during the summer and shrinkage in permafrost, which in turn will allow greater release of methane from the ground and will increase coastal erosion.

Large Swedish expeditions to Antarctica

Large Swedish expeditions to Antarctica have become fewer. Many individual scientists have carried out projects, often in collaboration with other countries or scientists flown into the Swedish stations Wasa and Svea. Researchers from the Swedish Institute of Space Physics in Kiruna have conducted measurements. A glaciological project collected ice specimens near Svea to study ice chemistry. A geologic project measured permafrost by drilling to about 20 meters near Wasa, Mount Fossilryggen, and Svea. Monitoring of permafrost is one possible method to observe climate change, but it has not been previously tested to any great extent in Antarctica. Another glaciologic-meteorologic project is studying the ice sheet in eastern Antarctica. For instance, researchers are studying the energy and mass balance of the ice and what happens in the interface between air, snow, and ice. Swedish scientists have worked from Oden in conjunction with the ice breaker's mission to Antarctica to open a channel to the American McMurdo Station.

Emperor penguins in the Weddell Sea, Antarctica. Photo; Martin Jakobsson

Swedish research stations in Antarctica

The largest single Swedish project in Antarctica during the International Polar Year has been the Japanese Swedish Antarctica Expedition (JASE), which is one of several routes, so-called *traverses,* taking measurements along different sections of the enormous ice continent to determine geographic variations in the climate and environment of Antarctica in an extended time perspective. The Swedish contribution has been carried out in collaboration with researchers from the National Institute of Polar Research in Japan. Scientists studied aerosols, snow chemistry, snow physics, biology in snow, and ice dynamics. The first four topics concern the current situation, while ice dynamics involves a very long time perspective that also includes studies of subglacial seas. The Swedish research stations Wasa and Svea were established in conjunction with Sweden's participation in Antarctic Treaty System, which at the time required some type of permanent presence on the continent. The stations are small and are not always manned during the field seasons. Sweden collaborates closely with Finland, which has its own station, Aboa. Measurements and observations from this part of Antarctica are an area of Swedish responsibility according to the Antarctic Treaty System and can be done year round with unmanned instruments.

Several research projects during the IPY have linked in with the stations. New atmospheric radar equipment at Wasa investigates waves and aerosol particles at an altitude of 50 to 80 kilometers. The project aims to increase our understanding about aerosol processes and waves in the middle polar atmosphere, and compare aerosols in

JASE – Japanese Swedish Antarctic Expedition surveys the ice structures and subglacial topography using radar equipment attached to an all-terrain vehicle. Photo: Per Holmlund

the troposphere above the "clean" Antarctica with the "polluted" Arctic. This research could also enhance our understanding of the meteorological disturbances around Wasa and other research stations in the area.

Swedish research stations in the Arctic

The Swedish polar research stations have deep historic roots. The first stations were established on Spitsbergen, where there were no options for staying the winter. The very first was the Nordenskiöld house at Mossel Bay on the northern edge of Svalbard that was used throughout the winter of 1872–1873. *Svenskehuset* (Sweden House) at Cape Thordsen on Svalbard – originally built for a Swedish mining project – was used during the first International Polar Year in 1882–1883. Somewhat later, with the growth of tourism and its infrastructure, permanent facilities for Swedish mountain hikers became of interest. The Swedish Tourist Association, founded in 1885, built cabins that also served an important function as facilities for scientists.

Abisko – more than a research station for the natural sciences

A vision of an actual research station remained, formulated not least by geologist and Norrbotten patriot Fredrik Svenonius. Creation of the railroad and iron ore traffic from Kiruna to Narvik offered the opportunity to establish a more permanent facility. This began at Vassijaure with

Abisko Scientific Research Station, with glacial valley Lapporten in the background. Photo: Philipp Theuring

buildings left standing from the railway construction and sold by the Swedish Rail Agency. In 1905, this became an institution at the Royal Swedish Academy of Sciences. After the station burned in 1910 it was relocated at its current location near Abisko, in part for research purposes, but also because Abisko already had a tourist station and railway station. In 1912, Lapland research finally got its research base and could, as Svenonius expressed it, freely and honestly study "nature in the fatherland's Arctic region" (Teknisk Tidskrift 1905).

