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# Cold War in a Warming Place: Can Eastern and Western Scientists Effectively Partner in the Arctic?

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ON a planet that is undergoing profound change, the Arctic is experiencing some of the most rapid changes, leading to historic, unexpected, and largely unprecedented physical and ecological transformation. Yet apart from Antarctica, there's no region on earth about which scientists know less or have fewer experts or instruments monitoring it. So scientists, local stakeholders, myriad industries, and policy makers around the world are closely watching the transformative developments taking place in the farthest northern reaches of the globe.

Rapidly changing ecosystems are threatening wildlife and the indigenous populations that depend on it, while thawing land and melting ice are shortening shipping routes and opening up new areas for development of fossil fuels and minerals. Science collaborations have played a key role in shaping various environmental and geopolitical regimes in the Arctic. International research partnerships are important because of the expense required to operate in the high latitudes; sharing the responsibility helps countries undertake more scientific projects than they could on their own. Furthermore, the issues at play in the changing North—rapid climate change, thawing permafrost, shifting global weather systems, expanded resource extraction, and shipping—affect nations far from the Arctic Circle.

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As the United States leads the Arctic Council during its two-year chairmanship (2015–2017), negotiations are under way to try to remove various barriers to effective scientific collaboration in the Arctic of the future. Central to that issue are relations between East and West, specifically between Russia and other nations. Russia controls the largest portion of land north of the Arctic Circle, with 40 percent of the Arctic sector under its control, including a massive 14,900-mile Arctic coast.

This essay explores how research in the Arctic, so much of it international in nature and collaborative in practice, has evolved in terms of cooperation between East and West. Science partnerships have been a fundamental part of Arctic exploration for centuries. Expanding the size and scope of these partnerships can bring benefits to the many nations that have interests in the Arctic. But it requires thoughtful reflection on the roadblocks to successful collaboration. What barriers exist to effective international partnerships in the Arctic? How can scientists and governments forge closer ties, and what lessons can successful collaborations provide? Answering these questions will shed light on important issues that will affect research in the High North for decades to come.

## At World's End, a Legacy of Cooperation

International Arctic research has a long and storied history. Arctic expeditions to discover a route linking Europe and Asia, to reach the North Pole, or to establish sovereignty began in the sixteenth century, with nations viewing the Arctic through imperialist, nationalist, or commercial lenses.[1] As the nineteenth century came to a close, scientists became increasingly interested in better understanding a region they had only recently begun to map properly. The first International Polar Year (IPY), from 1881 to 1884, occurred as the hunt for resources in the Arctic was getting under way and interest in the Arctic was high. IPY was not only the first international collaboration in the High North but probably the biggest international collaborative science project to date, in terms of sheer logistics.

IPY, which lasts two or more years to accommodate coordinated projects, came about as officials realized the importance of cooperation for successful Arctic science. Austrian explorer and scientist Carl Weyprecht conducted scientific work in the Arctic from 1872 to 1874 but was frustrated that different nations and explorers used different measuring devices and lacked standards to make their measurements comparable. In envisioning the historic project, he said nations should "put aside their unprofitable competition for mere geographical discovery" and instead field a series of coordinated expeditions dedicated to scientific research. The work of these expeditions would be conducted "with instruments precisely alike, governed by precisely the same instructions, and for a period of one year at least, to record a series of the utmost possible synchronous observations." Only in this way, he said, "shall we be placed in possession of materials enabling us to attempt a solution of the problems which now lie embedded in the Arctic ice. . . ."[2]

The first IPY focused on establishing research stations, with twelve in the Arctic and thirteen auxiliary stations elsewhere. Different nations conducted excursions to their own areas of interest—the Austrians to the Arctic island of Jan Mayen, the Russians to the mouth of the Lena Delta, and so forth. Maintaining the research stations they established involved some 700 men braving incredibly harsh conditions. But scientists subsequently were unable to derive much value from the suite of separately collected data sets. Polish scientist Henryk Arctowski said in *Aperçu des résultats météorologiques de l'hivernage Antarctique de la "Belgica,"* published in 1904: "It may be that if the publication, and above all the discussion, of the observations had been left to a central office, possibly international, the scientific level of the work accomplished would have been better appreciated."[3]

As nations conducted Arctic explorations in the early twentieth century, international science was part of the mandate. In 1913 Canadian Prime Minister Robert Borden ordered an Arctic expedition to map Northern Arctic areas and claim land. The expedition was led by well-known Canadian explorer Vilhjalmur Stefansson but also included American zoologist Rudolph Martin Anderson and Canadian anthropologist Diamond Jenness. By the interwar years, "genuine scientific advances occur[red] in the spirit of enthusiastic cooperation," wrote historian John English; forty nations participated in the second IPY in 1932 to 1933, including the Soviet Union, the United States, and Canada.

