ifa ECP Monitor Comparative Report

Science diplomacy

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1. Introduction

Although the term "science diplomacy" is largely a 21st century creation, scientific exchanges have played an important role in international affairs for centuries. Even during the intense competition between the United States and Soviet Union, "the Cold War was a time of highly effective use of science diplomacy to build bridges and connections despite the existence of great political tensions." (Turekian & Neureiter, 2012). In the late 20th century, as Japan and the United States became economic rivals, science also played an important role in maintaining ad collaborative relationship. Today, the US' Syracuse University collaborates with Kim Chaek University of Technology in North Korea, one of the few points of contract between the US and DPRK.

Borrowing from Turekian et al. (2015), science diplomacy is "the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge — their acquisition, utilization and communication — acquired by the scientific method." This field has become increasingly important in recent years, as the risks and interconnectedness that accompany globalization have made joint scientific progress more vital. The rise of the climate crisis as a concern and, more recently, the COVID-19 pandemic has re-emphasized the need for strong scientific international cooperation. As a sign of the field's advancement, the journal *Science and Diplomacy,* which features analysis and research on developments in international scientific cooperation, has been published since 2012.

Science retains a unique position along the spectrum of "hard" and "soft" power (Nye, 2004). On one hand, it provides a massive reputational boost, as a country's capacity for innovation can generate positive perceptions. Many countries even use the result of indices like the Global Innovation Index and European Innovation Scoreboard as explicit policy goals (Swedish Institute, n.d.). At the same time, science is a vital component in the "harder" economic and military competition between states, as both the 20th century US-USSR competition and the current US-China rivalry make abundantly clear.

Although there is immense room for "win-win" interactions, scientific links between countries are not always a means to solve common challenges and provide global public goods. Although collaborative relationships between rivals can ease tensions, "the intersection between science and diplomacy goes well beyond the building of bilateral relationships and speaks to broader foreign policy objectives" (Turekian & Neureiter, 2012). As with other forms of ECP, science diplomacy often follows unequal global power dynamics, with wealthier countries scooping up top talent from around the world in order to strengthen research output.

As Hollander (2015) points out, "The research subject matter itself can also pose perceived threats to states; all science is not created equal." Over the past several decades, fears abounded about the dissemination of nuclear and biological technology to rouge states or terrorist groups. Today, inter-state scientific competition is making a comeback. This has been particularly clear with respect to advanced technologies, as the US and China have sought to attract the best research without giving away industrial secrets to the other.

Many international scientific initiatives involve private actors like universities, businesses, foundations, and other civil society organizations. This creates a situation in where, "in contrast to traditional state-based diplomatic dialogue, the phenomenon of establishing working

relationships with non-state entities is inherent in the modus operandi of the science discipline as a whole" (Hollander, 2015). Despite this fundamental fact, this report seeks to compare the state-led approaches to science diplomacy, providing a comparative picture of what governments do in order to boost their country's scientific and diplomatic influence.

2. Science diplomacy in action

Science diplomacy takes two main forms: "(1) *Science in diplomacy*, understood as providing scientific advice to foreign policy; (2) *Diplomacy for science* encompasses promoting international research and science cooperation, both strategically top-down and bottom-up approaches" (Epping, 2020, p. 2). The latter category is the primary focus of this report, and itself break down into three main goals. These include: access (obtaining the best scientific minds and materials), promotion (sharing a country's achievements in R&D), and influence (attracting sympathy and a positive image from leaders and publics abroad) (Flink & Schreiterer, 2010).

The 2000s saw a proliferation of international scientific strategies, as the UK (2000), US (2000), Switzerland (2008), Japan (2008), the EU and others formally established programs and strategies to institutionalize science and research diplomacy initiatives (Flink & Schreiterer, 2010, pp. 666). More recently, many developing countries have sought to change their role from senders of scientific talent to technological centers in their own right. Although the proliferation of science diplomacy strategies is nearly universal, goals vary widely. For the United Kingdom (UK) and the United States, science has traditionally been seen as a way to expand influence. Others wealthy countries like France, Germany, and Japan primarily use technology and science to secure market access and boost economic growth (the UK has arguably moved closer to this group in the post-2010 era) (Hollander, 2015).

