John Lisle

Department of History, University of Texas at Austin

The Origins, Work, and Legacy of the World War I Science Attachés

This paper explores the careers of American science attachés during World War I and beyond. The first half of this paper describes the origins and functions of the World War I science attachés sent abroad by the National Research Council, including their ability to coordinate research, eliminate duplication, and accurately relay needed information. The second half of this paper describes the legacy of these science attachés by elucidating the pathway leading from them to post-World War II science attaché programs. The second half of this paper also situates America's science attaché programs within the context of national security. In the conclusion, this paper compares and contrasts the different iterations of the science attachés and explains the varying reasons for their accomplishments and failures.

The First Science Attaché

A shipment of swine livers arrived in Hamburg in 1898. German newspapers accused the "secret American method" of their preparation of causing premature putrefaction and human

cases of trichinosis, a parasitic disease.[1] Charles Stiles was a mild-mannered, meticulous American zoologist stationed in Berlin to investigate the ongoing trichinosis claims. He immediately set off for Hamburg to examine the livers. The Germans unsuccessfully attempted to deny Stiles access to necessary information.[2] But Stiles thrived in laboratories. Upon inspection, he exposed the entire story as a fabrication. American pork was trichinosis-free while *German* meats harbored the disease. The whole affair represented a smokescreen of German economic interests.

In his final report, Stiles exonerated the American pork trade and berated German microscopy. Half of the 6,300 German cases of trichinosis over the previous two decades "appear to have been due to faults of the German inspection," he said.[3] The *New York Times* commended Stiles' work, concluding, "The idea of keeping a scientist in Europe for the especial purpose of championing our products" had done an "incalculable good" for American industry.[4] Stiles became America's first science attaché. A year and a half later, he returned to the United States without a replacement.[5]

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[1] Edward Breck, "Germany Suspects Us Yet," *New York Times* (July 17, 1898): 17.
[2] James Cassedy, "Applied Microscopy and American Pork Diplomacy: Charles Wardell Stiles in Germany 1898-1899," *Isis* 62, no. 1 (Spring 1971): 18.
[3] Quoted in ibid., 19.
[4] Edward Breck, "Germany Suspects Us Yet," *New York Times* (July 17, 1898): 17.
[5] "Prof Stiles Recalled," *Washington Post* (November 25, 1899): 3. The United States established its first naval and military attachés more than a decade before Stiles' stay in Germany. These attachés primarily worked as intelligence gatherers, intelligence simply referring to any desirable information on a particular target, regardless of how the information is obtained. Bruce Bidwell, *Hitsory of the Military Intelligence Division, Department of the Army General Staff: 1775-1941* (Frederick: University Publications of America, 1986), 54. During the Spanish-American War, when Stiles examined livers in Hamburg, Navy and Army attachés provided valuable information on Spanish armaments and intentions. In one humorous incident, a secret War Department report on the Philippines turned out to be an article lifted from the *Encyclopedia Britannica*. Bradley Smith, "The American Road to Central Intelligence," in Rhodri Jeffreys-Jones and Christopher Andrew, eds., *Eternal Vigilance?: 50 Years of the CIA* (London: Frank Cass, 1997), 5.

The Growth of American Science

The United States emerged as an industrial giant at the turn of the twentieth century. Coal mining towns dotted the landscape. Railroads crisscrossed it. By 1890, there were 163,562 miles of rails in the United States, enough to travel between New York City and Los Angeles over sixty-six times.[6] J. P. Morgan's United States Steel Corporation became the first billion-dollar company. Factories embraced mechanization. Popularization of the repetitive assembly line soon followed.

Industrial growth led to a need for standardization in weights and measures. The National Bureau of Standards was created in 1901 to alleviate this need, resulting in a demand for physicists. Similarly, the proliferation of tainted and mislabeled foods and drugs created a demand for chemists. Upton Sinclair's 1906 book *The Jungle* fixated public attention on the issue. He vividly exposed revolting conditions in the Chicago meat industry: "There would be meat that had tumbled out on the floor, in the dirt and sawdust, where the workers had tramped and spit uncounted billions of consumption germs. There would be meat stored in great piles in rooms; and the water from leaky roofs would drip over it, and thousands of rats would race about on it."[7] The Pure Food and Drug Act of 1906, informed by Charles Stiles' reports from Germany, sought to end such practices. It established a Bureau of Chemistry, later renamed the Food and Drug Administration, which relied on increasing numbers of American chemists.

