

The Snow Dragon: China, Polar Science, and the Environment

With its unique geographic location and natural environment, the Arctic has great scientific value as an indicator of global climate change and a “laboratory” for global scientific research. As of today, mankind’s exploration and understanding of the Arctic is still limited. This makes it necessary for governments, social organizations, academia and business community to work together, further strengthen cooperation, and explore and understand the Arctic in a comprehensive way.

VICE FOREIGN MINISTER ZHANG MING,
Third Arctic Circle Assembly (2015)¹

Science forms an important foundation for Canada’s Northern Strategy across all four of its pillars, a fact demonstrated by Canada’s world-leading \$150 million investment in the International Polar Year (2007–09).² Arctic research initiatives emphasize Canada’s international obligation to contribute to knowledge about the “nature, mechanisms and extent” of connections between the Arctic and the rest of the globe.³ The federal government is carrying through on its promise to create new research infrastructure, particularly a world-class Canadian High Arctic Research Station (CHARS) in Cambridge Bay, Nunavut, and Canadian granting councils are encouraging researchers to coordinate their efforts across relevant topic areas (such as resource development, transportation, community sustainability, health, and

the environment) so that they can translate their findings into concrete policy recommendations.⁴

This emphasis dovetails with Chinese priorities and capabilities. Viewed through the lens of official statements, China's primary Arctic concern relates to climate change and associated scientific research efforts.⁵ Speaking to Norway's High North Study Tour in 2010, Assistant Foreign Minister Liu Zhenmin argued that, by virtue of China's geographic location, it is exposed to Arctic weather patterns, with impacts on the country's agriculture and economic development. The melting of the ice cap also affects the country's continental and ocean environment. Dr. Huigen Yang, the chief scientist of the IPY China program and the director of the Polar Research Institute of China at Shanghai, explained that:

The Chinese public has understood the linkage between the unprecedented sea ice retreat in the Arctic Ocean in September 2007 and the heavy snow disasters that happened in southern China in January of 2008. Many Chinese have also realized that if all Arctic and Antarctic ice sheets melt, the consequent sea level rise would affect China's coastline and the most populated and prosperous regions such as Guangzhou, Shanghai and Tianjin would be totally under water. Chinese scientists have attached great importance to the Arctic and Antarctic regions in understanding the earth system and its global changes and in pursuit of sustainable developments on this planet.⁶

The report of the Second Sino-Canadian Exchange on the Arctic provides a tidy summary of Canada's situation:

Canada has an extensive coastal archipelago with complex navigable and non-navigable channels in the Arctic. It claims the full range of maritime zones permitted by the United Nations Convention on the Law of the Sea, 1982 including a claim of historic internal waters over the interconnecting waters of its Arctic archipelago. Like other Arctic Ocean coastal States, Canada is in the process of preparing a submission regarding the outer limits of its extended continental shelf in accordance with the LOS Convention. Pursuant to its Northern Strategy Canada has

active programmes to support indigenous and other communities in the region, resource exploration, marine scientific and climate research, development of infrastructures, maintenance of navigation aids and services and building of polar capable vessels. It has bilateral agreements for scientific and climate research, navigation areas and meteorological information services, search and rescue, oil pollution response and other matters with its neighbours.⁷

Although Canada is a global trading nation, its perspective on the Arctic is unambiguously that of a coastal state with all the rights and responsibilities that that entails.

China's interests in the Arctic are best conceptualized as those of a "maritime state" rather than those of a coastal state (the lens which dominates its regional maritime interests). During the First Sino-Canadian Workshop on the Arctic, held in Beijing in February 2010, Dr. Gao Zhiguo (then a sitting member of the International Tribunal for the Law of the Sea) explained that while China does not border the Arctic Ocean, it has significant economic and maritime interests in the region.⁸ In particular, China is interested in enhanced navigational access to Arctic waters and the economic potential of the region, particularly with regards to offshore oil and gas. As a major shipping power and oil importer, China would expect to benefit or be affected by the opening of new sea routes and the exploitation of oil and gas and other natural resources in the Arctic Ocean. Furthermore, as a party to both the LOSC and the Svalbard Treaty (as well as other international instruments applicable to the Arctic), China is actively engaged in multilateral discussions about Arctic issues and is concerned about the potential loss of access to open ocean and deep seabed areas.⁹

From a research perspective, China can be conceptualized as a polar state, rather than an Arctic state. Its interests in Antarctic research predate its Arctic interests and the China Arctic Administration/China Institute for Marine Affairs budget still reflects an 80/20 per cent split in favour of the southern pole. The Chinese Arctic and Antarctic Administration's website is telling:

[The Chinese Arctic and Antarctic Administration] has been playing an active role in the scientific research and international

cooperation activities in the Antarctic continent and the Southern Ocean within the principles and the framework of the Antarctic Treaty System. China has done 27 national Antarctic expeditions until 2011 with the operating of two year-round Stations, namely the Great Wall Station located in King George Island, west Antarctica and the Zhongshan Station located in the Larsemann Hills, east Antarctica, and one inner land summer station, namely the Kunlun Station ... Within the framework of related conventions, treaties and other legal obligations, China is making her contribution to the scientific research and peaceful development both in the Antarctic and Arctic.¹⁰

When discussing polar science, China clearly emphasizes its accomplishments and contributions in the Antarctic above those in the Arctic. Accordingly, China's interest in Arctic scientific research must be situated within its broader polar research program. New Zealand political scientist Anne-Marie Brady notes that Beijing's annual spending on polar expeditions has trebled over the last decade and it has made huge investments in polar-related infrastructure. She quotes the Deputy Head of the China Arctic and Antarctic Administration Chen Lianzeng, who stated in June 2011 that the overall goal of China's five-year plan for polar research was to increase China's "status and influence" in polar affairs to better protect its "polar rights." Brady astutely observes, however, that "for all the attention it receives, China is not putting a lot of money into its Arctic program" and, "compared to China's budgeting elsewhere, the polar budget receives very little funding. On the Arctic, Beijing produces a lot of smoke, mirrors and big talk, which disguises their small investment."¹¹

Nevertheless, Brady acknowledges that China's increased polar science expenditures and activities in recent years "reflect the country's growing economic and political power and international ambitions."¹² With its growing economy and expanding global interests, China certainly has the resources and capacity to enhance its polar research profile. As Rob Huebert and other commentators emphasize, the substantial investment that China has made in polar sciences over the last decade has dramatically expanded its pool of experienced polar scientists and its network of polar research centres, including a new surge of interest in circumpolar political and legal issues.¹³ Still, to suggest that China invests more in Arctic science than Canada is erroneous.