Soviet interest in the Arctic was driven by a need for resources, including minerals, and as a location for its infamous system of prison camps. "Because of Stalin's personal interest in Arctic development, Soviet scientists continue to have support that other nations withdrew during the first years of the Depression," English wrote. And because of that support, Soviet scientists, trained in German universities, "made significant contributions to the science of meteorology."[4]

World War II shattered any hope that the Arctic could bring nations together, as Alaska, the northern Atlantic, and Greenland all saw military action or played a strategic role in the conflict. But toward the end of the war, U.S. Army Colonel Charles Hubbard called for the United States, Canada, and the Soviet Union to cooperate and establish weather observatories across the Arctic. The Soviets, however, were not to be a part of that grand vision—Cold War tensions set in soon after hostilities in Europe ended in 1945. Instead, Canada, the United States, and Denmark (which controlled Greenland) agreed to establish weather stations to stretch between Alaska and northern Greenland by 1950.[5]

Although civilian Arctic science progressed with regular international collaborations during the Cold War, the distant early warning line, or DEW line, united western Arctic nations in a more concrete way. This line of radar facilities, stretching across northern Canada between the Aleutian Islands and the Faroe Islands in the North Atlantic, provided a common defense against the Soviet Union. The installations also highlighted the importance of understanding meteorological conditions at the top of the planet as submarines patrolled under the sea ice, cruise missiles were tested in the Canadian Arctic, and Western and Soviet governments built up their air forces in Arctic bases.

But scientists did occasionally pass through the Iron Curtain to forge scientific collaborations. In 1984 Canada's Department of Indian Affairs and Northern Development signed a protocol with the Soviet Union focused on Arctic exchanges related to science and indigenous affairs. After the protocol was renewed in 1987, for example, thirteen Canadian and Soviet scientists skied across the frozen Arctic Ocean from Severnaya Zemlya to Ellesmere Island, ostensibly to study human physiology under stress. Subsequently, in 1989, Canada and the Soviet Union turned the protocol into a full agreement.[6]

In the 1980s the Soviet Union didn't participate in a number of international discussions among scientists and Arwith rectic policy makers. But it would fall to the Soviet leader, Mikhail Gorbachev, to highlight the importance of scientific collaboration in the Arctic on the global stage. "The community interrelationship of the interests of the entire world is felt in the northern part of the globe, the Arctic, perhaps more than anywhere else," he said in a famous speech in Murmansk in October 1987 that marked a key moment in the Soviet Union's opening to the West. Along with proposals related to nuclear and conventional security, Gorbachev called for an expansion of existing scientific collaborations under a proposed "Arctic Research Council" and offered Murmansk as the host city for such a meeting. And he called for "an integrated comprehensive plan for protecting the natural environment of the North." The following March, twenty-five scientists from the Arctic countries met in Stockholm and created the International Arctic Science Committee, which has gone on to coordinate international Arctic research, for example, the influential Arctic Climate Impact Assessment in 2004.

The Finns were to launch the next phase of East–West scientific collaboration in the North, with a firm focus on environmental protection, a potent issue in Finnish domestic politics. A meeting of Arctic nations held in Rovaniemi in September 1989 proved pivotal. The immediate outcome was to launch six reports, written by international teams of scientists, on major pollutants in the Arctic: acids, metals, noise, oil, organic compounds, and radioactivity.

But the Finns' more lasting effect was to create a series of international environmental initiatives in the Arctic that have since been known as the "Rovaniemi Process." Those talks led to the Arctic Environmental Protection Strategy (AEPS), which, as its first major project, launched the Arctic Monitoring and Assessment Program, to be based in Oslo, hosted and partially funded by Norway. The modern-day Arctic Council, an intergovernmental forum, evolved from the AEPS after nations realized a stronger body to help enforce environmental protections was needed.