During the station's century-long history, it has established what can be described as an enormous open-air laboratory for monitoring, long-term measurement, and specialized investigation of several different natural environments, from high alpine mountains to Arctic tundra, tracts of mountain birch, and boreal forest. Here, generations of Swedish and international ecologists have worked, as have limnologists, glaciologists, and climate researchers. A special characteristic of Abisko, currently, is that the station is located in an area where the annual mean temperature is close to zero degrees. This was not the case 100 years ago, when the temperature was a few degrees lower.

Abisko is now in a midst of a transition from one type of climate to another, a change that no one could have predicted when the station was started, but which has become a major advantage. The change processes are very rapid. The vegetation periods are becoming longer, and the permafrost is shrinking substantially. Serial photography shows changes in land and vegetation that will become visible to the naked eye in only a few decades. The station has grown in stages. Abisko currently has more than 10 000 guest nights by 700 scientists per year. Expansion has been particularly noticeable in recent years, with the peak during the Polar Year.

Glaciology and measurement series in Tarfala

Only a few miles to the south, on the east slope of Kebenekaise, is Tarfala Research Station. The Tarfala project was started in 1946 by Stockholm glaciologist Hans W:son Ahlmannn, who set the tone for Sweden's polar research in the period between the World Wars. He aimed to establish a fixed point from which to measure the mass balance of glaciers, which he and his students carried out. This work was continued by Valter Schytt,

Valter Schytt 1954. Photographer unknown.

Tarfala Station 1953. Professor Hans W:son Ahlmann (Reclining, lower right in the photo). Photo: Valter Schytt

who led the development of the station for many years. Its development and operation has taken place in close collaboration with Sami families in Nikkaloukta. Sami residents, including Andreas Niia, Nils Olsson Sarri, and Petter Haugli had already served for some time as guides for researchers and tourists in the Kebenekaise area. The Sarri brothers and the Haugli brothers had an excellent command of all transportation modalities required and the women of the family provided food and housekeeping services.

Today, Tarfala has the longest continuous series of mass balance measurements for any glacier in the world. The monitoring activities are extensive and provide an image of the melting glacier, the water flow, and material transport, and even the type of pollution found in precipitation.

Mountain biology in the Vindel Mountains

A mountain research station was established in the 1990s. The Vindel Mountain Research Station is owned and operated by an association including, e.g. the Swedish University of Agricultural Sciences, Umeå University, and the Swedish Environmental Protection Agency as permanent members, and with participation by the universities in Lund, Uppsala, Stockholm, and Göteborg. The station primarily targets biological and ecological research and offers geographic and climatic conditions that differ from Abisko and Tarfala, with more birch forest and closer proximity to agriculture and forestry.

Doctoral student in glaciology Susanne Ingvander uses a survey instrument to measure points in Tarfala valley. The Tarfala Scientific Research Station can be seen in the valley. Photo: Gunhild Rosqvist

Arctic Sweden

A mountain stream in Abisko. Photo: Anders Clarhäll

Swedish polar research has long traditions in the Northern parts of Sweden. Georg Wahlenberg introduced glacial research in these mountains around 1800, and was followed by Fredrik Svenonius and Axel Hamberg toward the end of the century. Botanists, zoologists, and ecologists joined in. The links between research in the mountains and in the Arctic and Antarctica has been strong at times, and many of the prominent field researchers in geography, geology, and biology in the 1900s as well as meteorologists, physicists, and chemists have participated in this research. Important contributions in the internationally prominent field of Swedish climate research have their roots in research in the mountains and polar tracts.

During the second half of the 1900s, the association between northern research in Sweden and at the poles has been gradually reformulated. Sweden is no longer considered "Arctic" or "high alpine", and polar research has come to mean something exceptional, while research in Lapland has more of an 'everyday' character. When the Ymer expedition in 1980s signaled a new era for Swedish polar projects, the focus was not research in Sweden, but rather on Sweden's aspirations as a polar nation, e.g. with the potential to become part of the Antarctic Treaty System.