This chapter explores the substance of China's research interests, activities, and capacities, and shows them to be poor fodder for alarmist narratives.

The Arctic and Climate Change

A more sober analysis suggests that much of China's interest in the region relates to changing climate. Of all the regions in the world, the Arctic has had the greatest influence on climate change over the past century. Many studies and climate models¹⁴ indicate that increasing levels of atmospheric greenhouse gases will bring intensifying large-scale change in the Arctic during this century, including a general scientific consensus that the region will warm between three and four degrees by 2050.¹⁵ Indeed, the Governing Council of the United Nations Environment Programme (UNEP) characterized the Arctic as the world's barometer of environmental change. Its February 2008 resolution on "Sustainable Development of the Arctic Region" urged better cooperation between states and non-governmental stakeholders to ensure sustainable development,¹⁶ given that the root causes of climate change are intrinsically global.

The impacts are also regional and local. The effects of climate change on the Arctic ecosystem have been widely documented, including rising temperatures, melting icecaps, glaciers and permafrost, and changes in flora and fauna.¹⁷ The decline in Arctic sea ice levels is a tangible indicator that the world's cryosphere – comprising that part of the earth's surface where frozen water is present – is fundamentally changing. The landmark report of the Arctic Climate Impact Assessment (ACIA) in 2004 noted a rate of sea ice reduction from 1972–2002 of approximately 300,000 km² per decade.¹⁸ Satellite data reveal that, in the Arctic Basin north of 65°N and between 50°E and 290°E, the open water area has increased at the rate of 23 per cent per decade while sea surface temperature has increased at 0.7 degrees per decade.¹⁹ According to the ACIA report, the rate of warming in the Arctic is more than twice the global average.²⁰

Based on recent forecasts, some zealous commentators predict that the decomposition of this ice will leave the Arctic Ocean similar to the Baltic Sea, reportedly covered by only a thin layer of seasonal ice in the winter and therefore fully navigable year-round.²¹ In addition, while the timelines are hotly contested, many observers do predict that the Arctic Ocean will be

completely ice-free during the summer in the coming decades,²² with some indicating that this may even occur within the next decade.²³

Although commentators tend to emphasize climate change as a “threat multiplier which exacerbates existing trends, tensions and instability,”²⁴ the challenge in the Arctic will likely relate to humanitarian and ecological issues, not a heightened danger of military conflict over the next decade. Thomas Homer-Dixon asserts that:

the most common “state-centric” concerns about the effect of climate change on the Arctic ... are exaggerated. These concerns are grounded in a set of assumptions that may have been appropriate for 19th and 20th century world affairs but are entirely inappropriate as a basis for addressing the 21st century’s challenges. Indeed, these state-centric concerns divert policy attention away from far more critical issues, including the larger climate consequences of Arctic ice loss, such as more rapid melting of the Greenland icecap, invigoration of carbon-cycle positive feedbacks, and potentially dramatic changes in precipitation patterns much farther south affecting global food production ... Access to the Northwest Passage and to reserves of oil and natural gas in the Arctic Basin will seem trivial in a world whipped by climate change shifts resulting from loss of Arctic sea ice. Policymakers need to focus on what is really important, not what fits their 20th century worldview.²⁵

Potential security and sovereignty threats must be considered alongside issues of food security, cultural survival, physical health, threats to settlements on the coast or built on permafrost, and the vulnerability of critical infrastructure. By extension, both preventing and adapting to climate change are abiding concerns for Indigenous groups. These groups recognize that global action is needed to reduce greenhouse gas emissions and slow the pace of change to provide northern residents with time to adapt to changing conditions – to the extent that such adaptation is possible.²⁶

However defined, Canada’s climate change strategy must be global in its aspirations for mitigation while sensitive to the needs for – and limits of – local adaptation. After all, overwhelming scientific data indicates that anthropogenic pollution is the leading cause of climate change. Over two centuries

of industrial activity has elevated atmospheric greenhouse gas concentrations and air pollution (i.e. persistent organic pollutants) over time, with the Arctic's climate catching a disproportionate share of such pollutants in a "cold trap."²⁷ The melting of the sea ice, receding glaciers, changing weather patterns, and the thawing of the permafrost are all signs of and contributors to global warming. Scientists have discovered that the modest thawing of the permafrost occurring can trigger a warming cycle as methane gas is released. Although methane is present in the atmosphere at a smaller volume than carbon dioxide, it can absorb twenty-five times more heat from the sun than carbon dioxide. If all of the existing Arctic permafrost melted, this would release approximately ten times more methane into the atmosphere than the current annual rate of global greenhouse gas emissions.²⁸

Reduced ice cover has also produced more erosion along Arctic shorelines, which directly affects some Arctic communities. Furthermore, some air pollutants – notably black carbon²⁹ – darken the ice caps, changing the reflective surface to absorb more sunlight and exacerbating a positive feedback, a dynamic that creates a melting cycle known as the ice-albedo feedback loop. This effect is playing out on a large scale as reflective glaciers and sea ice are replaced by dark, heat-absorbing land and open water.³⁰ These changes help to explain the consistent trend toward warmer and less icy conditions. Increased blending of tropical air and polar air has also produced larger and more intense weather systems and regional climatic changes, including severe tropical storms, winter storms in Eastern Canada and the United States, and the overall trend of warmer winters. Even if worldwide emissions were to stop today, atmospheric greenhouse gas concentrations would remain elevated. Scientists debate if the world will soon reach a "tipping point" when the effects of climate change cannot be slowed – or if this point has already been passed.³¹