Along the economic dimension to scientific diplomacy, science and technology "have gained an important and ever-increasing role in the competitive quarrel for market shares, power, and influence" (Flink & Schreiterer, 2010, p. 665). There is a clear economic rationale for attracting foreign talent, as "internationally mobile researchers significantly contribute to extending the international scope of the research network of destination countries, at no detriment to the quality of the research output" (Franzoni et al., 2012). While there is intense competition for the best scientists, there are often positive spillover effects for both sending and host country, as emigrant researchers maintain academic ties to their home country.

On the political level, scientific exchange "may help bridge the participants' different outlooks, resources, commitments, serve all parties involved and build valuable transnational social capital" (Flink & Schreiterer, 2010, p. 666). Of course, not all reputational benefits come from "eye-level" exchanges. The perception of technological sophistication is important for a country's external perceptions and many countries highlight their technical achievements as a way to increase international influence without person-to-person contact.

A relatively new development in science diplomacy has been the rise of so-called science and innovation centers (SICs). As Epping (2020), describes them, SICs are "distinct units or satellite institutes, established by governments, operating at the nexus of higher education, research, innovation, and diplomacy." SICs are typically closely tied to the private sector, and sometimes even are established outside of national boundaries, such as Austria's representa-

tion in Silicon Valley. These are often used by countries which have less developed and renowned scientific sectors as a way to jumpstart internationalization processes.

Science diplomacy is also conducted through multilateral fora. For example, the UN Conference on Trade and Development's supports "the provision of science and technology advice to multilateral negotiations and the implementation of the results of such negotiations at the national level" (UNCTAD, 2003). Although such initiatives are important, this report focuses primarily on national-level efforts to fuse scientific and foreign policy in order to give a comparative picture of country's in the field of science diplomacy.

3. Primary actors in scientific diplomacy

Many of the largest players in scientific diplomacy are the "usual suspects" of external cultural policy: wealthy Western countries and large geopolitical powers. Still, many smaller and wealthier countries punch above their weight in SD, since the prestige and suitability of research environments plays a larger role in attracting researchers than raw size or military power.

France operates one of the largest science diplomacy networks in the world, with responsibility shared between the Foreign Ministry, individual institutes and universities, and French National Research Agency (ANR) (Flink & Schreiterer, 2010). The French Research Institutes Abroad (UMIFRE) are also an important instrument for scientific diplomacy. They operate under the dual supervision of the Ministry for Europe and Foreign Affairs and the National Center for Scientific Research. UMIFRE is active in 34 countries and supports 150 researchers and 350 doctoral students. It describes its focus as Mediterranean and the Middle East (especially involving archaeology), but has branches on every continent. In addition to research, training, and information dissemination, it describes the support of French diplomacy as one of its four main goals (UMIFRE, 2019). The Hubert Curien Partnerships are also an important component of French scientific diplomacy. Falling under the remit of Campus France, they promote mobility for researchers. In 2019, 1,333 joint research projects and 4,000 mobile researchers were funded.

The United Kingdom is also a hub for science and research, with roughly one third of its scientists hailing from abroad (Franzoni et al., 2012). To promote internationalization, UK Research and Innovation (which falls under the Department for Business, Energy and Industrial Strategy) is active in projects in over 130 countries with roughly 8,000 staff and offices in Washington, Brussels, New Delhi, and Beijing. It has a budget of €190 million and cooperates with over 2,000 other organizations across 1,750 projects (UKRI, 2020). The Newton Fund (active in 17 countries) and Global Challenges Research Fund (active in 17 countries with 550 researchers) are also significant players in the UK's foreign scientific policy (BEIS, 2020).

Germany retains an impressive structure for promoting scientific exchange. The German Academic Exchange Service (DAAD) is the world's largest funding organization for international academic and scientific exchange. Much of its work is geared toward university internationalization, but it also supports five German Centers for Research and Innovation (DWIH) (DAAD, 2020). In light of looming global crisis like climate change and public health, the DAAD has also established eight global research centers in the Global South, focused on pandemics and the environment (DAAD, 2021). The Alexander von Humboldt Foundation for

