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Before the
Committee on Commerce, Science, and Transportation
United States Senate

"Nuuk and Cranny: Looking at Greenland's Geostrategic Importance to U.S. Interests"

February 12, 2025

Good morning, Chairman Cruz, Ranking Member Cantwell, and members of the Committee. My name is Dr. Jennifer Mercer, and I am the Section Head for the Arctic Sciences Section in the Office of Polar Programs at the U.S. National Science Foundation. Thank you for the opportunity to participate in today's hearing to share the important research and collaboration the U.S. National Science Foundation, known as NSF, is facilitating in Greenland.

Established by the National Science Foundation Act of 1950 (P.L. 81-507), NSF is charged with the mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF is unique in carrying out its mission by supporting research across all fields of Science, Technology, Engineering, and Mathematics, STEM, through grants to colleges, universities and other research organizations across the U.S. To augment the U.S. research enterprise, NSF has established research infrastructure that serves American interests in several strategic locations around the globe, such as ground-based telescopes and research vessels that transit the oceans, that enable discoveries and make the U.S. a global leader in STEM. Most notable for today's discussion are NSF's investments in research infrastructure and operations in the polar regions, including in Greenland. NSF's support of polar research facilities establishes a U.S. presence in the Arctic, facilitates research related to

U.S. critical interests, demonstrates our capabilities as a nation, and builds good will with other nations. This research is important in the polar regions where, as you know, Russia and China are increasingly seeking to extend their reach.

In my role, I oversee both scientific research conducted in Greenland, and the research infrastructure that enables research funded by NSF, other federal agencies, and by international partners that advances U.S. national interests.

Let me tell you a bit more about myself. I was born and raised in South Dakota and completed my undergraduate studies there. After earning my PhD at Dartmouth College in New Hampshire, I was a researcher at the University of Wyoming before joining the Federal government, first in the Department of Defense and then at NSF. The first time I deployed to Greenland was 15 years ago, bringing with me a decade of experience as a researcher in Antarctica. When I told my parents that I was going to Greenland, my dad, an Army veteran who served over 50 years ago, said "Greenland? The Army used to threaten to send us there for disciplinary action. Why would you want to go to Greenland?" Keep in mind that was a long time ago. I'm excited to share with the Committee today why Greenland is so important to the U.S. science and engineering research enterprise. When I stepped off the C-130 my first time in Greenland I was reminded of the vast open spaces of my home state. The towns and villages of Greenland are similar to the rural U.S. with small towns and wide open spaces, where people have both a sense of independence and of looking out for one another. The cold temperatures and biting winds might also be reminiscent of winter in some of our home states.

The polar regions have a long history with both U.S. scientific research and defense operations occurring there simultaneously and together. Greenland was strategic during WWII for the U.S. and its allies. It was again important during the Cold War. It was the site of Camp Century, where the U.S. Army established an operational base under the ice – right around the time my dad was serving. Efforts like this, novel as they were at the time, taught us as a nation a lot about ice sheet and snow mechanics, and how to operate in these extreme environments, knowledge and methods that we still use today for research and operations in both the Arctic and in Antarctica.

NSF has an established relationship with the Government of Greenland, which has authority over research there. All of the research activities that NSF supports in Greenland are conducted consistent with Greenland law and regulations, including obtaining any necessary permits from the Government of Greenland.

To make scientific research both successful and efficient in Greenland and throughout the Arctic, we at NSF collaborate across the U.S. government with the Department of State, several Department of Defense services such as Space Force, Air Force, Air National Guard, and Army research labs including the Cold Regions Research and Engineering Laboratory and the Natick Soldier Systems Center. NSF funds the research capabilities, as well as research projects, on the U.S. Coast Guard's Icebreaker HEALY which just last summer visited Greenland. NSF facilitates research logistics in the Arctic, on a cost reimbursable basis, for NASA, NOAA, and other agencies that are supporting activities there.

U.S. scientific research spans from the marine environment to the coastal villages and towns, to the top of the Greenland Ice Sheet. Today, about 80% of Greenland is covered in ice, and at its thickest points it is nearly 2 miles deep. The Greenland Ice Sheet is a massive feature that is important for understanding variability in the earth's land ice, and the ice sheet is an ideal location to study atmospheric circulation. Research in the coastal waters of Greenland is important for understanding marine ecosystems, ocean circulation, and the submarine environments which support fishing and vessel navigation.

NSF awards support research at 15-20 locations throughout Greenland each year with upwards of 300 people per year to carry out the work. NSF's main operational locations are the village of Kangerlussuaq, the United States' Pituffik Space Base, formerly Thule Air Base, on the west coast, and Summit Station and Raven Camp on the Greenland Ice Sheet.

Until recently, Kangerlussuaq was the only airport capable of accepting large intercontinental airplanes. In 2024, Greenland opened their new international airport in Nuuk and plans to extend capabilities at two other airports.

Pituffik Space Base is operated by the 821st Space Base Group with a mission to enable force protection, space superiority, and scientific research in the Arctic region for our nation and allies. It is due to the long history of NSF and the Air Force working together in Greenland that supporting scientific research is part of the base mission.