Drastic changes to the ecology and biodiversity of the Arctic directly affect human habitats. Indigenous communities have adapted to the Arctic climate and its related stresses over millennia, but emerging climate-related stresses are occurring over an unprecedentedly short time-scale, and have added a new set of challenges and sense of urgency that is likely to accelerate over the next decade and beyond. The Arctic Climate Impact Assessment noted that, "for Inuit, warming is likely to disrupt or even destroy their hunting and food sharing culture as reduced sea ice causes the animals on which they depend to decline, become less accessible, and possibly become extinct."³² This statement raises core questions about the future of Arctic societies and

the limits of adaptation. Author Alun Anderson tidily summarized that: “the Arctic is ever more entangled with the south and ever more at the mercy of decisions made elsewhere, often without the slightest consideration for the top of the world.”³³

This discussion highlights what most scientists have known for decades: climate change is not simply a regional issue but a global one. Joshua Ho, a senior fellow at Nanyang Technological University in Singapore, notes the implications for Asia. According to a November 2009 World Wildlife Fund (WWF) report on the impacts of climate change on major urban centres, Asia is the most vulnerable continent to changing precipitation patterns, rising sea levels, and extreme weather events. He cites another analysis, conducted by the Tyndall Centre for Climate Change Research at the University of Oxford, which estimates that an increase of one metre in sea level by the end of this century will displace more than 100 million people and flood more than 900,000 square kilometres of land in Asia. This will affect major cities in China such as Guangzhou, Shanghai, Tianjin, and Ningbo.³⁴ Studies also indicate that the Arctic air stream generates extreme weather in China.³⁵ According to recent ICPP reports, Asia will overwhelmingly bear the brunt of the natural, and consequently social, consequences of climate change.³⁶

The Chinese public acknowledges climate change and its consequences.³⁷ Given that the long-term effects of global warming have an obvious bearing on Asian interests, it is small wonder that China and other Asian states wish to take an active role in polar research, conduct Arctic studies, and increase their involvement in international institutions and conferences.³⁸

China's Polar Research Program

Although media commentators often perceive China's scientific interest in the Arctic as a very recent phenomenon, China has been doing research in the Arctic for several years, the organizational foundations for which were established some time ago.³⁹ China has been a party to the 1920 Treaty Concerning the Archipelago of Spitzbergen (also known as the Svalbard Treaty) since 1925,⁴⁰ though China did not show much direct interest in polar research until it created the Office of the National Antarctic Expedition Committee in 1981. Although China amassed field research experience in the Antarctic in the 1980s,⁴¹ its polar research capabilities only expanded significantly during the 1990s.⁴²

China began strengthening those programs with the founding of the Polar Research Institute of China (PRIC) in 1989 and the renaming of the Office of the National Antarctic Expedition Committee as the Chinese Arctic and Antarctic Administration (CAA).⁴³ Falling under the State Oceanic Administration, the CAA directly manages polar affairs and is administratively in charge of China's National Arctic/Antarctic Research Expeditions (CHINARE).⁴⁴ Its primary functions are:

1. Drawing up the national strategies, policies, and plans for Chinese Arctic and Antarctic expeditions, and organizing the studies on the major polar issues.
2. Formulating the laws, regulations, relevant standards, and rules concerning polar expeditions and other polar activities, and administering relevant Arctic and Antarctic affairs in accordance with laws and regulations.
3. Being responsible for the organization, coordination, and supervision of the Chinese National Arctic and Antarctic expeditions, and organizing the scientific research activities within the polar area.
4. Being responsible for the organization, coordination, and supervision of the infrastructures and capacity constructions for Chinese National Arctic and Antarctic expeditions.
5. Organizing and coordinating the manning for Chinese polar expeditions, and administering the Chinese polar expedition winter training base and the representative offices abroad.
6. Organizing and participating in the international affairs and organizations in the area of polar research. Cooperating with the overseas national polar programs.
7. Undertaking the science popularization and promotional work in the area of polar expedition.
8. Undertaking the other tasks assigned by SOA.⁴⁵

The PRIC, located in Shanghai, is the other primary Arctic-focused institution.⁴⁶ In February 2010, Dr. Yang Huigen, the Institute's director, explained its missions: to carry out scientific, technological, and strategic studies in the Polar regions; to conduct polar environmental monitoring and detection; and to operate polar vessels, stations, and logistical support. Its dedicated labs and facilities provide Chinese researchers with the means to organize polar expeditions, with a research focus on subjects including glaciology, oceanographic science, upper atmospheric physics, biological science, and polar information platforms. Yang also outlined the PRIC's future plans, which includes new facilities in Shanghai, an expansion in personnel (from 144 to 229), and capacity-building investments such as new Antarctic and Arctic research facilities, and laboratory upgrades.⁴⁷ In a move that reflects China's increasing awareness of the Arctic's geopolitical and strategic importance, Zhang Xia, who published the first Chinese report on Arctic geopolitics, established an Arctic strategic research department at the PRIC in July 2009.⁴⁸

The PRIC also oversees China's Polar Information Centre, created in 1995. It has become a national repository for polar archives with nearly 1,000 volumes of polar scientific and technological sources, more than 1,000 photographs, twenty records of audio-visual materials, and 1,000 digital discs. The Polar Research Library contains approximately 20,000 brochures, 270 reference books, and over 4,000 technical studies. China also created a digital database system in 2002 that now includes over 2,000 datasets covering polar oceanography, solar-terrestrial physics, and glaciology, with about 80GB of data available online, and hopes that this may serve as the basis for an international database on polar science.⁴⁹ It also seeks to participate in a spatial data infrastructure (SDI) initiative with the Arctic states, where Arctic data, information, and services are shared and integrated in a seamless manner.⁵⁰