Annika Berntsson, doctoral student from Stockholm University measures the results of sediment specimens in Luspasjaure, Arctic, Sweden in the summer of 2008. Photo: Gunhild Rosqvist

Since its founding in 1984 the Swedish Polar Research Secretariat has not funded research in the Swedish mountains. Not because this research lacks a need for logistical support, but as a direct consequence of the Arctic concept that the Swedish polar organization, and even scientists, have been working with. Over the years, this definition has reinforced and sealed the Arctic concept's absence on the Swedish map.

Swedish mountain research within the framework

The division began to dissolve during the IPY, largely due to external pressure. Two factors were of particular importance. One was the definition of the IPY's arena of activity: north and south, respectively, of 60 degrees latitude in the northern and southern hemispheres, respectively. For Sweden, this meant that we could reflect on whether our own northern area would be considered relevant. This was reinforced by the orientation toward society and culture. If the human dimension were to play an important role in the Swedish IPY, then northern Sweden must be included. Furthermore, it is important to link research with local interests, the traditional enterprises of reindeer management, hunting, and fishing, and with tourism and other economic development. These factors ultimately helped make it possible to join with the IPY Committee and the Swedish Polar Research Secretariat in a collective effort that would become known as *Arctic Sweden*. Research activities took place in a campaign during the summer and early autumn of 2008.

Several IPY research projects have been active in the campaign. One called Back to the Future, involves revisiting previous sites for research and specimen collection together with the researchers who worked there, often several decades

ago. Hence, younger researchers have had the opportunity to watch and learn from older colleagues, and concurrently collect new data. In this way they gain a first-hand understanding of the change processes. Another project, ENVISNAR, Environmental baselines, processes, changes and Impact on people in Nordic Arctic Regions, with scientists from 15 nations, is investigating the indications of the rapid environmental changes under way in northernmost parts of Sweden and in the entire circumpolar area. It might concern carbon flow in different zones from glaciers to birch forests, important research given the fact that 11% of all carbon bound in the layers of earth worldwide can be found in the circumpolar tundra. The tundra's ability to bind carbon therefore plays a major role in climate change. This could also apply to snow and ice formation under new climatic conditions. Experiences of Sami reindeer managers are being compared with scientific data, not only to define the rate of change but also to understand the effects of climate change on reindeer management.

Even Tarfala station and the glaciology researchers have participated in Arctic Sweden and have been able to prioritize otherwise difficult-to-access sites by helicopter, e.g. Pårte Station at 1830 meters altitude in the Sarek Mountains.

Media attention and research policy

Arctic Sweden received considerable media attention. Naturally, local media were interested in what was happening in their own areas. A group

The excavations at Luspasjaure uncovered rocks with changed magnetic characteristics, suggesting that they have been exposed to high heat. Here Nicklas Bertilsson attempts to create high temperatures using combustible material from the site. Arctic Sweden 2008. Photo: Andreas Viberg

of parliamentarians had an opportunity to visit the research sites and the archeological excavations. Visits were arranged in Abisko and Tarfala and surroundings for key individuals in science and politics, including several university presidents. Media interest also increased when HRH Crown Princess Victoria visited the Arctic Sweden project.

Generally, the experiences gained from this project are very positive. The exclusive nature of Polar science is easier to disseminate if research takes place in areas and contexts that people recognize and where they can have direct insight. A panel debate on research in the North was held in conjunction with a visit to Abisko. The panel included representatives of all parties in the Swedish Parliament, individuals who also played direct roles in the research system, either as members of the parliamentary committee on education, or state secretary (Peter Honeth), or the Chair of the Swedish Research Council (Björn von Sydow).

Both the panel and public became very engaged in the debate. Clearly, questions concerning research in the North can motivate political priorities, although the focus may differ. Arctic Sweden also has the potential to bring field researchers and citizens closer together. The research sites can become tourist attractions in their own right, similar to the excavations at Viking age trade centre Birka. Sami entrepreneurship, which has been so clearly demonstrated in Nikkaloukta – the Sarri family's tourist facility was presented as a cardinal example of a rural enterprise, can be followed by others.

Plant ecologist Åsa Lindgren takes a break from inventorying plants to observe mountain birds. Photo: Helene Schmitz

A Visible Polar Year

The exhibition "Cold Poles – Hot Stuff" on Arctic and Antarctic research was on public display in House of Sweden, the show room of the Swedish Embassy in Washington DC. The exhibition was produced by Teknikens Hus, Luleå Science Centre in cooperation with the Swedish IPY committee. Here is a group of children on a carpet picturing a map of the Arctic. Photo and copyright: Teknikens Hus

The International Polar Year represents a major breakthrough for interactive polar research, literally in real time. Scientists have blogged from icebreakers, glaciers, research stations, and field camps.

