CHAPTER 1

The Emergence of Science Diplomacy

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Introduction

Major structural changes in the international system over the last three and half decades have raised a big question mark over the Westphalian principle of state sovereignty that assumes that a state — subject to international recognition — exercises legal, unqualified and exclusive control over a designated territory and population. The end of the Cold War in the late 1980s and the process of deepening globalization served to profoundly alter the global political context. These changes seem to make the world a much smaller and more interconnected place, but one that is seemingly fragmented by the erosion of the autonomy of the sovereign state and the rise of intra-state conflict. These changes seem to make the world a much smaller and more interconnected place, but one that is seemingly fragmented by the erosion of the autonomy of the sovereign state and the rise of intra-state conflict. In this new environment where shared challenges — such as food security, water availability, health management — require strong interactions between the science and technical communities across borders, science has taken on a role of greater importance in the international system. As a consequence, a globalizing world has eroded the old dichotomy between science and diplomacy, and helped to facilitate the emergence of science diplomacy whereby scientific collaborations among nations are necessary to tackle increasingly common challenges.

In this introductory chapter, we explore the evolving relationship between science and diplomacy. The chapter proceeds in five stages. The first section delineates the concept of Science diplomacy. The second considers...
the historical association between science cooperation and international relations. In the third part, we examine the international circumstances that have contributed to the rise of Science diplomacy. The fourth section identifies three types of activity that are related to Science diplomacy and uses these categories as an analytical framework for organizing the discussion in this book. Finally, the concluding section provides a rationale for this volume and outlines the essays that comprise it.

The Concept of Science Diplomacy

The term ‘science diplomacy’ is a relatively new one and reflects the fusion of two previously distinct elements. Science is an evidence-based form of knowledge acquisition. It is founded upon empirical methods of experimentation and the repeated verification of results. Science is neither inherently political nor ideological, but represents a type of universal language, a vector of transnational communications that poses fundamental questions about the nature of things. The scientific ethos of objective experimentation through trial and error has broad appeal: it promotes merit (through peer review); openness (through publication); and civic values and citizen empowerment (through the encouragement of respect for diverse perspectives). In a public opinion survey reported in New Zealand on 20 June 2011, scientists were identified as the most trusted people in the country, and science as the most respected profession (TVNZ, 2011).

Diplomacy is a non-violent approach to the management of international relations characterized by dialogue, negotiation and compromise, often by a country’s representatives abroad, and involves the art of dealing with people or their representatives in a sensitive and tactful way. Diplomats pursue and deliver international policy objectives on behalf of governments, and it is that connection to the state which sets diplomatic practice apart from the international lobbying, advocacy and public relations activities engaged in by business and civil society actors.

Science diplomacy, therefore, 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. It is a crucial, if under-utilized, specialty within the diplomatic constellation that can be used to address global issues,
enhance co-operation between countries and leverage one country’s influence over another. In this regard, Science diplomacy is a significant generator of soft power (Nye, 2004) — that potent form of attraction that harnesses national image, reputation, and brand. More broadly, science diplomacy is an effective emissary of essential values such as evidence-based learning, openness and sharing. Science diplomacy is increasingly critical to addressing many of the planet’s most urgent challenges — such as management of the global commons, faltering public health systems, and the threat of collapsing ecosystems. It can also be used to enhance one nation’s interests with respect to another or to defuse international tensions.

Science diplomacy’s direct relationship with national interests and objectives distinguishes it from other forms of international scientific co-operation, which are sometimes commercially oriented and often occur without direct state participation. International scientific co-operation motivated by advancing science and is typically a win-win proposition, with private sector or civil society partners collaborating to produce, for example, better medications, cleaner water, improved hygiene or more disease-resistant crops. All parties reap the rewards. Science diplomacy is also founded upon mutuality and common cause, with the relationship being a central motivator for the cooperation. However, because national interests and the state are often implicated, motives may diverge and the outcomes may be asymmetrical, particularly if there are negotiations involved. A whole constellation of international scientific programs and exchanges undertaken during the second half of the last century come to mind by way of illustration, as do contemporary international discussions on issues such as the terms and conditions of resource access or environmental protection. While science itself may be apolitical, research and development in areas of Science and Technology (S&T) is often highly politicised, with countries keeping a firm eye on their scientific investments and on any potentially lucrative results. As Perkins argues, growing competitiveness — especially surrounding patents for drugs and new plant and animal varieties or the development of renewable energy