Other Chinese organizations and institutions engaged in polar research include the Shanghai Institutes of International Studies (SIIS), one of the most prestigious Chinese research institutions in the area of international affairs, and the China Institute for Marine Affairs (CIMA), which was established within the SOA in 1987 to conduct research on marine policy, legislation, economics, and interests. The SOA also has particular competency on Arctic legal issues. Meanwhile, the Chinese Academy of Sciences conducts scientific studies about the Arctic environment and climate change, mostly through the Institute of Oceanology (a multidisciplinary forum for marine science research and development).⁵¹

Academic “institution-building” also indicates rising Chinese academic interest in Arctic affairs in recent years. In 2010, the Ocean University of China established the Polar Law and Politics Research Institute as the first institute in China dedicated explicitly to polar social science research. The China-Nordic Research Center was founded in 2013 in Shanghai as a joint Chinese-European centre for cooperative research.⁵² In 2016, the Russian Far Eastern Federal University established a Polar Engineering Research Centre with the Chinese University of Ha’er Bing, with a focus on the industrial exploitation of the polar regions.⁵³ Other polar research institutes have also been established at Shanghai Jiaotong University, Fudan University, and Wuhan University.⁵⁴

China’s physical assets have likewise been expanding. In 1993 Beijing purchased a Russian-made icebreaker from Ukraine, which it christened *Xue Long* [雪龙] (the Snow Dragon). This 167-metre-long vessel has an icebreaking capacity of up to 1.2 meters and is equipped with advanced self-contained navigation and weather observation systems, along with a data processing centre and seven laboratories.⁵⁵ Its complement also includes three boats and a helicopter. In October 2009 the State Council (the Chinese Cabinet) decided that *Xue Long* alone no longer met the country’s expanding polar research needs and required “brothers and sisters.” After months of deliberating between purchasing a second-hand foreign vessel and building domestically, Beijing approved the building of a new high-tech polar expedition research ice-breaker. Preliminary plans peg the cost at two billion yuan (\$300 million) and work has been under way within the CAA since at least early 2009.⁵⁶ This new icebreaker, with a displacement of 8,000 tonnes and a 20,000 nm endurance, will be smaller than the *Xue Long* but still a substantial vessel, specifically designed as a platform for scientific research. Designed in cooperation with an international company and built in a Chinese shipyard, it should be delivered in 2019.⁵⁷

Cumulatively, these organizations, institutions, and assets signal China’s interest in conducting multidisciplinary studies that integrate the interests of government and non-governmental institutions. They also illustrate China’s limitations in coordinating efforts. Funding, for example, flows from various sources administered by the State Council. Obtaining a decision can be laborious and lengthy, given bureaucratic red tape and competition for resources, authority, funding, and attention. This helps to explain ambiguity about

“China’s” position on Arctic issues and why it is unlikely to issue an official policy towards the Arctic region.

China and the Antarctic

While China’s Arctic activities get a lot of attention in alarmist narratives, they are better framed as a small component of a significant polar research program. In recent years, the Chinese government announced significant increases in its Antarctic research program. The past two Five Year Plans (2006–10 and 2011–15), for instance, increased the country’s Antarctic research budget from \$23 million in 2003 to about \$55 million per annum, in addition to significant new investments in infrastructure. Anne-Marie Brady provides a concise summary of these historical and contemporary activities: “Beijing acceded to the Treaty in 1983, launched the first Chinese expedition to the Antarctic continent in 1984 and rapidly built two bases, first Changcheng Station on the Antarctic Peninsula (1985), then Zhongshan Station (1989) on the Australian Antarctic claim. All along China’s engagement in Antarctica has focused on establishing a significant presence, which would enable it to assert rights to be involved in decision-making.” In 2008, it built Kunlun Station at Dome A (including telescopes for deep space research), with Chinese scientists declaring that “the research done here may lead to China’s first Nobel Prize for science.” Officials have also indicated plans to establish a fourth Antarctic base. Compared to these infrastructure expenditures, however, Brady notes that actual scientific research funding is modest, and China has no dedicated fund for polar science.⁵⁸

Brady estimates Beijing’s annual spending on polar affairs at roughly \$60 million – about the same as India and South Korea. Although these are modest expenditures compared to “established players” like the United States and Australia in the Antarctic (see figure 2.1) and the United States and Canada in the Arctic, China’s “massive investments in polar hardware in the last five years” set it apart. The US, for example, “capped polar spending in 2008 and is desperately in need of a new icebreaker. By contrast, Beijing recently spent \$60 million to refurbish its Antarctic research bases and upgrade its national polar facilities in Shanghai. It also found \$300 million for a new icebreaker and plans a new ice-capable plane, a new polar campus in Shanghai, and a rapid expansion of the numbers of Chinese polar scientists from 200 to up to 1,000.” Brady soberly observes, however, that this dramatic

expansion of China's polar infrastructure does not correlate to a strong impact on polar science:

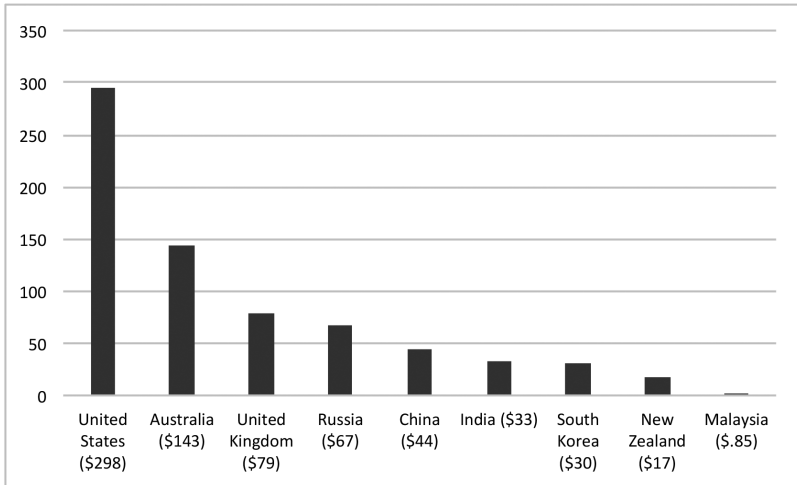
With the successful completion of the current five-year plan's objectives in 2015, China will have caught up with most of the developed states' Antarctic operational capabilities with two ice-fitted ships operational, ice-suitable long-range aircraft, and state-of-the art facilities at its polar bases. Beijing will not be spending as much, because it simply does not engage in as much science. In the 2011–2012 austral summer, China sent only 17 scientists to work at Changcheng Station while a mere six scientists worked at Zhongshan Station that year. In the Arctic, China is even more of a bit-player when it comes to science, but any activities there are promoted heavily in Chinese media reports targeted at both domestic and foreign audiences.⁵⁹