> Now we are so close to the American research station McMurdo that we could walk there, but Oden continues to break ice for a while longer. We see an area completely free of snow and with many barracks, which could house 1200 people in high season. It almost looks like a mining town.

Oceanographers Agneta Fransson and Anna Wåhlin wrote these lines on their blog from Antarctica *(Göteborgs posten* homepage, January 2009). Others have blogged from the Arctic. Arctic inhabitants have even blogged and commented on the IPY and the presence of scientists. The media covered IPY 2007–2008 more widely than any other International Polar Year, with the possible exception of Sputnik during IGY. Youtube contains film segments from conferences, field research, interviews with IPY representatives, and films about polar research.

It was also during the IPY when reaching the public became a key priority. School children and youth around the world and decision-makers became particularly important target groups. Special theme-days were arranged, e.g. Polar Days addressing themes like "People", "Ice Sheet", and "Land and Life". On these days, people around the world gathered to present their collective messages, all of which concerned the polar tracts. Comparisons with IGY can be beneficial. At that time, "World Days" were arranged to coordinate worldwide measurements along three longitudes, from pole to pole. They comprised a type of symbolic specimen collection on a planet, which for the first time began to seem as one – whole and manageable. In retrospect, perhaps we could say that IGY ushered in the new era of globalization – culminating with Sputnik, the vehicle that encircled us all.

Fifty years later, the idea of globalization is commonplace. But what still remains a challenge, and one of nearly utopian dimensions, is uniting human thinking and ideas around a common world view. This is what the IPY's global manifestations are all about. We cannot claim that they have dominated the attention of the world's media, but they have reached out to some extent. The author of these lines, on board a high speed train, participated in Peoples Day on September 2008, being in direct contact via cell phone with an editorial office in Yellowknife, northern Canada, and a school in Zambia, where students asked questions about the environment and policy in the Arctic.

In the Scandinavian September sunlight, heavy-laden apple trees sped by outside the train window. A strong sense of simultaneousness and new opportunities was unavoidable. The world during IPY is clearly not the same as it was 50 years earlier during IGY. Now one frequently hears that the concept of "polar tracts" is misleading. Antarctica is an exception from the rest of the world, a polar tract. But the Arctic, through globaliza-

Plant ecologist Åsa Lindgren inventoried plants on the Swedish tundra during the summer of 2008. Shown here is the Alpine Catchfly (Lychnis alpina). Photographer Helene Schmitz accompanied her during part of the inventory. The results of their collaboration were published in Forskning & Framsteg (a Swedish popular science publication). Photo: Helene Schmitz

tion and climate change, is becoming an integrated part of the northern hemisphere, not an exception, not a pole against which its southern counterpart represents a counterpole.

External activities central to the International Polar Year

The IPY in Sweden turned external activities into a central issue. The IPY opening in Jukkasjärvi in March 2007 began with the launch of a trial balloon – and the film clip quickly reached television channels and websites around the globe. As the IPY drew to a close in the winter of 2009, it was time for it to take its place on milk cartons from Arla Foods. Those who want to learn more can visit www.polarisen.se, a website on polar areas and Swedish polar research. *Universeum*, a scientific learning center in Göteborg, in collaboration with the Swedish IPY Committee produced the website. The polar climate exhibition can be viewed by in *Universeum's* public access area. Both the website and installation live on after the close of the IPY, forming part of its legacy.

In Washington DC, the IPY presented an exhibition, "Cold Poles – Hot Stuff", in time for the dedication of the new Swedish Embassy, House of Sweden, in October 2007. The exhibition was produced by Teknikens Hus in Luleå, where it appeared before touring other sites in Sweden. Another exhibition, Iskalla uppdrag (Ice Cold Mission) at the Maritime Museum in Göteborg presented the history of Swedish polar research, especially Göteborg as a center-point of polar research and expeditions then and now. Göteborg was a city where several of the patron families of polar research worked, e.g. Dickson and Ekman. Otto Nordenskjöld's Antarctic Expedition 1901–1903 started there, as did most of the Swedish expeditions to Spitsbergen and the Arctic during the first golden age of polar research, 1860–1910.