1A useful synopsis is offered in New Frontiers in Science Diplomacy (The Royal Society, 2010). This publication sets out three distinct activity areas within science diplomacy: informing foreign policy objectives with scientific advice (science in diplomacy); facilitating international science cooperation (diplomacy for science); using science cooperation to improve international relations between countries (science for diplomacy).
b1869  Science Diplomacy: New Day or False Dawn?

sources — suggests that ‘tensions between national commercial interests and ambitions for goodwill between nations may not be easy to reconcile’ (Perkins, 2012). For example, the Centre for Global Development reports that the commitment to development on the part of the US and a number of members of the EU — particularly Germany and Sweden — is regularly undermined by attempts to '[restrict] the flow of innovations to developing countries' by incorporating ‘TRIPS-Plus’ measures into bilateral free-trade agreements. US trade negotiators have pressured developing countries to agree not to force immediate licensing of patents even if this would serve a compelling public interest, such as with HIV/AIDS drugs (Barder and Krylova, 2013).

Thus, international science cooperation and science diplomacy are overlapping endeavours: they are related, yet analytically separate. International science cooperation is mainly concerned with the advancement of scientific discovery per se, while the central purpose of science diplomacy is often to use science to promote a state’s foreign policy goals or inter-state interests. In other words, international science cooperation tends to be driven by individuals and groups, whereas science diplomacy, while it may derive from the efforts of individuals, often involves a state-led initiative in the area of scientific collaboration. International science cooperation, therefore, may or may not encompass science diplomacy.

Conceptually, the idea of science diplomacy seems to be characterised by a potential tension in the relationship between the two key paradigms that comprise it. Diplomacy traditionally requires that practitioners have a good general knowledge of concerns relating to state interests, but diplomats would not typically see their professional remit extending to the details and complexities of modern science. At the same time, science involves the search

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2The 1995 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) is to date the most comprehensive multilateral agreement on intellectual property (IP), and provides a prescriptive regime for the protection and enforcement of intellectual property rights. With the remarkable upsurge in the number of free-trade agreements being signed in the past decade, the ‘post-TRIPS’ era has seen efforts to strengthen the protections for IP beyond those established under TRIPS, creating the ‘TRIPS-Plus’ phenomenon. Developing countries in particular have come under increasing pressure to enact these tougher ‘TRIPS-Plus’ provisions in their patent laws. Bilateral science and research and development cooperation agreements constitute an indirect form of ‘TRIPS-Plus’.
for verifiable knowledge and this process, almost by definition, is a collaborative activity and one which is likely to straddle national boundaries. However, scientific practitioners are not always sensitive to the diplomatic implications of their research-led cooperation across state boundaries. In the words of a 2010 joint publication by the Royal Society and the American Association for the Advancement of Science (AAAS), ‘scientists and diplomats are not obvious bedfellows. While science is in the business of establishing truth, Sir Henry Wotton, a 17th century diplomat, famously defined an ambassador as “an honest man sent to lie abroad for the good of his country”’ (The Royal Society, 2010: 1).

The link between international science cooperation and international relations

Notwithstanding divergent orientations, there is a long historical association between science and international cooperation. The post of Foreign Secretary of the Royal Society was instituted in 1723, nearly six decades before the British Government first appointed a secretary of state for foreign affairs, and in 1941 Sir Charles Galton Darwin FRS (the grandson of Charles Darwin) was appointed Director of the Central Scientific Office in Washington, becoming the UK’s first accredited scientific representative abroad. Just one year later, Joseph Needham FRS was made Head of the British Scientific Mission in China. He actively promoted the formation of an ‘International Science Co-operation Service’, and his lobbying led to the inclusion of natural sciences within the mandate of the United Nations Educational, Scientific and Cultural Organization (UNESCO) (The Royal Society, 2010: 1).