Nature Research and Travel, first established in 1860, is also an important and longstanding player in German foreign scientific policy, with over 2600 total partnerships. It has an annual budget of over €120 million and has roughly 240 employees (AvH, 2019). Approximately 95 percent of expenses related to this purpose are financed by federal grants, in particular by the Federal Foreign Office (AA) and the Federal Ministry of Education and Research (BMBF) (AvH, 2017, p. 36). The German Archaeological Institute (DAI) is another important aspect of Germany's foreign scientific partnerships. Founded in 1832, it maintains offices primarily throughout Europe and the Middle East, including in Madrid, Rome, Istanbul, Athens, Cairo, Damascus, Baghdad, Tehran, and Sana'a with more than 300 projects worldwide. Despite these impressive institutions, there is some degree of tension in Germany's *Außenwissenschaftspolitik.* The AA and BMBF are divided on approach, as the Foreign Office seeks to use science as a tool of diplomacy, while the BMBF attempts to promote scientific advancement largely for its own sake, such as through a series of bilateral agreements (Flink & Schreiterer, 2010).

Although it is a small country, Switzerland has an impressive scientific reputation, with many leading universities and strong scientific output. Indeed, science diplomacy is one of the core components of Swiss ECP. Its main objective is to secure Switzerland's top position in key scientific fields. In this process, the promotion of international cooperation is of growing importance. For the years 2021-2024, the Swiss Federal Council has approved CHF 200 million (around €185 million) for this purpose. It has a highly strategic approach to science diplomacy, with China, India, Russia and South Africa, Brazil, Japan, South Korea and Chile as regional priorities (Flink & Schreiterer, 2010). Switzerland's Knowledge Network (SWISSNEX) is linked with diplomatic efforts, but operates largely outside of national capitals, preferring instead locations in top scientific centers like San Francisco, Bangalore, or Shanghai. It combines public and private funding in order to spur innovative research (SWISSNEX, n.d.). Due largely to its highly-developed programs and strong university reputations, Switzerland is both a top receiving and sending destination for scientific talent (Franzoni et al., 2012).

Russia draws on a long history of using science to boost its international prestige. During the Soviet period, the USSR's successful space program and a number of other impressive technological achievements generated enormous prestige (Velikaya & Simons, 2020). After the fall of the Soviet Union, the newly-formed Russian Federation lost thousands of scientists to the West as the economy collapsed. However, it continued to cooperate on some scientific endeavors, most notably the International Space Station (ISS). This collaboration was planned during the late Soviet perestroika period and continued until this year, when Russia announced it would be withdrawing from one of the few productive forms of cooperation that remain between it and the West (Cookson & Foy, 2021). Aside from flagship programs such as the ISS, Russia remains active in a number of science diplomacy initiatives. The Joint Institute for Nuclear Research—which was founded in the 1950s as a way to encourage international cooperation on nuclear science—draws thousands of scientists from over 18 countries to the Moscow area for cutting-edge physics research. Recent initiatives also stress the need to reinvigorate Russia's international scientific reputation. In 2018, President Putin announced a plan to establish 900 new laboratories and fifteen world-class research centers by 2024, with a particular emphasis on climate science (Schiermeier, 2018).

Although it is the leading scientific power in the world, the United States has relatively limited official science diplomacy initiatives. This may be due to the natural appeal that US research institutions possess, many of which lead the world in scientific output. Indeed, nearly half of

postdocs in the US are foreign born, are roughly 40% of master's and PhD students (National Science Board, 2020). Still, some researches lament the lack of official promotion and highlight the drawbacks. Noting that the US State Department has *no official budget* for science diplomacy, Flink & Schreiterer argue that the US approach toward "international S&T policy cannot become anything but highly fragmented, imponderable and inward-looking" (2010, p. 674). While the overall picture is sparse, one notable program is the Bureau of Oceans and International Environmental and Scientific Affairs (OES), which has 12 research centers worldwide. In 2019, it was funded with $690,000, a decline from $1.1 million in 2015 (ACPD, 2019).