IPY recognition of artistic works

The International Polar Year has given recognition to works of art. *True North* by Isaac Julien at BildMuseet in Umeå was based on diary notes by Matthew Henson (1866–1955), a key figure in Robert E. Peary's Expedition in 1909 to reach the North Pole. Henson, who was African American, and the four Inuit's on the expedition remained in Peary's shadow for many years. The work was filmed on Iceland and in northern Sweden, and is a poetic and powerful story of Matthew Henson's outer and inner voyage to the North Pole. Isaac Julien moves freely between feature film, documentary film, and video installations and photography. His interpretation of Henson's fate can be viewed in the light of his own identity as artist, black, and homosexual, which has emerged in several works on post-colonialism, geography, ethnicity, and sexuality. Julian, a visiting professor at Harvard University, was nominated for the prestigious Turner Prize in 2001. His productions also include short-subject films and music videos for Peter Gabriel and Youssou N'Dour. A seminar at BildMuseet in Umeå in September 2007 recognized Julien's work, and artists and researchers

In early March 2009 Stockholm University arranged "The Living Question Box" with a polar research theme. The project promoted discourse between students and polar scientists at Stockholm University. During this meeting, students and researchers alike got answers to many of their questions.

from New Zealand, Canada, Norway, USA, UK, and Sweden discussed the art, film, and literature from polar regions.

Another film associated with Peary and the IPY is *The Prize of the Pole* by Staffan Julén, first screened at film festivals in Copenhagen and Göteborg, and later by the Swedish Broadcasting Corporation in April 2007. The film describes how Robert Peary in 1897 took six Inuit's from Greenland to New York. Peary had given them sugar and rifles and promised more gifts. What he did not tell them was that anthropologist Franz Boas at the Museum of Natural History had asked Peary for a "middle-aged Eskimo" for research purposes. While in New York, Peary charged 25 cents to see them, and in two days he showed them to 30 000 people. But interest quickly faded, and while living in the basement of the museum where they were kept accessible for "research" they contracted tuberculosis. The first to die was Quisuk, father of Minik, a small, motherless, 7-year-old boy. In the end, the boy was the only surviving member and was adopted by a musician. Dressed in cap and jacket he attended school in the Bronx. The story follows Minik's life. The rage when he understands that the museum never buried his father, but preserved his skeleton and perhaps brain. His attempt to return to Greenland, whose language he had forgotten. And the end, in New Hampshire, where he dies young from the Spanish flu.

The film about Minik calls attention to a recent concern addressed during the IPY: how science uses native populations. Not long ago this theme was somewhat taboo. Kenn Harper, who wrote a book about Minik in 1980, met resistance from museums. American museums now work together with natives on more equal terms. In Australia, the remains of ancestors are being repatriated. Some came from the Museum of Ethnography *(Etnografiska Museet)* in Stockholm, which up until 2004 held entomologist Eric Mjöberg's infamous collection of Aboriginal skeletons. But the disturbing truth is even closer. Ten or more museums and institutions in Sweden have skulls and skeletons of Sami people, as revealed by a report from the Sami Museum Ájtte in Jokkmokk *(Samiskt kulturarv i samlinger, 2005).*

Justice on the agenda

Why are the traditional questions of the past on the political agenda of today? As globalization eliminated exoticism, it also undermined the self-assumed privilege of scientists to treat everything in the world as a research subject, often at the cost

Snowmobile drivers in Iqaluit, Baffin Island, Canada. Photo: Malin Avenius

of ethical considerations. When one sees the photographs of Minik and his relatives, pictured naked, a face, in profile, in full body, it reminds one of prisoner 'mugshots'. One hundred years later it is the researchers of that time who emerge as the criminals. We no longer accept science as a motive for everything. Now, after a century, we are listening to Minik and his letter asking: "Why am I an experiment?" It is no coincident that the question is asked on film just as the IPY calls attention to "the human dimension".