More AEPS projects followed, including the Protection of the Arctic Marine Environment, the Conservation of Arctic Flora and Fauna, and the Emergency Prevention, Preparedness and Response Working Group. "Few reached for the grasp [of cooperation] Gorbachev extended at Murmansk in 1987, but the Finns did. The Finnish initiative—the Rovaniemi Process—was without doubt, a success," English wrote.[7] (Other officials say the response from the West to the Soviet outreach was more unified.) One of the most important steps in the thawing of the Cold War focused on scientific cooperation in the Arctic, and the Rovaniemi framework continues to impact science and policy in the region today.

A number of important groups have given an international voice to Arctic indigenous people, beginning with the 1977 formation of the Inuit Circumpolar Council. The 1991 gathering of the Rovaniemi Process, the first ministerial meeting of Arctic states, included Arctic indigenous representatives. And as of 2015, six indigenous groups have permanent participant status on the Arctic Council, where they inform various international scientific initiatives.

**When Arctic Cooperation Shines**

One of the longest-standing international scientific projects in the Arctic is also one of the most successful ones, and that may not be a coincidence. Northern European countries have relied on abundant cod in the Barents Sea for centuries and began studying the ecosystems in their respective waters in the late nineteenth century. In 1902, however, Russia, Germany, the United Kingdom, and the Scandinavian nations formed the International Council for the Exploration of the Sea. As their collaborative scientific work grew, it informed management of the major cod fishery in the Barents, said biologist John Waldman. The partnership flourished until World War I but resumed

> in the 1950s, with regular meetings leading to the commencement in 1965 of cooperative, in-depth, multi-vessel surveys in what is now known as the Barents Sea Ecosystem Survey. This led to the implementation in 1976 of the Joint Fisheries Commission between Norway and the Soviet Union, which sets harvest control rules. Under their agreement, the parties use those rules alongside regular scientific stock assessments to settle on a total allowable catch, or TAC. Norway and Russia share about 80 percent of the TAC, with the rest allotted to other nations with historical rights to fish in the area.[8]

Waldman points out that cod fisheries off Newfoundland, Canada, and Georges Bank, New England, crashed decades ago and remain threatened. He attributes some of the success of Barents Sea cod stocks, by contrast, to a system in which scientists from either country "can provide a check" on each other's management decisions and fishing behaviors, since the Fisheries Commission formalizes a mechanism to share the resource.

Other successful collaborations focus more on environmental monitoring than resource management. The Tiksi International Hydrometeorological Observatory, a joint project of Finland, Russia, and the United States, serves as a vital link in a handful of Arctic observing stations that dot regions along and above the Arctic Circle. It is built on the grounds of the prestigious Soviet-era Polyarka station, established in 1932, and is located near the town of Tiksi in the eastern Sakha Republic. At its height between 1960 and 1980, Polyarka was staffed by more than fifty working scientists, engineers, and technicians focused on measurements of surface weather, snow depth, sea ice, and conditions in the upper atmosphere. But as a result of the economic downturn of the 1990s, activities at the station, like those at other Soviet Arctic outposts, almost completely shut down. During the 2007–2009 International Polar Year, the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet) proposed a revitalization of the station for IPY. Together with the U.S. National Oceanic and Atmospheric Administration (NOAA), Russia subsequently signed a memorandum of understanding that mentioned the project. (The project was granted a waiver from recent U.S. sanctions that bar government contact with Russians.)

Since then, the station has grown to produce twenty-six suites of atmospheric measurements. It transmits 380 data sets every four hours to centers in St. Petersburg, Helsinki, and Colorado, totaling roughly 60 gigabytes of data each year as of 2012. Its measurements, conducted by international teams, have led to significant papers, including publications on ice formation in the Arctic Ocean, methane flux from Arctic sources, and changing properties of permafrost.

Contributing to the station's success has been a rigorous adherence to Russian importation rules.[9] As part of the station's contributions to station research equipment in 2011, for example, officials in Colorado sent $350,000 in equipment in thirty-eight boxes to Tiksi. In accordance with import protocols, a NOAA summer student spent weeks documenting every individual part contained in the shipment, including the manufacturers and specifications.