The United States also has a long history of involvement in cooperative international scientific efforts. In the early 1970s, as the country was winding down its involvement in a controversial war in Southeast Asia that clearly demonstrated the limits of US hard power, an adviser to then-Secretary of State Henry Kissinger stated to Science magazine that ‘[the Secretary of State] thinks that America’s ability to contribute money and run the world in the old fashioned way … is now over. What we can contribute — and what the world wants — is our technological capabilities’ (Wade, 1974).³

³Similarly, in an address to the United Nations session on development in April 1974,
This focus on the role of science and technology became a central element of US foreign policy outreach to allies and adversaries alike during the course of the Cold War. In a 1985 address to the nation just days before meeting with Soviet leader Mikhail Gorbachev for the first time, President Ronald Reagan stated: ‘We can find, as yet undiscovered, avenues where American and Soviet citizens can cooperate fruitfully for the benefit of mankind…. In science and technology, we could launch new joint space ventures and establish joint medical research projects’ (Regan, 1985). Two years later, John Negroponte, the President’s Assistant Secretary of State for Oceans and International Environmental and Scientific Affairs (OES), further articulated the Administration’s view during congressional testimony: ‘It would be shortsighted of us not to recognize that it is in our national interest to seek to expand scientific cooperation with the Soviet Union’.4 In many ways, the Cold War period initiated the beginnings of science diplomacy, as states used scientific collaboration to build bridges and connections despite the existence of great political tensions.

While perhaps the interactions between the United States and the USSR provide the most well-known historical case of linking scientific cooperation to foreign relations, they are by no means the only example. Throughout the second half of the 20th century, science played many important roles in diplomacy. At a White House state dinner for Japanese Prime Minister Hayato Ikeda in 1961, President John Kennedy made US diplomatic history by announcing the US-Japan Committee on Science Cooperation, the first of its kind. Kennedy had followed the advice of his Ambassador to Japan — the illustrious scholar and Harvard professor Edwin Reischauer — and created the committee as part of a broad effort to repair ‘the broken dialogue’ between the intellectual communities of the two countries.5 The National

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4 As quoted in Turekin and Neureiter (2012).
5 In the wake of rising tensions between Tokyo and Washington over the revised Security Treaty between the two countries, Reischauer wrote an article for Foreign Affairs in which he pointed to the ‘weakness of communication between the Western democracies and opposition elements in Japan’ (see Reischauer, 1960). His article so impressed President-elect John F. Kennedy that he was subsequently appointed United States Ambassador to Japan.
Science Foundation's implementation of that cooperative science program has endured for over half a century, evolving with the times and delivering great benefits to both countries.

International scientific cooperation, while strongly linked to the Cold War experience of the United States, also served as an important instrument in the wider global context. For example, after World War II had divided the European continent, collaboration on scientific endeavours served as a significant ingredient in efforts to improve inter-state relations. In 1954, CERN, the European Organisation for Nuclear Research, was established. It was a major project in which the Federal Republic of Germany (FRG) was able to work with former European adversaries such as France. According to a former CERN director, Horst Wenninger, in the aftermath of the Second World, ‘cooperation between [European] nations was simpler in science than in other fields’ (Prolavorio, 2013) and helped play a part in Franco-German rapprochement that culminated in the Elysée Treaty of January 1963.

Similarly, scientific interactions between Israel’s Weizmann Institute and Germany’s Max Planck Society provided a channel for the first high-level discussions between the countries after World War II. Originating in the late 1950s, collaboration between the two bodies precipitated a historic agreement in 1964 which facilitated the transfer of German government funds to Weizmann Institute research projects, hereby fostering a wide range of scientific exchanges between the Institute, the Max Planck Society, and other German universities. Such ties ‘helped lay the foundation not only for German-Israeli scientific cooperation, but also for the establishment of diplomatic relations between the two countries one year later’ (Weizmann Institute of Science, 2013). In January 2012, the two groups announced the creation of a joint Centre for Archaeology and Anthropology, marking their more than five decades of scientific partnership. It is hoped that the Centre will not only strengthen ties between the Max Planck Society and the Weizmann Institute, but may encourage an expansion of scientific ties between Israel and its regional neighbours. The Institute’s Professor Stephen Weiner has expressed enthusiasm regarding the potential political and diplomatic benefits of the initiative, noting that ‘just as happened in relations with Germany, now too scientific collaboration could have a broader impact, helping to promote peaceful ties in the Middle East’ (Weizmann Institute of Science, 2013).
More recently during the post-Cold War era, science outreach has provided an important — and often first — step in the EU’s efforts to expand its diplomatic footprint into such places as post-communist East Europe and an Islamic country like Turkey. Such efforts are also increasingly taking place in other parts of the world. Science cooperation has a powerful role in helping countries as they look to build stronger regional partnerships. Within the East African Community (Burundi, Kenya, Rwanda, Tanzania, and Uganda), a presidential-level initiative to better align and integrate this diverse, populous and historically unstable region is drawing on the promise of scientific cooperation. By sharing costs and resources and increasing the interaction of students and researchers, such technical cooperation can help the region increase its prosperity while contributing to more sustainable regional links. However, it must be acknowledged that not all science diplomacy has been devoted to civilian and diplomatic purposes. A particular area of concern — exemplified by the A. Q. Khan network — has been covert collaboration in the field of nuclear weapons technology and the attendant risk of nuclear proliferation.