History also received attention by the International Polar Year. Luleå University of Technology coordinated the production of a Barents book covering the history of the northern-most parts of Norway, Sweden, Finland, and Russia for a broad audience. In the background is a graduate school network involving the departments of history in the Barents region. Graduate schools have had the goal of investigating how industrialization and development of national status have affected the national and regional levels in four Barents countries. A history book about the Barents region is being developed at the graduate schools for teaching purposes at the high school and university levels. The book is expected to contribute to greater visibility, in Europe and internationally, for culture, business, ecology, and social conditions and to highlight the region's shared history from a northern European perspective.

The International Polar Year has targeted the public. Throughout the country, the IPY has made its presence known through newspaper articles, seminars, and lectures. Most activities have been organized at lower levels, e.g. interested universities, high schools, societies, and associations. The

Under the title Livet som polare (Life as polar pals) information was published on Arla milk cartons in February 2009 using the theme, polar tracts and the IPY. The text included the Web address of the IPY in Sweden: www.ipy.se Photo: Jakob Halaska

IPY Committee has supported a few particularly ambitious initiatives. A lecture series *Främmande nord* (The Foreign North) at Umeå University reflected new research in literature, art, and history about the image of the northern areas in Europe and Scandinavia. Research efforts in the natural sciences at different sites in Lapland and the Arctic have, through Stockholm University, been communicated via film, a lecture series, and Youtube clips. The film premier was in Jukkasjärvi in January 2009.

Occasionally, Arctic questions find their way into Swedish homes via the media. The Arctic travels of IPY patrons naturally received attention. In June 2008 HRH Crown Princess Victoria visited Svalbard along with her neighboring successors to the crown, Håkon from Norway and Fredrik from Denmark. Among other sites, they visited the Ny-Ålesund research community and Zeppelin Mountain, where Sweden has an environmental monitoring station. As mentioned earlier, the visit by the Crown Princess to Abisko and Tarfala areas during implementation of the Arctic Sweden field campaign also attracted the interest anticipated.

International Polar Year opened questions for debate

Primarily, this has taken place through opinion building by individual scientists. But it has also taken a more organized form. The IPY Committee conducted a series of seminars jointly with the Nordic Council's delegation to the Swedish Parliament. At the first meeting in April 2007, the International Polar Year was presented for the

Kuopervagge, viewed from the summit of Kebnekaise, the highest mountain peak in Sweden.
Photo: Anders Clarhäll

parliamentarians. The President of the Norwegian Sami Parliament, Aili Keskitalo, was honored guest and speaker.

A seminar in January 2008, *Brännpunkt Arktis* (Hotspot Arctic), filled the second chamber of the Swedish Parliament with participants from Sweden and other Nordic countries (the Nordic Council session had just concluded).

As interest in Arctic issues really began to gain speed, many parliamentarians asked how they could contribute. There were no routines, no rules, and most importantly no complete and well-known Swedish policy to fall back on. The Norwegians and Danes were in a somewhat better position. As the IPY originated, the Norwegian Foreign Minister, Jonas Gahr Støre, speaking from the podium of the Swedish Institute of International Affairs eloquently presented the new, ambitious Norwegian policy for the northern area. Finland had also been active, formulating "The Northern Dimension" during its EU Presidency (1999), which clearly placed the Nordic area in a European perspective.

In March 2009 another seminar that looked toward the future was held at the Swedish Parliament, formally marking the end of the International Polar Year. However, it could be viewed as the prelude to what appears to be a new period of more advanced and ambitious Swedish Nordic policy for the Arctic and North Atlantic region. Swedish Government representatives have indicated greater interest in the Swedish position.

Another minor, but important, indication of a policy shift appeared in a *Dagens Nyheter* article written by Carl Bildt, Minister of Foreign Affairs, in early January 2009. The word "Arctic" is now listed among with the world's major conflicts and the global economic crises. Hence, the political language has also changed during the IPY.

Europe and the Arctic

A young couple on a jetty in Ilulissat, Greenland.
Photo: Malin Avenius

The IPY has altered the conditions for development in the Arctic, both concerning research, but perhaps even to a higher degree, policy development. It is against this background that we can consider the recent, rapid increase in European Union activity concerning Arctic issues. EU has a strong interest in a stable and accessible Arctic that is part of EU, both in a territorial and a geopolitical sense.