After ownership of the boxes was transferred to Roshydromet, they sat in a Russian warehouse for months until they were eventually released. One might question why NOAA and its partners at Roshydromet decided to follow the Russian customs rules precisely. Couldn't an intern's time be better spent? High-level Russian officials have sometimes offered to intervene to obtain a waiver to skirt bureaucratic rules, but NOAA leaders believe their work with Russian partners is legitimized by following all the Russian regulations. They have declined to receive waivers, since U.S. officials believe that if they receive one once it will be expected each time, making it impossible to work through established channels.[10]

Other lessons from the Tiksi success include the value of formal international agreements, which can ease visa and import issues, and documentation requirements so that it is clear to both Russian and Western negotiators that there is full governmental support. "Positive decisions cannot be made and success cannot be achieved until there is confidence that all superiors and officials (perhaps as high as the Presidential level) are on board with the program," a Russian official told the Polar Research Board in 2010.[11]

Another example of Arctic cooperation is the Northeast Science Station (NESS) in Chersky, Siberia, one of Russia's most successful scientific organizations in the Arctic. There, the value of relative bureaucratic anonymity and geographic isolation has contributed to the station's success. NESS hosts dozens of foreign scientists each year, collaborating regularly on conference posters and research papers while maintaining important air and climate monitoring stations as part of international partnerships. Away from any military or industrial centers, the research station receives little attention from Russian officials and operates outside of the influence of the Russian Academy of Sciences, which in recent years has increasingly lost its independence to the Kremlin. NESS officials dutifully pay taxes and follow protocols for obtaining permission for their foreign visitors to work, thus allowing the station to avoid political or economic entanglements.[12]

Meanwhile, the Distributed Biological Observatory has shown how high-level, agency-to-agency cooperation can pay off in the Arctic. It is a joint program between the United States, Russia, China, Japan, South Korea, and Canada to visit fixed oceanographic positions along 200 km-long transects north and south of the Bering Strait using "cruises of opportunity"—cruises that were heading to or from the Arctic for other studies. Ships from all six countries take standardized physical, chemical, and biological measurements along established transects without expensive research cruises dedicated to the observatory's data collection. The emerging data set has fueled the publication of numerous scientific papers that detail changes occurring in this dynamic region of the global oceans. Because of budgetary pressures, neither U.S. science agencies nor its partners would have been able to afford to obtain this data any other way. Central to the success of the program has been standard measurement protocols so that ships of opportunity can contribute meaningful data relatively easily.

Even international forums that might breed conflict can instead inspire partnership. As a part of the United Nations Convention on the Law of the Sea (UNCLOS), Arctic nations submit to the convention's commission proposed maps of their continental shelves. These can include boundaries in the Arctic Ocean. The press has portrayed this effort hyperbolically; *Newsweek*, for one, lumped the process in with new Russian military investment in the Arctic, calling it part of "the race to control the Arctic."[13] But Elizabeth Riddell-Dixon has demonstrated that efforts to demarcate the Arctic floor and settle disputes have in fact been fruitful:

> Numerous media articles describe activity pertaining to Arctic continental shelf extensions as a Cold War and a rush for resources, thereby conveying the idea of conflict and competition. Yet the process

> of establishing the limits of the continental shelves in the Arctic has been characterized much more by cooperation than by competition. . . .
>
> Collecting the data required for the submissions is expensive and time consuming—factors mitigating in favor of cooperative ventures. Furthermore, there are very few ice- breakers in the world capable of carving a path through thick Arctic ice, which compels countries to work together.[14]

Riddell-Dixon explains that when two countries have potentially conflicting claims to the seafloor, conducting joint research to collect and interpret data yields geopolitical and scientific benefits for both countries. "Since 2005, Canada has participated in collaborative research projects with Denmark to collect data on the seabed north of Greenland and Ellesmere Island. Not only have scientists from the two countries collected data together, but they have also interpreted them jointly; hence they now have a single data set on which they both agree," she writes. "Having bilateral agreement on a data set makes the data more credible. . . . Having their scientific findings peer reviewed and accepted prior to each country's submission should enhance the prospects of receiving positive reviews."[15]