Another significant player in science diplomacy, Canada, applies what it considers a "Science Diplomacy and Outreach", overseen by the Chief Science Advisor of Canada. In its implementation, Global Affairs Canada spent approx. €388.5 million for Science and Research in 2019-2020 (Office of the Chief Science Advisor, 2020). As part of Global Affairs, the Trade Commissioner Service (TCS) is another important point of reference for Canada's international science policy. The agency is represented with a network of 25 dedicated counselors on science, technology and innovation, spread across the diplomatic representations of 11 countries (Wilshaw, 2020). The federal Canadian government also funds the International Development Research Centre (IDRC), which is located in Canada's capital of Ottawa. The central location is complemented by five institutes abroad, located in Uruguay, Kenya, Senegal, Jordan and India. Global Affairs supported the IDRC with €94.5 million in 2019. These programs, and the draw of Canadian institutions, makes Canada one of the top destinations for foreign scientists, as roughly 50% are foreign-born (Franzoni et al, 2012.)

4. Additional actors in scientific diplomacy

The next tier of countries in scientific diplomacy ranges from small, sophisticated countries to larger powers striving to establish more homegrown scientific innovation. Some countries, like the Nordics and Netherlands, have a large share of scientist hail from abroad. Others, like China and India, are working to reverse a traditional outflow of scientific talent.

4.1. Small, but highly internationalized

Science diplomacy plays an important role of the Netherlands ECP, as over a quarter of scientists there come from other countries. The Dutch Research Council (NWO) coordinates scientific policy (though only a fraction is international) and has a yearly budget of roughly €1 billion (NWO, 2019, p. 13). Under the umbrella of the NWO, the Science Diplomacy Fund was established in 2020 to "strengthen [the Netherlands'] international profile as a knowledge economy where world-class science is conducted" (SDF, 2020). The program will only be open to non-EU countries, with Turkey and Russia the primary focus. Others include Brazil, China, India, Indonesia and South Africa (ibid.). The Royal Netherlands Academy of Arts and Sciences also coordinates the funding schemes on behalf of the Dutch Ministry of Education, Culture and Science, such as a decades-long partnership with China (KNAW, n.d.).

The Nordic countries are also active in science diplomacy, many using it as an explicit economic tool. For example, Sweden views science diplomacy as crucial for global competitiveness and to boosting its growth. The R&D sector in Sweden is mainly led through the central

government, with the dynamic private sector closely involved. Swedish Research Council (*Vetenskapsrådet*), a government agency within the Ministry of Education and Research, is the largest public funding body.

Sweden is an active member in Nordic-level[1] research cooperation. Apart from contributing to regional development, one of the aims of the cooperation is to strengthen the Nordic region internationally and make it attractive for work and business. An important actor is NordForsk (est. 2005, based in Oslo), an organization under the Nordic Council of Ministers[2] which provides funding for regional research cooperation. Norway is also active with its own dedicated institutions, such as the Research Council of Norway (Forskningsrådet, under the trade ministry), Innovation Norway (under the education ministry), and Skattefunn (an R&D tax incentive scheme, one of the largest sources of innovation support funding).

The influence of Spanish (the second most popular in academic publishing) grants Spain extra centrality in the scientific field. Still, compared to some European neighbors, Spain is not a very attractive destination for international researchers, with an explicit SD policy only since 2015. Post-financial crisis budget cuts have forced it to rely heavily on European Union funding. According to the 2011 Globsci survey on global brain circulation, Spain was at the tail end with the share of foreign researchers of only 7.3%. The Spanish research diaspora was equally small (8.4%) but also most likely to return home (Franzoni, et al., 2012).

4.2. From 'brain drain' to scientific power?

Krishnaswamy Vijay Raghavan, secretary of the Indian Department of Biotechnology remarked in 2015 that "the US and Europe have seen science and education as instruments of foreign policy, of income and of brain-gain. Developing countries have seen science and education in the West as a trade-off between the gains of training against the loss of brain drain" (UNESCO, 2015). In light of this tension, some countries seek to transition from their traditional roles as exporters of scientific talent to exerting newfound efforts to foster a cutting-edge research climate at home.

Most significantly, this list includes the two largest countries in the world, China and India, as they try to reverse a decades-long scientific power dynamic between themselves and the West. In China, government programs typically focused on outward mobility so that scientists could develop expertise abroad. However, more recent programs emphasize inbound movement. From 2008-2020, over 10,000 scientists have participated in Chinese government funding programs (Barry and Kolata, 2020). Like other programs, this has created pushback in the West (US Senate, 2019). The government has therefore demanded that talent recruitment exclude the phrase 'Thousand Talents Plan'—which it found to arouse particular anxiety abroad—from written documents.