NSF also operates Raven Camp on the Greenland Ice Sheet. This seasonal camp serves as a backup landing site on the ice sheet and as a training site for the NY Air National Guard's 109th Airlift Wing that operates the ski-equipped LC-130 aircraft fleet – the only fleet of its kind, capable of landing large loads of cargo and fuel on snow runways known as skiways. The U.S. is the only country with this capability. The LC-130 is the backbone of transportation within Antarctica and on the Greenland Ice Sheet.

Summit Station, where NSF owns the infrastructure and operates with permits from the Government of Greenland, is the only high altitude, high latitude, inland year-round research station in the Arctic. Summit sits at a physical elevation of 10,530 feet above sea level and at times the pressure altitude can reach 13,000 feet – meaning that the air pressure makes it feel higher than it is – 13,000 feet is similar to the top of Grand Teton in Wyoming. Temperatures range from -88 degrees F in the winter to just below a freezing 32 F in the summer. Summit Station was established initially in 1989 as an ice drilling camp and in 1993, after drilling around the clock during the summer months, scientists retrieved what was the deepest ice core in the world at that time. Year-round operations began at the station in 1997 focusing on continuous atmospheric sampling and measurements. People and cargo are delivered to the station via the LC-130 aircraft fleet. Summer population tends to hover around 35 people and in winter a small staff of 5 people maintain the station, its systems, and the scientific research. Clean water for drinking, cooking, and bathing is produced by melting snow. Food is kept frozen by storage in underground snow trenches.

NSF is currently in the process of designing new station infrastructure for Summit so that we can replace approximately 30 outdated buildings with five elevated buildings and two surface level buildings which will allow for more efficient and flexible operations. The wind and snowfall at Summit Station constantly threaten to bury buildings through drifting. This new infrastructure will be easier to maintain over time and will serve as a hallmark of U.S. scientific research in the Arctic.

Greenland's capital city of Nuuk has a strong research community of its own. It has several small research organizations such as Asiaq, which is similar in concept, but not scale, to the U.S. geological survey. It also has the larger Greenland Institute of Natural Resources which houses departments for the study of fish, bird and mammals, mineral resources, and climate. Greenland also has a national Research Council which funds research and develops research priorities for the country, including a national strategy for research in Greenland.

The U.S.-Denmark-Greenland Joint Committee was established in 2004 to broaden and deepen cooperation among the United States, the Kingdom of Denmark, and Greenland. The Joint Committee is led by Department of State, and NSF has long funded the U.S. component of the Joint Science Education program which was originally established by the Joint Committee. This program provides field science experiences for students from Greenland, the U.S., and Denmark each summer.

Over a decade later, the Joint Committee created an Embassy Science Fellowship opportunity through our U.S. Embassy in Denmark. In 2017, I had the privilege to serve as that Embassy Science Fellow. But instead of being stationed at our embassy, I was embedded with the Government of Greenland in Nuuk, with the ministry that oversees research in Greenland. This was an extraordinary opportunity to see and learn first-hand about Greenland's priorities for scientific research and STEM education, and to build relationships with its leaders.

Currently, NSF has approximately 75 active grant awards to U.S. institutions for research in, around, and about Greenland. Several of those awards are to institutions in your home states.

For example, the University of Texas at Austin is leading a study of ecological dynamics in a fjord that is connected to a glacial outlet. This has implications for the fishing industry which is rapidly developing in the Arctic. This work also contributes to U.S. understanding of emerging dynamics that may influence global food security.

Another example is a long-standing project at Summit Station called ICECAPS which refers to the integrated Characterization of Energy, Clouds, Atmospheric state, and Precipitation at the top of the Greenland Ice Sheet. This project is led by Washington State University with collaborators from institutions in Colorado, New Hampshire, Wisconsin, and Idaho as well as in the UK. It is aimed at understanding atmospheric dynamics over the Greenland Ice Sheet and has implications for daily weather forecasting in the northern hemisphere.

University of Kansas is developing sensor technology to add to drones to improve mapping of glacial activity in Greenland, while the Universities of Montana and Wyoming are working together to develop a novel ice drilling capability to understand how meltwater affects ice movement along the margin of the Greenland Ice Sheet.

And Penn State is working with institutions in Delaware, Nebraska, Wisconsin, Kansas, Illinois, and a few other states to establish the first ultra-high energy neutrino observatory in the northern sky.

These are just some highlights of the important scientific study happening in Greenland where the U.S. is a leader and a collaborator in research. The Arctic, including Greenland, contains distinct physical features that allow for unique research opportunities with practical impact. The ice sheets and sea ice affect ocean currents and our weather patterns in the northern hemisphere. The extreme cold, and long dark winters, prompt physiological adaptations in mammals that may have applications to the human body, and the harsh

conditions allow us to evaluate infrastructure performance and advance materials science. In addition, the high altitude of Summit Station offers a unique and important platform in the high Arctic for the study of astrophysics.

In closing, I am honored and grateful for the opportunity to talk about NSF's important work in Greenland with you. Thank you.