Russia, specifically, has often been portrayed as the prime aggressor in this supposed struggle for resources. But Russian efforts to map the ocean under the UNCLOS process have served to advance understanding of the Arctic geological processes at play. A conference on undersea ridges hosted by Russia in 2003, for example, served to "driv[e] scientific exchange," Riddell-Dixon said. After reading Russian filings to UNCLOS, Margaret Hayes, of the Office of Ocean and Polar Affairs at the U.S. Department of State, indicated that "the U.S. view of Arctic geology is changing," specifically about the meaning of certain stones found on the seafloor.[16]

## Challenges to Collaboration

As the Arctic's profile has risen, access to other countries' Arctic lands and coasts has emerged as the most contentious issue in terms of international science. In some cases, scientists have trouble bringing equipment, data, or geological samples into or out of Russia. Soil or water samples are routinely detained by authorities; equipment can take months to import or export. In some cases regional officials will block the passage of ships or even individual scientists, as detailed in a 2010 workshop conducted by the U.S. Polar Research Board of the National Academies. "While much research is conducted successfully, there are instances when access issues interfere with the implementation of science programs, particularly when dealing with Russian areas of the Arctic," said an informal summary of the meeting published by the board's staff.[17]

Access to Russian Arctic areas has undergone three distinct phases. During the Cold War, the Soviet Union severely curtailed access by Western scientists to its land and the Arctic Ocean shelf. After the collapse of the Soviet Union, however, one Russian official said:

> Foreign scientific cooperation with Russia in the 1990s was almost without government regulation. The decade provided new opportunities and pitfalls for scientists. It was both a time of new freedom from bureaucracy and rapid financial decay created by the collapsed Soviet economy which plunged the Russian scientific institutions into poverty. Foreigners were able to access unique data and much of the endangered information was saved, preserved and reinterpreted fostered by an infusion of funding from organizations outside of Russia.[18]

Now, in a third phase, the Russian Federation is reinvigorated. At home the bureaucracy is powerful and the central government influential, with an emphasis on oil and gas development, which has created new barriers for Russian and foreign scientists. Abroad, the nation has assumed a more active and in some cases provocative role on the world stage. In the past, the prospects for cooperation between the United States and Russia depended on the extent of geopolitical tension between the two nations.[19] So perhaps now that the superpowers once again find themselves at loggerheads it is not surprising that cooperative scientific efforts face renewed challenges.

A summer 2014 research cruise across the Arctic Ocean provides a case study in international collaboration and geographic access to sensitive Russian areas. The cruise, which focused on geochemical processes along the East Siberian Arctic shelf, was called SWERUS-C3 (Swedish-Russian-U.S. Arctic Ocean Investigation of Climate-Cryosphere-Carbon Interactions).

Sweden provided several key scientists and the research vessel, its prize icebreaker *Oden*; American and British scientists added analytical capability and equipment; and Russian scientists provided overall direction, instrumentation, and expertise, and they also secured crucial permits to operate in coastal areas within Russia's waters.

In general the Arctic Ocean is considered highly under-sampled compared with other marine regions. Research cruises to the East Siberian Arctic shelf are particularly valuable since scientists are deeply interested in whether this area of the Arctic Ocean is releasing greenhouse gases as a result of warming seas. At issue is whether the shallow ocean shelf that makes up the seafloor, originally composed of submerged permafrost, is now a significant source of emissions of methane, a potent greenhouse gas. With this possibility as a key focus, the scientists set out from Tromsø, Norway, to Barrow, Alaska, along the Russian coast, the first of two planned legs of the cruise.

Cruise participants had expected that physical oceanographic data such as ocean temperature and salinity would be quarantined by Russian officials for some months. This is a standard procedure when doing research in the territorial waters of any nation. Sampling of suspected or previously identified methane seeps during the first leg of the cruise proceeded smoothly until the leadership of the cruise approached scientists and asked them to sign a proposed agreement regarding the fate of their data.

The new agreement, said to be written in accordance with the Russian government permit, called for scientists to relinquish all data—it was not limited to physical oceanography—including any copies that existed on hard drives. The agreement also specified that future analyses of the data must include Russian permit holders.

Several researchers angrily refused to sign, creating a standoff and putting some younger researchers in difficult professional positions. The proposed agreement was withdrawn. Scientists relinquished physical oceanography data, per normal procedure, and six months later they received the data back. Other data, such as atmospheric measurements, were not held by the permit holder or submitted to the government.