Some Western scholars warn that it is simply a matter of time before Chinese researchers and scholars take a stronger position in Arctic studies and use this as leverage to influence Arctic affairs,⁶⁰ but they have succumbed to symbolism rather than substance in heralding China's ascendancy to the top rank in polar science.

China's scientific engagement in the Antarctic has brought diplomatic benefits with various countries. International collaborations with countries such as Canada, Chile, France, Germany, Norway, Japan, New Zealand, South Korea, Romania, Russia, the United Kingdom, and the United States since the 1980s have "not only been profitable from a scientific point of view, they have also been a useful platform for track-two diplomacy." Scientific activities bring a country legitimate influence in decision-making about governance and resource management on the continent, so Brady notes that "it is only natural that Antarctic diplomacy is also frequently conducted via scientific cooperation." Given that "these scientific exchanges almost always continue regardless of other disagreements between the cooperating countries ... they can serve as a useful confidence-building exercise" in addition to their scientific contributions.⁶¹

It is reasonable to assume that China is applying a similar logic to the Arctic. Trends in Antarctic research may also indicate China's approach to balancing scientific interests with sovereignty concerns. For instance, in

2.1 Investments in Antarctic Research in millions of USD, Anne-Marie Brady, “The Emerging Economies of Asia and Antarctica: Challenges and Opportunities,” in *Australia’s Antarctica: Proceedings of the Symposium to Mark 75 Years of the Australian Antarctic Territory*, Julia Jabour, Marcus Haward, and Tony Press eds. (Institute for Marine and Antarctic Studies, Occasional Paper no. 2, February 2012.)



recent years China has offered “generous research and funding opportunities to Australian scientists” to appease concerns about research activities in the Australian Antarctica claim area.⁶²

China and Arctic Research

In February 2010, Dr. Chen Liqi provided participants in the First Sino-Canadian Workshop on the Arctic with a review of Chinese priorities for Arctic scientific research, emphasizing Chinese scientists’ interest in the impact of climate change in the Arctic and how these changes will affect other ecosystems around the world. He reviewed scientific observations about atmospheric and climate systems, ocean waters and systems, sea ice, environmental processes, and ecology. He explained that CHINARE had conducted three scientific cruises on the *Xue Long* in the Arctic Ocean since 1999. In addition, China established the Yellow River (Huanghe River) research station on Svalbard in 2004 – after setting up its own section at Ny-Ålesund in 2003 – and carried out annual research expeditions there. Research findings

from these expeditions relate to physical changes in the Arctic Ocean (such as halocline structure, ocean currents, sea level, and biogeochemistry) and their impacts on global climate change; atmospheric-ocean-sea ice interactions and its influence on climate and ecosystems; and Arctic environmental processes and ecological evolution.⁶³ Chinese publications on polar science reflect this emphasis on the natural sciences.⁶⁴

China has completed seven Arctic science missions (compared to thirty-two Antarctic science missions) through to the end of 2016. Using the *Xue Long*, it completed its first Arctic expedition in 1999 where it conducted scientific programs in the Bering Sea, Chukchi Sea, and the Canadian Basin in an attempt to better understand:

1. the role of the “Arctic in the global change and its impact on the climate in China”;
2. the variable impact of the water mass exchange between the Arctic Ocean and North Pacific on the North Pacific circulation; and
3. the ecosystems and living resources in the sea area adjacent to the Arctic Ocean on the development of China’s fishery.⁶⁵

Although the Chinese authorities notified Ottawa that the *Xue Long* intended to sail into Canadian waters, and the Canadian Ice Service used Radarsat data to help the icebreaker navigate through thick ice north of the Alaskan coast, the ship’s arrival in Tuktoyaktuk, Northwest Territories surprised local officials. Defence scholar Nancy Teeple notes that:

The unannounced arrival at Tuktoyaktuk was apparently the result of miscommunication between agencies in Canada, as sources report that the Canadian embassy in Beijing had been notified by the crew of their intentions to sail into Canadian waters. Assuming that the ship intended to sail north, away from Canadian waters, the Canadian Ice Service did not communicate the seemingly unannounced presence of the Chinese ship to Canadian authorities – i.e., the CCRA, CIC and Transport

Canada. In addition, Beijing would have informed Foreign Affairs, whose role would have been to inform the RCMP and relevant agencies that the Chinese had requested permission to sail into Canadian waters.⁶⁶

The Standing Senate Committee on National Security and Defence later concluded that the Chinese had provided advanced notification and had received the requisite approvals; still, this episode exposed the lack of interdepartmental communication among Canadian federal stakeholders and raised questions about intelligence, law enforcement, and potential espionage. The alleged discovery of “excessive” weapons and ammunition aboard the ice-breaker⁶⁷ further served to make the case an oft-cited example of the potential security threat emanating from the North and Canada’s need to invest in Arctic surveillance and enforcement capabilities.⁶⁸

