POLICY FORUM

SCIENCE DIPLOMACY

The Arctic Science Agreement propels science diplomacy

Amid geopolitical tension, science aligns common interests

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Global geopolitics are fueling the renewal of East-West tensions, with deteriorating U.S.-Russia relations in the wake of conflicts in Ukraine and Syria, issues involving cyber-security, and broader concerns about expanding militarization. Against this backdrop, the Agreement on Enhancing International Arctic Scientific Cooperation, signed on 11 May 2017 by foreign ministers of the eight Arctic States, including the U.S. and Russia, as well as Greenland and the Faroe Islands, is a milestone. This "Arctic Science Agreement" is a strong signal reaffirming the global relevance of science as a tool of diplomacy, reflecting a common interest to promote scientific cooperation even when diplomatic channels among nations are unstable (*1*–*3*). It provides a framework for enhancing the efforts of scientists working on cutting-edge issues, but translating the general language of the agreement into enhanced action requires further attention, collaboration, and effort among diplomats and scientists to ensure its successful implementation. With the International Arctic Science Committee (IASC) convening the International Science Initiative in the Russian Arctic (ISIRA) at the Russian Academy of Sciences in Moscow next week, we highlight steps to advance science, its contributions to informed decision-making, and its role in maintaining the Arctic as a zone of peace and cooperation.

STRENGTHENING ARCTIC SCIENCE

Negotiated under the auspices of the Arctic Council through a process co-led by Russia and the United States, the agreement recognizes first "the importance of maintaining peace, stability, and constructive cooperation in the Arctic." This legally binding agreement aims to enhance scientific cooperation by "removing obstacles" (*4*) and by providing a basic road map and commitment to facilitate consistent access for marine, terrestrial, and atmospheric research on a pan-Arctic scale.

The agreement aims to improve use of existing infrastructures that were previously unavailable; enable new movement of researchers, students, equipment, and materials; promote sharing of data and metadata in ways that were not previously possible; and encourage holders of traditional and local knowledge to participate in scientific activities across territories (see the map). The science community, working through the organizations representing it in the Arctic Council, including IASC, the University of the Arctic (UArctic), and the International Arctic Social Sciences Association (IASSA), as well as through separate meetings of science ministers, already has identified substantive priorities for the next phase of Arctic research (*5*).

Concrete examples of improvements needed to achieve success with the agreement would be to (i) establish procedures to expedite the granting of visas and permits for accessing field sites; (ii) digitize historic and other data from hard-copy formats and create shared platforms for searching data located in a variety of repositories, including coordination with the Arctic Data Committee and Sustaining Arctic Observing Networks; (iii) use organizations mentioned in the agreement to set up and monitor research partnerships across borders; (iv) increase support for field and summer schools and related means for training the next generation of Arctic scientists; (v) promote well-formulated comparative studies designed to examine common issues at multiple locations across the Arctic; (vi) maximize the use of icebreakers and other forms of infrastructure for scientific purposes; and (vii) create innovative venues that integrate natural and social sciences along with indigenous knowledge to address common concerns.

Some of these measures will require action on the part of officials in foreign ministries; others can be handled best through organizations representing the science community. Each of the signatories can and should designate an official point of contact with a mandate to assist with the implementation of the agreement, monitor progress regarding efforts to remove obstacles, and make recommendations for the adoption of additional measures as needed.

Although the Arctic States are the signatories, the agreement emphasizes that these States "may continue to enhance and facilitate cooperation with non-Parties with regard to Arctic science." This holistic (international, interdisciplinary, and inclusive) science cooperation broadens the scope of the agreement beyond its defined area (see the map).

PROPELLING SCIENCE DIPLOMACY

The Arctic Science Agreement is the third legally binding instrument to emerge from the efforts of the Arctic States, following the search-and-rescue (*6*) and marine oil pollution preparedness and response (*7*) agreements. All have benefited from Russian and U.S. leadership of the negotiations (along

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Supplies are retrieved by crew from the U.S. Coast Guard Cutter Healy while in the Chukchi Sea, 12 July 2011. The Arctic Science Agreement can improve researchers' access to marine and terrestrial regions.

with Norway regarding marine oil pollution), but only the Arctic Science Agreement enhances the logistic capacity for cross-cutting knowledge discovery and application.