However, the Arctic area controlled by EU Member States is quite limited. Of the five Arctic costal states that in May 2007 signed the *Ilulissat Declaration* on collaboration concerning Arctic resource issues, only one, Denmark, is a member of EU (but only through Greenland, which left EG in 1984, and whose self-determination is gaining strength after the November 2008 referendum). In a strict sense, EU has no Arctic coastline, and only through Sweden and Finland does EU have its own Arctic territory. However, European activities are under way throughout the entire Arctic region. Many corporations based in EU countries are engaged in various projects, e.g. extraction of oil and gas in the region, and thereby the expected economic growth has generated strong economic interest. European stability, at least indirectly, is dependent on Russian gas, much of which originates in the Arctic region.

Street scene from Longyearbyen, the largest settlement and administrative center of Svalbard. Photo: Marin Jakobsson

It is therefore not surprising that EU has taken several initiatives to generate interest in Arctic development and has spoken out on the Arctic as a European interest. In November 2008, the Commission issued a communiqué (The European Union and the Arctic Region, com 2008–763), which clearly expressed general and European interest in well-considered and responsible development of the Arctic and the need for international collaboration, not least in monitoring and research. The SAON process was identified as an important component. Good data and observations are of overriding Arctic, European, and global interest. It is essential that the SAON process be continued in an efficient way. EU's support would contribute substantially to giving the process sufficient breadth and linking it to European and global information and environmental monitoring systems.

EU and ambitions for a permanent presence in the Arctic

In November 2008, EU applied for observer status on the Arctic Council. The EU work with climate change and international security pointed to the Arctic as one of the regions in the world that should be carefully monitored. The Member States' forum for coordinating research infrastructures, ESFRI, in updating its roadmap from December 2008 highlighted the facilities on Svalbard and the expansion of EISCAT, headquartered in Kiruna. As decided earlier, it also aimed to initiate work on a European research icebreaker, *Aurora Borealis*.

The French EU Presidency arranged a ministerial-level conference in Monaco, November 9–10, the final declaration of which clearly indicated that the IPY represents somewhat of a paradigm shift in our view toward the Arctic in general, and the

effects of climate change in the Arctic in particular. The document emphasizes the importance of considering the interests of the Arctic's permanent population, not least the native population. As a specific message to Sweden, the declaration stressed the importance of actively addressing these matters during the Swedish EU Presidency in 2009.

Sweden and the EU Presidency

Sweden is in a good position to address Arctic-related issues during its EU Presidency. Sweden is an Arctic EU country with its own Arctic territory and has EU's only native population, the Sami. Hence, Sweden's position in this context differs in many ways from that in the early decades after WWII. Swedish Arctic research is robust and highly respected, and Sweden plays an active role in the SAON process via the IPY Committee and Swedish agencies. Furthermore, the Swedish Government has recognized the need to strengthen Swedish research and its political presence in the Arctic by trying to link together Swedish infrastructures for polar research and by allocating new and expanded tasks to the Swedish Polar Research Secretariat to help bridge the gaps between politics, diplomacy, and research. Concurrently, it appears that the Secretariat will be given the responsibility for operational management of the Abisko Scientific Research Station in northern Sweden. Several different ministries have an interest in Arctic issues, e.g. the ministries of education and research, environment, agriculture, foreign affairs, and defense. Also, the Ministry of Enterprise, Energy, and Communications deals with important matters in this context.

Sweden should aim at a broader political legacy from the IPY. Even in this context, it should be natural for Sweden to emphasize traditional Swedish political values. In fact, these values are

Playing outdoors in Pangnirtung, Nunavut, Canada. Photo: Malin Avenius

incorporated in current EU documents: sustainable development, international collaboration, security-promoting efforts, and minority and human rights issues. Issues that Sweden can stress – in addition to international collaboration in research and monitoring – include broad and fair social and economic development in the North that draws on European perspectives

Sweden and the IPY legacy

The International Polar Year 2007–2008 substantially broadened the concept of polar research. The differences are obvious between the skeptical and cautious attitude that existed when the IPY was first discussed by the Swedish Polar Research Committee in 2002–2003, to the robust and broad-based collaboration that resulted during the IPY 2007–2008 – and which appears will continue for years to come.