Sébastien Pelletier and Frédéric Lasserre concluded in their recent study of the affair, based upon a series of Access to Information requests submitted between 2010 and 2012, that they had no reason to suspect bad intentions on the part of China in connection with the *Xue Long*’s 1999 visit or that the ship posed a real security threat. They also question the idea that the vessel arrived unannounced or that its appearance was a surprise to Canadian authorities, given that the RCMP was aware in advance that the Canadian consulate in Shanghai had issued eighty one-day visas to the Chinese prior to the visit. Two immigration officers had to be flown from Edmonton, Alberta, as well as a customs officer from Inuvik, NWT, in order to complete the process required to first allow the ship to enter Canadian waters and then allow passengers to go ashore. They found no record of evidence suggesting an “excessive” amount of weapons (never mind the “criminal intent” intimated by Teeple), and the RCMP corporal cleared the ship after “minor problems” (a failure to follow normal procedures by Vancouver-based organizers of the visit) were resolved. In the end, they suggest that the Canadian media made “much ado about nothing” and that the exaggerated treatment of the visit by scholars such as Rob Huebert, Michael Byers, and Teeple served to misrepresent a rather “trivial” incident as a serious security or sovereignty concern.⁶⁹

According to the CAA, China’s second expedition in 2003 focused on the following subjects:

1. Variability mechanism of Arctic circulation, water structure, and exchange.
2. Process of Arctic sea ice change and its influence to the air/sea exchange.
3. Carbon flux in the upper Arctic Ocean and the land-source matters influence to the Arctic Ocean.
4. Interaction between the north Pacific and the Arctic Oceans.
5. Mechanism of Arctic climate variability and its influence to the climate in China.
6. The geobiochemical processes and past environment survey in the Arctic Ocean.
7. Interactions between biological and physical processes of the oceans in the north high latitudes.⁷⁰

These expeditions also gave China the confidence and experience necessary to open their first Arctic station at Ny-Ålesund on Svalbard in 2003, which Chinese officials hold up as an example of the country's growing status as a major polar research country.⁷¹

The International Polar Year from 2007–09 also helped China's polar research to mature. It raised public awareness of the importance of the Polar regions, provided fresh data for analysis, led to plans for further observation networks, and promoted international collaboration.⁷² The Chinese government launched the IPY China program, consisting of two projects. The Antarctic project, named PANDA, carried out observations and investigations in the changes of and interaction among the ocean, ice shelves, and high plateaus of the ice sheet. The Arctic project, coded ARCTML (for the study of Arctic Change and its Tele-impacts on Mid-Latitudes), involved two Arctic expeditions (the third and fourth CHINARE expeditions in 2008 and 2010) in which scientists from Canada, Finland, France, Norway, and United States participated. In summarizing the achievements, Huigen Yang noted:

IPY 2007–2008 provided China with a great opportunity to explore polar science frontiers and to raise public polar awareness

through international cooperation. By participating in IPY with a national program, China achieved multidimensional polar linkages, increased its understanding of the earth's system and climate change, raised public awareness of polar environmental conservation and protection, and advanced polar science, technology and culture. In the coming decades, a more comprehensive development of polar linkages will be achieved for the benefit of mankind. And a more creative and harmonious polar culture will be cultivated for a sustainable planet.⁷³

The fourth CHINARE expedition, conducted between July and September 2010, lasted eighty-five days and recorded changes in the ice surface related environmental effects in the Bering Sea, Bering Strait, Chukchi Sea, Beaufort Sea, Canada Basin, and the Alpha-Mendeleev Sea Ridge. It was China's largest expedition to date, and included 120 scientists, logistical staff, and media persons from China (including one scientist from Taiwan), as well as seven scientists from Estonia, Finland, France, South Korea, and the United States. It did not enter Canadian waters.⁷⁴

In 2012, China launched its fifth Arctic scientific expedition, with *Xue Long* completing an unprecedented trip through the Northern Sea Route, after leaving Qingdao port in July. During these expeditions, scientific research included systematic geographical surveys, installation of an automatic meteorological station, and investigations on oceanic turbulence and methane content in Arctic waters.⁷⁵ Expedition leader Huigen Yang, the head of the PRIC, was surprised at the lack of ice along the route at this time of the year: "To our astonishment ... most part of the Northern Sea Route is open," he told Reuters TV. The major difference with this voyage in comparison to China's prior Arctic expeditions was that the news was global.⁷⁶ On a return journey to China from an official visit to Iceland in August 2012, the *Xue Long* took advantage of the largest summer sea ice retreat on record and attempted to cross the Arctic Ocean via the North Pole – a route that some Western observers quickly identified as a future shipping lane for Chinese exports and cargo.⁷⁷ China's sixth research expedition took place in July 2014 and saw the *Xue Long* transit the Bering Sea into the Arctic Basin north of Canada. The seventh, undertaken in the summer 2016, saw the icebreaker travel 13,000 nm to the Bering and Chukchi Sea and through the Canada Basin. Scientists studied marine meteorology, geology, and chemistry, and surveyed seven

ice stations while laying several observation buoys along the way.⁷⁸ Upon its return one scientist interviewed by the *Chinese Scientific Newspaper* emphasized the importance of these missions for understanding climate change and potential opportunities for Arctic shipping. “China should not be left behind,” the scientist was quoted, “but we don’t need a fight.”⁷⁹

All told, China aspires to become a significant player in Arctic polar science. It considers the Arctic an “important area for China to enhance its sense of national pride and cohesion,” given that most of the countries conducting Arctic scientific research are developed countries. Accordingly, it seeks to deepen research cooperation with key Arctic stakeholders. It joined the International Arctic Science Committee, a non-governmental organization, in 1996, and has reached out bilaterally to foster links with Arctic states. As one Chinese official noted in 2012, “to strengthen dialogue, enhance understanding, promote scientific exchange, and expand cooperation with Arctic states, is very important for the further development of China’s polar research capabilities.”⁸⁰ As China expands these capabilities it naturally carves out a place for itself in scientific discussions about the Arctic and ensures that it cannot be excluded from some of the larger discussions taking place concerning the Arctic and climate change more generally. One official from the Polar Affairs section of the Norwegian foreign ministry noted that China’s involvement in climate science was now too significant for it to be excluded.⁸¹