Historically, polar scientists have played important roles in building East-West cooperation as demonstrated at the height of the Cold War. The 1957–1958 International Geophysical Year stimulated cooperation leading to the 1959 Antarctic Treaty, with its membership based on "substantial research" to manage nearly 7% of Earth's area forever for "peaceful purposes only," becoming the first nuclear arms control agreement.

The Antarctic Treaty laid the groundwork for the 1967 treaty promoting the peaceful use of outer space. Derived from common interests of the United States and Russia, among other nations, these two international spaces (*8*) were used peacefully throughout the Cold War and remain insulated from global geopolitics as a result of science diplomacy [see the supplementary materials (SM)].

Drawing lessons from these regions and facing "burning security issues" involving nuclear weapons in the Arctic, Soviet President Mikhail Gorbachev observed in his 1987 Murmansk speech (*9*) that "scientific exploration of the Arctic is of immense importance for the whole of mankind." This speech triggered a stream of cooperative developments with science in the lead.

Recognizing the value of Antarctic Treaty linkages with the Scientific Committee on Antarctic Research, national academies of science moved quickly to establish IASC in 1990. Science-based public agencies took the lead in the 1991 formation of the Arctic Environmental Protection Strategy, which then became the first signed record of international governance among the eight Arctic States (see SM). This catalyzed the 1996 establishment of the Arctic Council (*10*) as a "high level forum" of the eight Arctic States and six indigenous peoples organizations with observers and six technical and science-based working groups, involving key Arctic stakeholders (see the map and SM). In parallel, the education community created the Circumpolar Universities Association in 1989. With the endorsement of the Arctic Council, the UArctic was born in 1998 (see the map).

Within and between nations, research and education together promote understanding of and resilience to external stresses and disturbances (*11*), applying methodologies of the natural and social sciences as well as indigenous knowledge to detect and interpret changes over time and space. For example, diminishing sea ice and increasing ship traffic in the Arctic Ocean highlight biophysical and socioeconomic changes that directly affect the security of Arctic residents facing risks today and across generations (*12*). Moreover, external stressors, which are planetary in scale, raise additional questions (see SM) about the future of the Arctic in our globally interconnected civilization (*5*).

Minimizing the risks of policy shifts, the agreement enhances the stability of research platforms across nations to interpret and disseminate previously inaccessible data, as well as generate continuous data to interpret marine, terrestrial, atmospheric, and human-centered changes on a pan-Arctic scale (see the map). Moreover, scientific investigation is being enhanced to facilitate research on land, extending from marine scientific research under the law of the sea, to which all Arctic States "remain committed" (*13*).

Resulting questions, information, and observations can be organized into data; analyzed to expose patterns, trends, and other insights; and become evidence that can underlie decisions (see SM) about built infrastructure and governance mechanisms. As an apex goal, informed decisions benefit from consideration of available options (without advocacy), which can be used or ignored by the decision-makers. In the

Arctic, this science-diplomacy process (see SM) is being enhanced by the agreement to address the "common Arctic issues," in particular, "sustainable development and environmental protection," established by the Arctic Council (*10*), balancing economic prosperity, environmental protection, and societal well-being. In this context, the Arctic Science Agreement emphasizes "the importance of using the best available knowledge for decision-making."

LOOKING FORWARD

Science, whether for basic or applied objectives, can promote cooperation and prevent conflict by engaging diverse stakeholders in dialogue. With stakeholder inclusion (see the map and SM) enhanced by the Arctic Science Agreement, holistic evidence and options become increasingly feasible for informed decision-making (see SM) to achieve Arctic sustainability across the 21st century, recognizing that children born today will be alive in the 22nd century. As the upcoming ISIRA Workshop demonstrates, the agreement is already generating opportunities to enhance pan-Arctic research that will become increasingly vital, complementing implementation of the 17 Sustainable Development Goals on a planetary scale.