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[6] Department of the Interior Census Office, *Report on Transportation Business in the United States at the Eleventh Census: 1890*, by Henry Adams (Washington D.C.: United States Government Printing Office [hereafter USGPO], 1895), 4.
[7] Upton Sinclair, *The Jungle* (New York: Grosset and Dunlap, 1906), 162.

The private sector funded even more scientists. Andrew Carnegie, John D. Rockefeller, Cornelius Vanderbilt, and Leland Stanford, among others, contributed massive sums of money to higher education, laboratories, and research. The Carnegie Institution of Washington received an initial $10 million endowment from its namesake, equaling Harvard's entire endowment.[8] Corporations such as AT&T, General Electric, DuPont, and Kodak created their own research laboratories. With this infusion of funds, universities began admitting more science Ph.D. students and the number of new American scientists grew.

Establishing the World War I Science Attachés

On June 28, 1914, Bosnian Serb Gavrilo Princip assassinated Archduke Franz Ferdinand of Austria with a "shot heard round the world." Austria-Hungary quickly declared war on the Kingdom of Serbia after issuing a failed ultimatum. A complicated entanglement of political alliances drew other European countries into the hostilities, resulting in the outbreak of World War I. The Great War eventually cost roughly eighteen million people their lives. It ushered in the use of aircraft, chemical, submarine, tank, and trench warfare.

Sir Humphry Davy gave chemistry lectures in Paris during the Napoleonic Wars, "Not because of enlightened governmental attitudes to the freedom of science," the President of the Canadian National Research Council said in a 1960 speech on science and international affairs, "but rather as a tribute to its utter uselessness in the minds of the governments of the day."[9]

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[8] Daniel Kevles, *The Physicists: The History of a Scientific Community in Modern America* (New York: Alfred A. Knopf, 1978), 69.
[9] F.W.R. Steacie, "Science and International Affairs," November 4, 1960, H.P. Robertson Papers, Box 11, Folder "National Academy of Sciences Office of International Relations," Caltech Archives.

Harvard President James Conant often told a similar anecdote about American science during World War I despite science's growing utility. Allegedly, in 1916, an American chemist approached Secretary of War Newton Baker to offer his and his colleagues' aid to the war effort. Thank you very much, Baker said, but that would not be necessary. As Conant recalled, "On looking into the matter he found the War Department already had *a* chemist."[10]

Despite Conant's humorous anecdote, World War I reshaped the landscape of American science. Congress diverted funds toward scientific research largely for practical military applications. The war provoked several American military science advances, including new methods of submarine detection and flash and sound ranging techniques. Chemists devised useful optical glass (for periscopes, gun sights, field glasses), nitrates (for explosives), and poison gases.[11] The war also gave the United States its first science attachés since Charles Stiles examined pork in Germany two decades earlier.

President Woodrow Wilson created the National Research Council (NRC) in 1916 as a branch of the National Academy of Sciences to foster scientific research and develop industry. During World War I, the NRC sent three science attachés, physicist Henry Bumstead, mechanical engineer William Durand, and engineer S.L.G. Knox, to U.S. embassies in London, Paris, and Rome, respectively.[12] In reality, they lacked any official rank within the embassy, but nevertheless functioned as if they had—the title of science attaché was more a courtesy than an

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[10] Quoted in James Hershberg, *James B. Conant: Harvard to Hiroshima and the Making of the Nuclear Age* (New York: Alfred A. Knopf, 1993), 43.

[11] Kevles, *The Physicists*, 117-31, 137. Science's growing utility in war prompted Navy Commander Clyde McDowell and James Cattell, editor of *Science*, to call for extending government-funded basic research into peacetime for scientific advancement and national security.