On a more general note, scientific advice is crucial for diplomats, and growing recognition of this need has resulted in the rise of international scientific advisory bodies since the 1950s (National Research Council, 2002: 6). In 1957 and 1958 a global community of scientists joined together in a sharing of information and research, naming the period the International Geophysical Year (IGY). The International Council of Scientific Unions arranged for much scientific collaboration across borders, and to some extent did not recognise state borders at all. Sixty-seven states participated in the IGY by prior international agreements settled by the negotiation of diplomats. Upon the success of the IGY collaboration, other scientific research programmes arose which have led to institutions such as the Scientific Committee on Antarctic Research.

While the role of international cooperation in science has a long history, the interaction between science and the conduct of a nation’s foreign policy
does not have such an intertwined past. However, in recent years there has been an increased focus on issues at the interface of science and foreign policy, leading to greater emphasis on the relationship between science and diplomacy.

**Globalization and the Rise of Science Diplomacy**

Structural changes in the mid to late 1980s began to challenge a compartmentalised, state-centred understanding of global politics. The aftershocks of the end of the Cold War and intensified globalization were associated with the growth of international linkages and a reduction in the capacity of nation-states to act independently. The time of absolute and exclusive national sovereignty began to wane as the traditional boundaries between domestic and external policy roles of the sovereign state were blurred by the impact of globalization (Scholte, 2001: 14). The latter could be broadly defined as the intensification of technologically driven links between societies, institutions, cultures and individuals on a worldwide basis. Above all, it was revolutionary changes in communication and information technologies in the 1980s — advances in personal computing and the development of the internet — that effected a compression of time and space by reducing the time taken to cross geographical boundaries. This process facilitated ‘networks of interdependence at multicontinental distances’ (Keohane and Nye, 2000). As an upshot, the world began to be perceived as a smaller place, with issues relating to the environment, economics, politics and security intersecting more deeply at more points than was previously the case (Clark, 1997: 15).

The advent of globalization initiated a debate over the role of the sovereign state in the modern world. Three rival schools of thought can be identified. The hyperglobalists contend that the growing interconnectedness of states through globalization gradually negates the significance of territorial boundaries and paves the way for the decline of the sovereign nation-state (Held and Anthony, 1999: 4). In contrast, the realists or skeptics basically believe that little has changed in the international arena. The skeptics argue

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7The seminal text on the various approaches to globalisation is Held et al. (1999). In particular, see the Introduction (pp. 32–86).
that the impact of globalization on the sovereign state is much exaggerated. From this viewpoint, the state is not the victim of this process, but its main architect (Held and Anthony, 1999: 8).

On the other hand, the transformationalists reject the tendency of both the hyperglobalists and the skeptics to juxtapose state sovereignty and globalization. For transformationalists, state sovereignty is a dynamic concept that is simply undergoing a new phase in its evolution as states respond to the costs and the benefits of the globalization process. This environment is not only widening the opportunities for many states to interact diplomatically, but is also obliging states to recognize that many diplomatic challenges they are now facing are complex and can only be resolved through multilateral or international action. In this era of globalisation, the most profound challenges to human survival — climate change, diminishing bio-diversity, public health, food insecurity and resource scarcity, to name but a few — are rooted in science and driven by technology. Thus, according to the transformationalists, globalization is a ‘mega trend’ that is not only changing the nature of the sovereign state but is also providing the impetus for the rise of science diplomacy.

