Chapter 24

Introduction

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One way to understand the range or breadth of roles is to use the taxonomy articulated in the Royal Society and American Association for the Advancement of Science (AAAS) report *New Frontiers in Science Diplomacy* (2010):¹ Diplomacy for science is what we call international relations that facilitate cooperation on science. Science for diplomacy is where technical cooperation helps international relations by connecting people and providing an example of mutually beneficial cooperation. The collateral benefits of those interactions are relationships and better understanding of underlying culture, which is acquired only through interaction. And the third type, science in diplomacy is where scientists use information and analyses to address diplomatic issues. In a sense, the scientist-to-scientist engagements on security issues embodied by the Amaldi Conferences combine science for diplomacy and science in diplomacy.

Three organizations illustrate some of these roles of scientists in addressing problems between and among nations. The Nobel Peace Prize winning International Campaign to Abolish Nuclear Weapons (ICAN) has brought new energy and new people, including scientists, to the disarmament effort. The International Organization of the International Thermonuclear Experimental Reactor (ITER), a joint project of 35 nations to build the world's largest magnetic fusion energy facility, was born out of the Cold War. The Laser Interferometry Gravitational Observatory (LIGO), which detected gravitational waves directly for the first time in September 2015, draws members from across the United States and the world.

Scientists developed nuclear weapons and, because of that role, according to Alicia Sanders-Zakre, they had a sense of responsibility for controlling nuclear weapons.

¹The Royal Society and AAAS [1].

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The organizations founded by scientists illustrate this history, including the Federation of Atomic Scientists (later the Federation of American Scientists), the Bulletin of Atomic Scientists, the Union of Concerned Scientists, the Russell-Einstein manifesto and Pugwash, and others. Scientists continue to research and share their findings on the terrible consequences of nuclear war, including recent analyses of the effect of a limited nuclear exchange on the climate. ICAN has engaged scientists in support of the Treaty on the Prohibition of Nuclear Weapons (TPNW). Some working within the nonproliferation regime criticize the TPNW as counterproductive, redundant to and therefore distracting from the Nuclear Non-proliferation Treaty (NPT), and providing no path to arms reductions and disarmament. ICAN sees the TPNW as complementing the NPT, not interfering with it, but also not accepting the inaction on disarmament, and therefore inspiring scientists and others to develop frameworks for disarmament. ICAN utilizes the strength of youthful impatience and impertinence to speak up when told to be quiet, evident in other major social movements such as the current push for action on climate change.

Born of a desire to use science to demonstrate cooperation between rivals, the agreement to pursue ITER was a product of the 1985 Geneva summit between U.S. and Soviet leaders, a kind of multilateral descendent of the Soyuz-Apollo mission. Fusion is often touted as a future limitless energy source. ITER is the world's largest effort to bring that future nearer, and it illustrates how difficult practical international cooperation is. As Sergio Orlandi explained, ITER grew to have many partners and, through a selection process, the facility was located in Southern France. The partners provide in-kind contributions, such as the magnets, the vacuum vessel, and the cryoplat. It has been an enormous challenge as an engineering project to marry together these essential components from so many different places. There have also been considerations of export controls and security restrictions of the host country with respect to tritium. Rules enable these partners to make progress and, we hope for the benefit of humankind, succeed.

Barry Barish shared the 2018 Nobel Prize in Physics for "for decisive contributions to the LIGO detector and the observation of gravitational waves." This set of observations in 2015, verifying Einstein's 1916 prediction of gravity waves, is one of the great successes of modern physics and was achieved with participation of an international team, despite being located in the United States. Barish argues that cooperation among scientists in different countries is essential. Science is an international sport, trying to solve problems that do not yet have solutions. In LIGO, because the solutions were unknown, the project had to be organized and operated in a less hierarchical way than say a project to build a bridge with a known design. They came together and worked on a common problem and successfully developed solutions, which should give us hope for how scientists can help solve other problems.

Although these experts are optimistic about the potential for scientific cooperation to help the world avoid calamity, several concerns were raised. First, as valuable as international science institutions are for Science Diplomacy, a participant argued that their impact on real-world problems would be higher if the institutions would develop positions on issues for humankind. Dual-use technology, that is to say technology that has both benign and potentially harmful uses, is another concern. For example,

if scientific results are openly available, then they could be misused. On the other side of that coin, are concerns about the securitization of science. According to Dr. Barish, scientists worry about these issues, not so much for the scientific results, but more for the new technologies used to reach those results. Pure science has to be open; this is a core principle. But the new technologies developed, such as artificial intelligence used for LIGO, raise several concerns about misuse. The scientists worry about that and are talking about it, but they have no solutions yet. For ITER, sensitive technologies are produced and controlled by the host country and not all partners and participants get access to the knowledge. A different kind of concern closed the session. The average age of scientists addressing nuclear issues has been rising for many years. ICAN has been effective in engaging young people around the world by having a simple, clear message on an important issue. It is easily understood and people are inspired to work on it.

Reference

1. The Royal Society and AAAS, *New Frontiers in Science Diplomacy* (The Royal Society, London, 2010)

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