India is another traditional exporter of scientific talent, making up one of the largest sources of scientists in the United States, with roughly one of every thirty US-based scientists born in India (*Economic Times*, 2015). Overall, a staggering 40% of Indian born-scientists reside out-

[1] Nordic cooperation refers to Denmark, Finland, Iceland, Norway and Sweden as well as the three autonomous areas, the Faroe Islands, Greenland and the Åland Islands.
[2] The Nordic Council of Ministers is the Nordic governments' cooperation forum.

side of India. This has not been matched by a comparable inflow, as a 2011 survey found that only 0.8% of scientists in India were foreign born, compared to 38% in the US and 57% in Switzerland (Franzoni et al, 2012). Lately, however, India has emphasized homegrown technological know-how, particularly in the pharmaceutical industry (Joshi, 2021).

Although it is a latecomer to explicit science diplomacy (first strategy published it 2015), Poland is also active in trying to reverse the outflow of talent. The government seeks to work with the Polish diaspora aims to balance out 'brain drain' and 'brain gain.' As the government strategy states, "the Polish government will encourage scientists of Polish origin to transfer their scientific activity to Poland" (qtd. in Szkarłat, 2020).

Turkey has also increased efforts to boost its domestic scientific reputation, particularly within the region. The Turkic Academy was established in 2012 as part of the Turkic Council and has "the aim of coordinating scientific researches on the language, literature, culture, and history of Turkic people and evaluating the contribution of the Turkic civilization to the human civilization based on indigenous sources (Turkic Council, n.d.). TABIP, the Academic & Scientific Cooperation Portal of Turkey, coordinates scientific action under the banner of the Yunus Emre Institute. TABIP states its mission as "establishing academic and scientific collaborations and conducting scientific diplomacy activities" (TABIP, n.d.). A total of 299,000 academics and 66,270 projects were registered on the portal in 2018 (Yunus Emre, 2018, p. 119).

5. Conclusion

The wide range of strategies, approaches, and institutions across the world makes it clear that science diplomacy is now a key feature of external cultural policy and international relations. While countries are expending more and more effort in SD, as with many other fields of ECP, a perception of over-instrumentalization can be harmful. As Flink & Schreiterer (2010, pp. 676) argue, "exploiting science for political purposes—to brag about competence in hot high-tech fields or research areas or to demonstrate goodwill in IR—makes little or no sense" due to the possibility of such rhetoric backfiring. Indeed, the influence of science must be carefully balanced and coordinated with other national strategies.

Still, science diplomacy is a very important way for countries to boost perceptions abroad. As Hollander (2015) finds, "a survey of Islamic countries demonstrated that while overall they held an unfavorable view and low level of trust for the USA and its policies overall, in contrast, these same states had a high level of respect and admiration for American science and technology" (Hollander, 2015). Likely for this reason, the US concluded several scientific cooperation agreements with Middle Eastern countries during the Obama administration. Many other countries now adopt these specific regional approaches to target area.

In an era of rising geopolitical tensions, can science diplomacy ally the risk of conflict between great powers? Some scholars are doubtful. Flink and Schreiterer argue that "science and collaborative research work are no panacea for easing conflicts or improving stale relations between nations" (2010, p. 676). As rising tensions between two of the world's preeminent science powers—China and the US—has shown, this may be the case. Still, the history of productive scientific cooperation between the US and USSR does give some hope to the idea that academic exchange can foster international peace.

Science diplomacy has made great strides in recent decades, but political trends may threaten many of the advances made in international scientific cooperation. Even as "globalization has considerably enhanced and extended the importance of science and technology for and in international relations beyond" (Flink & Schreiterer, 2010, p. 665), there may be a risk that so-called "de-coupling" of interconnected economies may reduce the space for science diplomacy. Indeed, fears of a "new Cold War" between the US and China are closely linked to the balance of scientific power between the two, with access to cutting-edge technologies a top point of contention. Whether this competition will erode the basis for productive science diplomacy remains to be seen. What is clear is that science diplomacy is no longer just the territory of the world's wealthiest and most powerful countries. In the coming years, more and more efforts will be expended to attract talent, boost scientific output, and increase international scientific prestige for countries around the world.

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