Growing interest in science diplomacy is, therefore, accompanying an evolution in international relations, and is in some ways a function of such global change. As a more disaggregated diplomatic system — consisting of dynamic networks of lawyers, scientific bodies, non-governmental organisations and the media — takes shape, (The Royal Society, 2010: 3) ‘track II’ diplomacy involving scientists, science and technology based business groups, and scientific regulatory advisors is acquiring a heightened significance. While science has always transcended borders, the growing ease with which such ‘track II’ initiatives can be accomplished is in large part due to the unprecedented mobility of ideas, people and information that characterises the globalisation age (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2011: 7–9).

The Parameters of Science Diplomacy

The convergence of two words — science and diplomacy — has produced an umbrella term that according to the British Royal Society and the American
Association for the Advancement of Science (AAAS) encompasses at least three main types of activities:

- **Diplomacy for Science**
- **Science in Diplomacy**
- **Science for diplomacy**

**Diplomacy for science**

One dimension of science diplomacy — diplomacy for science — seeks to ‘facilitate international cooperation, whether in pursuit of top-down strategic priorities for research or bottom-up collaboration between individual scientists and researchers’ (The Royal Society, 2010). While scientists and diplomats typically come from different backgrounds and experience very different training, there are many areas where their interaction is central to advancing the scientific enterprise.

For instance, while the science and technology community has had great interest in developing large scale and deployable fusion energy as a way to produce cheap, clean and abundant energy, the technical challenges have been formidable, as have the costs. As a result, there has been great interest within the physics community in developing large-scale multinational experimental platforms that could support such advanced science without decimating budgets. Working at the multinational level (at first involving China, Europe, Japan, the Republic of Korea, Russia and the United States), the international science community began to plan for such an international project. As Harding et al. (2012) noted, laying the diplomatic foundations was as important as overcoming the technical challenges:

In addition to design and cost, there was no agreement on a legal and policy structure that would be appropriate for creating and sustaining an international facility and experiment. New approaches were needed for a form of agreement and organization that would allow partners with diverse political and legal systems to work together on a science experiment of this magnitude.

The need for cooperation between the diplomatic and scientific communities on such large multilateral programs is the principal driver behind diplomacy for science. This second dimension of science diplomacy has played a
crucial role in enabling many other international scientific initiatives — such as the International Space Station, the Square Kilometer Array (SKA) project, the International Thermonuclear Experimental Reactor (ITER)\(^8\) and the SESAME synchrotron\(^9\) — to get off the ground. Diplomacy is therefore a key facilitator of science and technology research and development, allowing for communication and collaboration across and beyond national borders.

The work undertaken by the SKA project members across Australia and South Africa also illustrates the importance of diplomacy for science. The projected cost of the project will need to be met by the contributions of participating countries. Similarly, the project has been expanded to two locations in order to utilise the benefits both sites have to offer. Australia has superior radio silence and facilities well suited for low frequency research, whereas South Africa geographically is the ideal candidate for medium and high frequency analysis. Flagship international initiatives such as the Large Hadron Collider (LHC) also rely on the effective utilisation of diplomacy for science.\(^10\) These projects carry enormous costs and risks, but are increasingly vital in areas of science that require large upfront investments in infrastructure, which are beyond the budget of any one participating country. In this sense, international scientific projects require diplomatic input.

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\(^8\)A fusion experimental research facility was first proposed after the standoff over nuclear disarmament at the Reykjavik Summit in October 1986, with collective design efforts beginning in 1988. The final ITER Agreement, signed in November 2006, emphasises the potential for diplomacy for science to enable large-scale, capital-intensive international projects. For more information see Harding \textit{et al.}, (2012).

\(^9\)SESAME, or Synchrotron-light for Experimental Science and Applications in the Middle East, is a major intergovernmental scientific facility hosted by Jordan designed to ‘foster scientific and technological capacities and excellence in the Middle East and the Mediterranean region’ and ‘build scientific links and foster better understanding and a culture of peace through scientific collaboration’. Skilful diplomacy and international cooperation have been central to the early stages of the project’s implementation. For more information see Smith (2012).