Social Science Research

Dr. Xinjun Zhang, Associate Professor of Public International Law at Tsinghua University, told participants in the First Sino-Canadian Workshop on the Arctic that Chinese academic interest in the Arctic has expanded significantly since Russia planted its flag on the seafloor at the North Pole in 2007. Subsequently, Chinese social science journals began publishing articles on Arctic issues (with much of the research sponsored by the Chinese government) including the status of the land, continental shelf, water, and ice in the Arctic Ocean Basin; the international legal status of the Northern Sea Route and the Northwest Passage; environmental protection and scientific research in the Arctic; and international cooperation in governance and dispute settlement in the Arctic region. Most of this research focused on treaty interpretation of the relevant articles in the LOSC and the Svalbard Treaty, while some proposed or indicated preferences for the international legal regime in the Arctic.⁸²

Li Zhenfu of Dalian Maritime University has criticized Chinese research for “fail[ing] to provide fundamental information and scientific references for China to map out its Arctic strategy,” therefore inhibiting China’s ability to protect its rights in the international arena. Linda Jakobson notes that “this kind of criticism of the government’s approach by Chinese scholars is rare in Arctic-related publications,” but Li’s 2009 article appeared in a national journal administered by the prestigious China Association for Science and Technology (CAST).⁸³ Similarly, Jakobson notes that Chinese scholar Guo Peiqing of the Ocean University of China expressed disapproval in media interviews with China’s natural sciences-dominated Arctic research and said “it is not in China’s interests to remain neutral and ‘stay clear of Arctic affairs.’” Guo asserts that “any country that lacks comprehensive research on Polar politics will be excluded from being a decisive power in the management of the Arctic and therefore be forced into a passive position.”⁸⁴

Recent indications suggest that China has paid heed to this advice. Yang Huigen explains that: “Realizing that the Arctic is a region where natural and social developments are closely coupled, a new research division on polar social and human sciences was established in the Polar Research Institute of China. This research division has fostered a national network with more than 40 social scientists and 16 research universities and institutes. Topics on Arctic passages, law, economics, governance, geopolitics and international Arctic cooperation have been examined intensively and internationally.”⁸⁵

Chinese scholar Kai Sun noted in a recent paper that the project topics suggested by the Chinese Social Science Fund (the top ranked funding agency in China) serve as a barometer of China’s governmental focus. In 2013, its list included both Arctic Studies and “Russia’s Arctic Policy and Its Regional Impacts.” Furthermore, the CAA serves as another major source for natural and social science research through its Polar Strategic Fund (established in 2006), and Kai observes that the funded projects in recent years include more research from social science disciplines.⁸⁶

The first Sino-Canadian Exchange on the Arctic, which brought together senior Canadian and Chinese academics and experts for exchanges of viewpoints and dialogue on international law, policy, and governance issues, confirmed China’s growing interests in social science research. At the opening session, Dr. Gao Zhiguo emphasized that China has maintained an active scientific research program since the 1990s, and highlighted the importance of climate change, maritime shipping, environmental protection, regional

inter-governmental cooperation, and scientific research exchange and cooperation. During the Shanghai session, Yang Huigen emphasized China's cooperative approach to polar research, as well as correlations between changes in the Arctic Ocean and climate changes observed in China itself.⁸⁷

During the second workshop, hosted by Dalhousie University in Halifax in 2012, Chinese officials reaffirmed the need for cooperation in scientific research, emphasizing the importance of scientific agreements with countries such as Canada, Iceland, and Norway.⁸⁸ One Chinese presenter from the PRIC provided a comprehensive overview of China's position on a range of scientific, political, economic, defence, and legal issues. This individual's concluding remarks are worth citing completely, to give a sense of China's understanding of policy issues:

- The importance of the Arctic region in international affairs has increased considerably in recent years on account of debate about climate change, natural resources, continental shelf claims, and new shipping routes.
- The Arctic Policy Rush on the one hand predicts more competition will occur in the Arctic, on the other hand, through these policies, we can know each country's interests and concerns on the Arctic Issue well, which will facilitate the identification of fields for future cooperation.
- Transparency of National Arctic Policy is important for a peaceful and stable Arctic.
- China's past activities in the Arctic mainly focused on the scientific research issues, and China does not have a specific Arctic policy ...
- China does need to formulate a comprehensive Arctic Policy to guide its future activities in the Arctic and to reduce international concerns and misconceptions against China.
- China needs to enhance relevant research on the Arctic issue, so as to discern its national interests in the Arctic.

- China needs internal coordination with a view to formulate a common policy on the Arctic and to take up concrete and concerted positions.
- China needs to seek more participation in the Arctic Governance, particularly through international and regional regimes, in order to play a constructive role in the Arctic.

To finish, the presenter indicated that China’s launching of the five-year “Chinese Polar Environment Comprehensive Investigation and Assessment Programs” in February 2012 – its largest program ever – might facilitate the development of an official state policy. The main focus would remain on environmental research into climate change in the polar regions and corresponding effects on China, but it would also more specifically identify “China’s national interest in the polar region.”⁸⁹

Marine Scientific Research and International Law

Scientists have long recognized the importance of the Arctic for marine scientific research (MSR). This awareness explains the creation of the Svalbard Treaty, 1920, as well as the extensive international rules codified in Part XIII of the Law of the Sea Convention (LOSC) on MSR. The first section of the convention on general provisions notes that “all States, irrespective of their geographical location, and competent international organizations have the right to conduct marine scientific research subject to the rights and duties of other States as provided for in this Convention” and that states and competent international organizations “shall promote and facilitate the conduct of marine scientific research.”⁹⁰ Article 240 of the LOSC lays out the general principles that activities must be conducted for peaceful purposes, must employ appropriate scientific methods – “shall not unjustifiably interfere with other legitimate uses of the sea” – and must conform with international law, including “the protection and preservation of the marine environment.”⁹¹ Within this framework, the convention also promotes international cooperation within the conduct of research activities.⁹²