The Swedish and Russian leaders of the cruise describe it as a scientific success, pointing at joint publications that have flowed from the expedition and plans for more research. But the incident over the proposed data agreement has threatened some future projects for the group and soured personal relationships among some American, Russian, and European scientists.

Arctic scientists say that most research delays involve requests to access Russian waters or territory. However, U.S. sanctions against Russia, established in March 2014 after Russia's military intervention in Ukraine the previous month, have also impacted collaborative Arctic research efforts, albeit in relatively minor ways. A number of Arctic science cruises involving Russian partners have had to wait until the last minute to receive approval from the U.S. Department of State, but none has been canceled or disrupted. A program funded by the Department of State to facilitate exchange between U.S. and Russian scientists on Arctic hazards, called ice jams, has been threatened with cancellation since it involves travel funding for Russian scientists who have been barred under the sanctions regime. However, in September 2015, Department of State officials informed scientists running the program at the University of Alaska, Fairbanks, that they could proceed if the travel funding was omitted from the program. This would prevent U.S. funds from going directly to individuals covered by the rules. The scientists in charge are now raising funds to make up the difference.

### Better Partnership in the Great White North

The U.S. government considers research cooperation in the Arctic more than a scientific issue alone. As University of Vermont law professor Betsy Baker has pointed out, stated U.S. national policy values scientific collaboration as a geopolitical objective in its own right: the current U.S. Arctic Region Policy, promulgated in 2009, has a dedicated section on "Promoting International Scientific Cooperation." Declaring that scientific research "is vital for the promotion of the United States interests in the Arctic region," the policy goes on to state that "better coordination with the Russian Federation, facilitating access to its domain, is particularly important."[20]

Toward this end, in 2013 the United States began to advocate for a new international agreement on scientific collaboration in the Arctic. A new Arctic Council task force, the Task Force for Enhancing Scientific Cooperation in the Arctic, has seen the issue of geographic access emerge as one of the most challenging sticking points in the talks.

"We all recognize that the magnitude of the changes and the rapidity of the changes presents a challenge that no one nation alone can tackle," said Kelly Falkner, director of Polar Programs at the National Science Foundation and a top official for the United States in ongoing negotiations on the issue. "We're building on a strong track record. We just think we can improve our collaboration."[21]

Working drafts of the agreement have emphasized the need for "facilitating" the efforts of foreign scientists within national boundaries. Russian negotiators, meanwhile, have insisted on wording that requires such facilitation to be consistent with existing laws. This has raised concerns by U.S. officials that such a document would do little to change the status quo.

The question of whether the science deal should be a binding agreement has also been a challenge during negotiations. The U.S. negotiating strategy from the beginning was to push for a binding agreement, while Russians preferred a less formal memorandum of understanding.

Furthermore, some bureaucrats contend that the talks will bring about little change because they involve science officials from each country rather than customs or security officials who deal with visa, import/export, and border issues on a daily basis. "U.S. scientists have for years been asking Russian scientists to arrange better visas—that would be like NOAA telling Homeland Security how to do its job," one federal scientist said.[22]

### Moving Forward in the Arctic, Together

Scientific cooperation in the Arctic will most effectively begin at far lower latitudes. Building strong and lasting international partnerships for Arctic studies should take place in an atmosphere of true two-sided scientific exchange. Western research papers on the Arctic rarely reference Russian science, despite the fact that Russians translate the work of their Western colleagues in geoscience within thirty days of when the papers are published. The first step to partnering is learning what each side has to offer.

But sharing literature is only the start. In recent years few Russian scientists have presented findings at the American Geophysical Union's fall meeting in San Francisco, the world's largest annual geoscience conference. More collaboration and direct dialogue between polar researchers at venues and conferences will facilitate joint studies in Arctic forests, tundra, and sea ice.

Researchers can reduce logistical challenges to working in Russia by creating or equipping laboratory facilities in Russia for the analysis of samples taken during joint projects. That approach has helped the successful research-and-education effort called the Polaris Project at NESS reduce the number of samples required to be taken out of Russia.