\(^10\)The Large Hadron Collider (LHC) housed at CERN in Switzerland is the most powerful particle accelerator ever built, and allows scientists to reproduce the conditions that existed within a billionth of a second after the Big Bang. 27km long and weighing more than 38,000 tonnes, the LHC is the product of a collaborative effort by 20 countries and an enormous international community of scientists and engineers working in multinational teams both at CERN and around the world. See Science and Technology Facilities Council (STFC) (n.d).
But such expansive multinational efforts are only the tip of the iceberg. Bottom-up collaboration takes place daily between institutions and individual scientists, and the strengthening of personal and professional relationships at this level is proving instrumental in driving crucial science and technology research and innovation. As the AAAS and Royal Society argue, ‘the stereotype of the scientist as a lone genius no longer holds true. The scientific enterprise is now premised on the need to collaborate and connect’ (The Royal Society, 2010: 6). Globally, we are increasingly seeing the emergence of ‘an invisible college of researchers who collaborate not because they are told to but because they want to … because they can offer each other complementary insight, knowledge or skills’ (Wagner, 2008).

Science in diplomacy

Many of the major challenges facing states are increasingly global in nature and scale, and have science and/or technology in the fingerprint of their cause or cure. Science in diplomacy describes the role of science — and technology — in providing advice to inform and support foreign policy objectives. The function of science in diplomacy should be to ensure the effective uptake of high quality scientific advice by policymakers (National Research Council, 2002). The scientific community would provide policymakers with up-to-date information on the dynamics of the Earth’s natural and socio-economic systems, and identify where uncertainties exist or where the evidence base is inadequate, in order that informed decisions are made at both the national and international levels (The Royal Society, 2010: 5).

Science in diplomacy, in other words, is about equipping international decision-makers with the scientific knowledge and understanding required to cope with the increasingly complex S&T-related demands of the 21st century. More and more foreign policy decisions are drawing on information that science and the scientific community provides. In looking at current challenges, such as those related to global health, climate change, weapons proliferation and economic growth and innovation, it must be acknowledged that science, technology and knowledge have potentially a central role to play in providing possible solutions. None of these issues can be fully addressed without: (1) understanding the science driving the challenge; (2) developing the technical institutions to disseminate information and knowledge about
the challenge; and (3) engaging with technical experts. As such, decision makers need access to both highly qualified people and timely and relevant information.

The establishment of the Intergovernmental Panel on Climate Change (IPCC) is probably one of the better known examples of policy-related scientific advice, and is a contemporary illustration of science in diplomacy. Mechanisms have been established to aid the flow of information regarding climate change and its potential consequences — from the environmental to the economic — from global scientific institutions and research bodies to the policy making community. While the IPCC does not carry out original research, it reviews and produces periodic assessments of recent scientific, technical and socio-economic research from around the world, and differing viewpoints from within the scientific community are reflected in its reports.

These reports have had far reaching effects in the realm of international relations and on the activities of scientific institutions. Affiliated bodies such as the World Meteorological Organization and the United Nations Environment Programme (which together established the IPPC in 1988), also influence international relations. Scientific knowledge informed the 1992 United Nations Framework Convention on Climate Change and the 1997 Kyoto Protocol, both of which stipulated binding obligations for states to reduce carbon emissions. The notion of 'carbon credits', and the process of states offsetting the limitations of their pollution by purchasing carbon credits from other states, highlight the impact of science in the policy sphere. In December 2007, the IPCC was awarded the Nobel Peace Prize (jointly with former US Vice-President Al Gore) 'for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for the measures that are needed to counteract such change' (Nobel Media AB, n.d.).

National and international academies, learned societies and national scientific advisory bodies are also important sources of independent scientific advice for foreign policy makers. For example, the InterAcademy Panel on International Issues (IAP) — which represents more than 100 national science academies around the world — published statements on ocean acidification and deforestation as part of the UN climate change negotiations in 2009 (The Royal Society, 2010: 6). A decade earlier, a report by the US National Academy of Scientists concluding that the majority of US foreign
policy objectives had science, technology and/or health implications led to the appointment of a science advisor to the Secretary of State and a more than 15-fold increase in the number of scientists with PhDs receiving fellowships to work in the State Department or USAID. Similarly, the Obama administration has recruited several Nobel laureates to fill key executive branch positions, including Secretary of Energy Steven Chu (National Academy of Sciences, National Academy of Engineering, and Institute of Medicine, 2011: 8). Such developments have helped the US foreign policy community build stronger links to the US scientific community and increased America’s overall scientific capacity to deal effectively with the many technical issues that arise in contemporary US foreign policy. This pattern is not replicated to the same degree everywhere in the world, but there are signs of increased scientific input in policy-making in general and in diplomacy in particular.