Discussions foreseeing $1 trillion USD of investment in the Arctic over the next few decades (*14*) reveal global commercial opportunities extending across the 21st century (*15*), but with local risks that will swell without planning across generations. Warming of the Arctic (*16*), thermohaline changes in the ocean from melting ice sheets, decreasing albedo as sea ice disappears, and increasing methane emissions from thawing permafrost all have climate footprints with societal, environmental, and economic implications on a planetary scale (*16*).

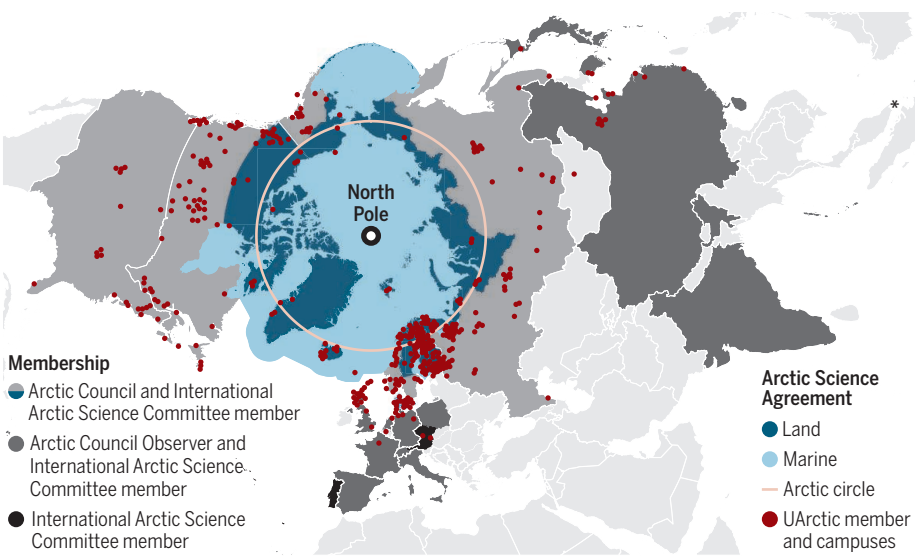
Effective implementation of the agreement will require its associated networks (including IASC, UArctic, IASSA, and partner organizations) to help strengthen research and education across borders (see the map). Considering the sovereign rights of Russia extending over nearly half the Arctic, research partnerships with Russian scientists are critical for Arctic science and diplomatic progress.

Researchers can and should invoke the Arctic Science Agreement as a research-facilitation tool to build partnerships, conduct fieldwork, access data, and begin to answer previously unanswerable scientific questions, especially with pan-Arctic dimensions. The pathway for the researcher could involve the international research and education networks mentioned above to interface with the diplomats, for example, through periodic meetings jointly convened with foreign ministries.

Ultimately, the process of science diplomacy (see SM) builds common interests among allies and adversaries alike across a continuum of urgencies, spanning security to sustainability time scales with efficiencies and synergies that transcend the geopolitics of today. These issues are being discussed among foreign ministries (*18*) and will be relevant to the continuing series of Arctic Science Ministerials (*19*). In the Arctic, as elsewhere, science diplomacy helps to balance national interests and common interests for the lasting benefit of all on Earth with hope and inspiration across generations. ■

Land and ocean areas covered by the Arctic Science Agreement

The map draws on information from the following sources: Extent of the Identified Geographic Area in Annex 1 to the Arctic Science Agreement, U.S. Department of State (2017); H. Ahlenius/Nordpil; IASC; UArctic; thematicmapping.org. The map is a stereoscopic equal distance projection (north-south). See Supplementary Materials for high-resolution map with bathymetry and topography.



*Singapore is an Arctic Council Observer State.

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SUPPLEMENTARY MATERIALS

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