Another important step might be to encourage increased participation in Arctic research by non-Arctic nations, which can contribute novel insights, logistical support, equipment, and funds. Several Asian states, for example, have provided rich opportunities for collaborative research. Japan has conducted respected research in the Arctic since the 1950s; South Korea's icebreaker *Araon*, commissioned in 2009, is the centerpiece of the nation's strong polar research program. Acquired in 1994, the ice-capable Chinese research vehicle[23] *Xuelong* ("Snow-Dragon") has since carried out regular Arctic research cruises, including international teams of scientists. In 2003 the Chinese established a permanent Arctic research institute in the Ny-Ålesund science base on Svalbard. Additionally, China applied for observer status to the Arctic Council in 2008, which it was granted in 2013 along with six other states, including South Korea and Japan.

Creating successful Arctic collaborations takes time, and work, but certain characteristics have led to successful collaborations in the past. When shared priorities such as fishing or weather are a focus, nations tend to come together for fruitful international projects. Maintaining scientist-to-scientist ties can lead to official international programs with governments funding partnerships, as has happened in the Barents Sea cod fishery and NESS. Coordinating a large number of partners, as the Distributed Biological Observatory has done, can catalyze greater success. Working the system has its benefits, as the Americans in partnership with the Tiksi station have shown; conversely, staying out of the spotlight, as NESS has done, works, too. Whatever approach scientists take in the future, one thing is certain: working together in the unforgiving Arctic has paid off handsomely in the past and could continue to pay rich dividends well into the uncertain future. SD

**Endnotes**

1. John English, *Ice and Water: Politics, Peoples and the Arctic Council* (London: Allen Lane, 2013), 56.
2. National Oceanic and Atmospheric Administration, "The First International Polar Year 1881–1884," accessed May 1, 2015, http://www.arctic.noaa.gov/aro/ipy-1/History.htm.
3. Quoted in: Susan Barr, Cornelia Lüdecke, *The History of the International Polar Years* (Springer Science & Business Media, 2010).
4. John English, *Ice and Water: Politics, Peoples and the Arctic Council*, 56.
5. Ibid, 70.
6. Ibid, 112.
7. Ibid, 113.
8. John Waldman, "How Norway and Russia Made a Cod Fishery Live and Thrive," *Yale Environment 360* (September 2014), http://e360.yale.edu/feature/how_norway_and_russia_made__a_cod_fishery_live_and_thrive/2806.
9. Taneil Uttal, U.S. National Oceanic and Atmospheric Administration, interview with author, March, 2015.
10. Ibid.
11. Polar Research Board, *U.S. Scientific Access to the Russian Arctic Recap*, September 22, 2010.
12. Nikita Zimov, NESS director, interview with author, May 5, 2015.
13. Elisabeth Braw, "Putin Makes His First Move in Race to Control the Arctic," *Newsweek*, January 6, 2015, http://www.newsweek.com/2015/01/16/putin-makes-his-first-move-race-control-arctic-296594.html.
14. Elizabeth Riddell-Dixon, "Canada's Arctic Continental Shelf Extension: Debunking Myths," *Policy Options* (2008).
15. Ibid.
16. Quoted in: Betsy B. Baker, "Law, Science, and the Continental Shelf: The Russian Federation and the promise of Arctic cooperation," *American University International Law Review* 25, no. 2 (2010): 10–38.
17. Polar Research Board, "U.S. Scientific Access to the Russian Arctic Recap," 2010.
18. Aleksey Ostrovskiy, "The RUSALCA Project: A successful example of a public-private partnership approach for Russian-American cooperation in the Arctic," in *Proceedings of a Workshop on Facilitating U.S.-Russian Environmental Change Research in the Russian Arctic*, 2005, http://arctic.cbl.umces.edu/RAISE/RAISE_Workshop_Proceedings1.pdf.
19. Heather A. Conley and Lev Neretin, "Through the Arctic Looking Glass and What the U.S.-Russian Relationship Found There," in *In Pursuit of Prosperity: U.S. Foreign Policy in an Era of Natural Resource Scarcity*, ed. David Reed (London: Routledge, 2014).
20. Baker, "Law, Science, and the Continental Shelf," 10-38.
21. Kelly Falkner, interview with author, March 2015.
22. Taneil Uttal, U.S. National Oceanic and Atmospheric Administration, interview with author, March 2015.
23. Frédéric Lasserre, "China and the Arctic: Threat or Cooperation Potential for Canada?" Canada International Council China Papers no. 11, June 2010.