Finally, building stronger inter-agency collaborations, so that foreign policy makers have easier access to the pool of technical knowledge and communities available in government ministries or departments, and fostering stronger scientific civil societies that have the ability to formally or informally advise international policy leaders, will continue to be objectives of key importance in the future. Ultimately, the ability for science and scientists to equip decision makers with necessary technical and scientific information and also the willingness of decision-makers to recognise the need for such information will help determine the effectiveness of international responses to some of the world’s most pressing challenges.

Science for diplomacy

Science diplomacy and science and technology cooperation … is one of our most effective ways of influencing and assisting other nations and creating real bridges between the United States and counterparts.11

Unlike the categories above, science for diplomacy is the use of science to help build and improve international relations, especially where there may be

strain or tension in the official relationship. Science for diplomacy primarily draws on the ‘soft power’ of science: its attractiveness and influence both as a national asset, and as a universal activity that transcends national or partisan interests.

By enabling countries to exercise and express ‘soft power’ in new and highly effective ways, and fostering the development of trust and agreement between often-adversarial nations, the science for diplomacy dimension is increasingly acknowledged to be of real potential significance. In describing the importance of his country’s research and discoveries in its broader global strategies, Professor Peter Gluckman, Chief Science Advisor to New Zealand’s Prime Minister, said: ‘As a small nation we must compete hard to maintain our relevance in a world where we can easily be forgotten. We have to demonstrate that small countries can indeed, make a difference’ (Gluckman, 2011), in his address at the 1st Annual Meeting of the New Zealand Greenhouse Gas Research Centre. A country’s attempts to project influence and importance on a global scale through its national scientific community provides a fascinating snapshot of science for diplomacy in action. Other nations are also picking up on this potential power. For example, through its ‘science without borders’ initiative (now known as The Brazil Scientific Mobility Program), Brazil is not only training future scientists internationally but is critically using science as a way to reach out to key strategic allies and important economic partners. Other countries, such as China, are using large investments in science and infrastructure both to build their national science systems and to reach out to, and attract, top talent from around the world to their shores (Marcelli, 2013).

Perhaps the real promise of science for diplomacy, however, lies in its ability to develop stronger links between countries in which the political

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12The programme is part of the Brazilian government’s broader effort to grant 100,000 scholarships to the country’s top undergraduate and postgraduate students in the Science, Technology, Engineering and Mathematics (STEM) fields to enable them to study abroad at the world’s best universities. Jointly funded by CAPES (an organisation within the Brazilian Ministry of Education) and CNPq (an organisation within the Brazilian Ministry of Science and Technology), the initiative aims to promote scientific research, increase international cooperation within science and technology, and to engage students in a global dialogue. For more information see IIE (n.d.).
environment is tense and official relationships are strained or limited. The emergence of an era of science diplomacy — in which non-governmental scientists and academics play a key role in diplomacy and international policy — has already provided US scientists with access to potentially influential communities in countries such as Cuba, Burma, Iran and North Korea, despite recurring political crises and the absence of formal government-to-government relations. In particular, initiatives undertaken by the US National Academy of Sciences (NAS) in Iran, in areas such as earthquake science and food-borne diseases, have provided one of the few enduring links between the two countries over a decade marked by particular distrust and tension. Similarly, university partnerships, such as the nearly ten year-long collaboration between Syracuse University and Kim Chaek University of Technology in North Korea on standards-based information technology (Thorson et al., 2008), have enabled people-to-people contacts to persist despite the near total lack of sustained connections at the official diplomatic level between their respective nations.

Like other dimensions of science diplomacy, science for diplomacy comes in many forms. These include, but are not limited to:

- **Science cooperation agreements.** Agreements, such as that signed between Libya and the US in 2004 after the former consented to relinquish its WMDs, are often used to symbolise thawing political relations.
- **Creation of new institutions.** International academies and institutions, such as the European Organisation for Nuclear Research (CERN), can be specifically created in order to reflect and promote the goals of science for diplomacy.
- **Educational scholarships.** Educational scholarships and exchanges act as a mechanism for network-building, and encourage global partnerships. The Newton International Fellowships, run jointly by the Royal Society,

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13This characteristic helps to explain the current focus within US foreign policy on expanding science diplomacy with the Arab and Islamic worlds, and it aptly illustrates the use of science for diplomacy (Lord and Turekin, 2007). For an extraordinary, but all too rare, multilateral example is the SESAME Synchrotron project in Jordan, see Smith (2012).