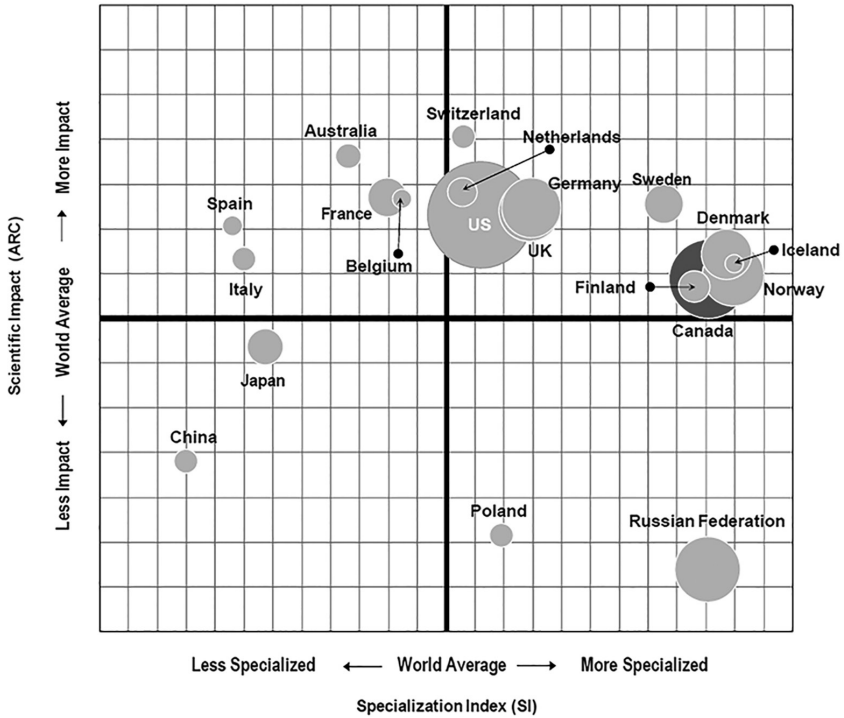
Accordingly, China’s research activities in Canadian waters and on its continental shelf are clearly constrained, but not prohibited, by international

law. Canada retains significant regulatory controls as a coastal state and there is no reason to believe that China does not abide by these rules.⁹³ In spite of this, China remains a maritime state (at least in its outlook on the Arctic) and has argued that it would like to see the Arctic coastal states adopt a more uniform and consistent application of these research provisions, including streamlined procedures for requesting permission to conduct research work that transcends coastal state boundaries. Chinese officials also expressed concern that once the Arctic coastal states defined their continental shelves beyond their 200 nautical mile Exclusive Economic Zones, this would reduce the areas open for research. As such, Chinese commentators have highlighted China's need to press their rights (as they exist in the LOSC) to ensure maximum benefit from any development on the sea floor.⁹⁴ Chinese experts have also suggested that some aspects of the regime for scientific research in the Antarctic Treaty System might be useful to inform those research regimes in the Arctic.⁹⁵

Conclusions

Given that long-term investments in physical, human, and social scientific research are needed to avoid the “feast and famine” cycle that has marked Canadian Arctic research,⁹⁶ Canadian stakeholders may mobilize concerns about losing ground to China as a justification for continued investment in Canadian science. On the other hand, as a global leader in Arctic science, Canada might seek opportunities to enhance its research relationships with China and use this as a means of sharing best practices and of shaping and monitoring China's evolving interests in Arctic research.

Indeed, science can serve as a conduit for international collaboration, influence, and confidence building across a range of issues and areas. In an article in *Jingji Cankao Bao* (*Economic Information Daily*), Liu Huirong of the School of Law and Political Science, Ocean University of China, Qingdao, argued that an ongoing focus on climate change offered China the best opportunity for engagement on Arctic issues, serving as a conduit to raise issues related to biodiversity, shipping, fishery management, and indigenous rights.⁹⁷ Given the complexity of local-global linkages, “the problematic nature of sovereignty as a framework for addressing problems of global ecology,” and the critical role of science in informing debates related to “planetary politics,”⁹⁸ this is an appropriate and shrewd approach for China to pursue. Jakobson



2.2 Positional analysis of leading countries in Arctic science, 1996-2007. Calculated by Science-Métrieix Using the Scopus Database for Aboriginal Affairs and Northern Development Canada (2010).

and Jingchao astutely note that prominent Chinese researchers and commentators recommend that China prioritize climate change in its public agenda to generate a “new public narrative” through which Chinese scholars can “strive to circumvent the sensitivity of Arctic resources and sovereignty issues, and to calm outsiders’ jitters about China as a rising power. Cooperation on climate change is one of those ways that China can partner with other states on the Arctic agenda.”⁹⁹

Rather than succumbing to media rhetoric about Canada’s need to match East Asian states in a “polar icebreaker race”¹⁰⁰ or accepting unfounded claims that China spends more on Arctic research than Canada, Canada should shake its insecurity complex in the scientific domain. The Canadian

government spent approximately \$152 million on Arctic science and technology in 2007–08 (including both federal programs and granting councils). Canada also made the largest national contribution to International Polar Year, supporting fifty-two natural science, social science, and health research projects, with more than 1,750 Canadian scientists conducting research at over 100 study sites across the Canadian North and aboard Canadian Coast Guard icebreakers. The federal government has also invested \$85 million through its Arctic research infrastructure fund, as well as \$46 million in 2003 and an additional \$67.3 million to the Network of Centres of Excellence ArcticNet program. Furthermore, the “impact factor” of Canadian Arctic scientific research is second only to that of the United States and is far higher than Asian research.¹⁰¹ In short, Canada need not feel insecure in its Arctic research, and China better represents a potential partner on specific projects – rather than a nefarious rival deploying science as a Trojan horse.