The Swedish legacy appears to be a more conscious, northward-directed policy and understanding that Sweden is not only part of Europe, but is also deeply anchored in the Nordic world that stretches across the Arctic. The IPY has shown concurrent international and the regional (within Sweden) expansion. The scope of research has increased as the disciplines have expanded. As studies in the humanities and social sciences become an established part of polar research, the natural sciences have continued to grow.

The scope of research has increased. In Sweden, a greater understanding has taken root regarding the close association between research and the political importance of the polar areas. It is essential to recognize this association, even when one wants to play a role in scientific work. A more proactive position appears to be emerging in the Swedish attitude toward the role of the Arctic. The voices of the Sami people and the northern population have been heard when research was discussed during the IPY. Research projects have drawn on the unique knowledge of the Sami.

What does the IPY mean to the "Arctic" parts of Sweden?

Perhaps issues concerning development of the North, particularly research issues, will receive more attention. Given the upswing in raw-material markets during the IPY, northern Sweden experienced a period of strong economic growth. The IPY has highlighted the important role that research plays in long-term development. The legacy of the IGY is apparent in Kiruna's future as a high-tech center for space, minerals, and geophysics. Investments in research have demonstrated positive, long-term effects and have contributed to Kiruna's shift "from mine to mind", to quote a slogan from the early 1980s. It is on this legacy that the IPY can build. The new keywords that now join the previous ones are: ecology, culture, tourism, traditional knowledge, and diversity – all of which have emerged in research and other activities during the IPY.

What does IPY mean to the Sami?

On a global level, the IPY has meant strong recognition for the knowledge traditions of local populations and for the precision and utility of their systems and methods of observation. Sami and other minorities participate in research and are no longer research subjects. The "Arctic exception" problem has been framed, and the view that something damaging exists in past attitudes toward local populations has become more established, which must be considered a good thing. Concurrently, research has brought forth examples of important collaboration between research-

ers and local populations. This trend is paralleled across the Arctic. Important elements in our knowledge of conditions in the North have been co-produced by researchers and local 'informers' and their and colleagues. The IPY hinged, like most good research, on teamwork.

What does the IPY mean for research?

Probably it means reinforcement. The Polar Years constitute a comprehensive chronology. In addition, they consolidate our strengths. They reveal different phases in development, primarily in research about the Polar region, but they also help formulate political interest. It is obvious that the major developments of importance for Sweden take place within the European Union. Efforts are being consolidated for an offensive Arctic research agenda that will also benefit Swedish research.

The Polar Year has recognized not only the strengths in Swedish polar research, but also its weaknesses: instability and problems in long-term planning; and insecurity about resources, which inhibits the power of attraction, particularly for younger researchers. Hence, it was beneficial that the Polar Year took place at a time when the future of polar research was being debated. Already in 2008, indications emerged in the Government Bill on Research Policy that the Government intended to address the fragmentation in this sector. The first step was taken toward a new polar organization. That work can be advanced further. Many have an interest in this happening and also share in the responsibility: the Swedish Polar Research Secretariat, whose authority is growing; the research councils, universities, higher education institutions, and obviously the scientists who work in or with the polar areas. Certainly, we have not seen the final step in this change process.

Sorting reindeer in Saarivuoma, Sami village. Photo: Veijo Pohjola

What does the IPY mean to Sweden?

Sweden is a northern nation, but this fact has not been particularly noticeable in Swedish foreign policy since the 1920s. In contrast to Denmark and Norway, who have their own northern territories to consider, for years Sweden has preferred to look in other directions: south toward Europe and the community being formed there; east across the Baltic toward old friends and familiar challenges; and west toward America who's influence have had strong impulses on Sweden.

However, Sweden also has an old tradition of looking northward. A year like this one, when we commemorate the 200th anniversary of the Finnish War and the events of 1808–1809, can give cause to remember that when Finland was surrendered to Russia, Sweden shifted her eyes northward. There she could see a future of resources and available land.

Today we can imagine a similar shift toward the Pole. Emphasis on exploiting the potential of natural resources is not as apparent. In contrast, we think more in terms of responsibility, the difficulties of balancing different interests, and the care of the region and its role in the future of our planet and the fate we all share. Thanks to the Polar Year a Swedish voice is beginning to be heard in this discussion.