14For more information on the use of science diplomacy to foster US-Iranian engagement see Jillson (2013) and Albro (2014).
the Royal Academy of Engineering and the British Academy, are a case in point.

- ‘Track II’ diplomacy. In contrast to ‘track I’, or official, diplomacy, ‘track II’ diplomacy directly involves those — such as scientists and other academics — working outside of the official negotiation process.

- **Science festivals and exhibitions.** These events often constitute an effective platform from which to emphasis the universality and impartiality of science, and to highlight common interests. Countries such as China, India and Iran are particularly proud of their historical contributions to scientific advancement, and are keen to share and celebrate this with the world.

## Exploring the Significance of Science Diplomacy

This book seeks to do more than acknowledge the emergence of Science Diplomacy in the international arena. It also attempts to examine the significance of this development and assess whether the advent of Science Diplomacy represents a major break from the past. The structure of this book reflects this central concern.

The first four chapters in this volume focus on the theme of Diplomacy for Science. Using President Barack Obama’s commitment of June 2009 to expand science and technology engagement with the Muslim world as a benchmark, Cathleen A. Campbell outlines specific initiatives taken to advance US science diplomacy in the Arab world since 2009 and then pinpoints some key lessons of this experience. Sarah Macindoe assesses current international efforts to manage plant genetic resources for food and agriculture and whether New Zealand can harness science diplomacy to make a positive impact here. For Gary Wilson, Antarctica has a critical role in world’s ocean and atmospheric system and it is now imperative for the model of international co-operation, based on links between science and diplomacy on the frozen continent, to be extended to counter the threat of global warming. In addition, Maria Pozza examines the Square Kilometre Array (SKA) radio telescope project as a case that is not only deepening scientific links between South Africa and Australia (and to a lesser degree, New Zealand) but is also expanding diplomatic links between a developing and developed state.
Four subsequent chapters deal with various aspects of Science in Diplomacy or how scientific advice interacts with foreign policy goals. Manjana Milkoreit explores the fascinating question of how scientific information is received and used in the minds of diplomats by probing the belief systems of diplomatic participants in the United Nations Framework Convention on Climate Change (UNFCCC) negotiations. Drawing on his own high-level professional experience, Sefton Darby looks at the international hydrocarbon and minerals extraction environment in two countries — Chad and Azerbaijan — and, in particular, considers the relationship between the ‘resource curse’ and science diplomacy. Joan Leach outlines the problems and possibilities for science communication in international diplomacy. Science communication is considered as a form of ‘soft power’ in the three related areas of diplomacy for science, science in diplomacy, and science for diplomacy that characterise science diplomacy. In contrast, Daryl Copeland focuses on the role of science and technology in today’s world and looks at the 2010–2011 WikiLeaks ‘Cablegate’ affair as a case study of the impact of digital communications technology on contemporary diplomacy (technology in diplomacy).

The final four chapters provide insights into the possibilities and challenges of Science for Diplomacy. In a chapter concerning the association between science cooperation and international security, Jeffrey Bourwell explores the impact of the information and communications revolution on three 21st century security issues — missile defence, militarization of outer space, and the geopolitics of the Artic in the era of climate change. Meanwhile, Edison T. Liu considers global health research as a specific form of science diplomacy and drawing on three examples — epidemic research, clinical cancer research and population genetics research — he maintains that this form of collaboration delivered substantial and diplomatic benefits. Stephen Goldson and Peter Gluckman consider how a small state like New Zealand, a predominantly food exporting nation, strategically uses science to maximise diplomatic impact in seemingly diverse areas such as biosecurity and pastoral gas greenhouse emissions. Furthermore, Atsushi Sunami, Tomoko Hamachi, and Shigeru Kitaba analyse a growing recognition in Japan that science and technology diplomacy has a big role to play if Tokyo is to remain one of the ‘critical points’ in an expanding global science resource network.
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