[12] The Rome appointment was not made until after the other two were already established.

official designation.[13] Bumstead did not lose sleep over the bureaucratic matter, writing to NRC Chairman George Hale, "I shall assume that I have a right to the title and use it on letterheads and cards."[14]

The increasingly complex scientific and technological nature of warfare heralded their appointments. There was, Durand said, "a serious and imperative need for a continued and regular interchange of information regarding […] the applications of science to warfare, in order that duplication of efforts might be avoided and equality of status between ourselves and our allies […] might be realized and maintained."[15] The British "threw open secrets on cryptography, chemicals, gas warfare, aeronautics, sound detection, wireless telegraphy, and psychological warfare," which presented "so rich" an opportunity, historian of naval intelligence Jeffery Dorwart says, that distinct science attachés were deemed necessary in addition to their military counterparts.[16]

Bumstead received an enthusiastic reception as science attaché in London. He wrote, "I have been received absolutely with open arms by every single Britisher I've come in contact with." In one close encounter, Bumstead experienced his first air raid and found himself "thoroughly enraged and filled with hate for the infernal Germans when I thought of what must be happening somewhere in London. It was a much more intense and violent feeling than I have

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[13] C. E. Mendenhall to George Hale, March 12, 1919, Folder "Research Information Service Appointments: Scientific Attachés Designation by State Department, 1919," National Academy of Sciences Archives [hereafter NAS].
[14] Henry Bumstead to George Hale, February 27, 1918, Folder "General Relations: Res Info Service; Foreign Offices: London, Beginnings of Program, 1918," NAS.
[15] William Durand, *Adventures in the Navy, in Education, Science, Engineering, and in War: A Life Story* (New York: American Society of Mechanical Engineers and McGraw-Hill, 1953), 70.
[16] Jeffery Dorwart, *The Office of Naval Intelligence: The Birth of America's First Intelligence Agency 1865-1918* (Annapolis: Naval Institute Press, 1979), 126.

ever experienced when reading about their various atrocities. It is curious that actual physical proximity makes a difference."[17]

William Durand experienced a similarly eventful welcoming in Paris. Supposedly, a German torpedo nearly sunk his ship en route to his station. Durand stoically watched air raids from his balcony instead of seeking underground shelter with the Parisians. "The first indication of approaching planes would be the beginning of a barrage of shells bursting high in the air over the path of the anticipated planes," he wrote. "This was highly spectacular and interesting as a show."[18] Durand also experienced long-range shelling, which, over time, the French appeared inoculated against. "Often I have seen men and women seated at tables on the sidewalk in cafés, taking their afternoon aperitif, note the burst of an explosion with nothing more than a wave of the hand and some remark such as, 'There's another.'"[19] Knox's appointment was less eventful, though still useful. His efforts mainly concerned consolidating information on submarine detection. He resigned his position due to ill health in April 1919.[20]

War Work of the Science Attachés

[17] Quoted in Page, *Biographical Memoir of Henry Andrews Bumstead*, 116. The NAS biographical memoirs are available online at: http://www.nasonline.org/publications/biographical-memoirs. In 1918, Bumstead succeeded Robert Millikan as president of the American Physical Society. After the war, he returned to Yale and later became the chairman of the NRC.
[18] Durand, *Adventures*, 71, 74.
[19] Ibid., 82.
[20] Henry Washington to NRC, August 27, 1919, Folder "Research Information Service Foreign Offices: Rome," NAS; [*Blank*] to Robert Lansing, June 13, 1919, Folder "Research Information Service Appointments: Scientific Attachés Designation by State Department, 1919," NAS.

Henry Bumstead serves as a useful case study for the World War I science attachés because his work was particularly well chronicled. On February 24, 1918, Bumstead and Karl Compton, who was to be an associate to Durand in Paris, arrived in Liverpool after being delayed from traveling abroad for a month by influenza.[21] On their first day in London, the two attended an inter-allied conference on airplane fittings. The next day, Bumstead met up with Durand, who was friends with the resident naval attaché and saw to it that Bumstead received a cozy office in the overcrowded American embassy.

Bumstead summarized his duties as science attaché in an official report, "The general object of the new service was to get the information if possible and to transmit it as promptly as possible; to obtain answers to specific questions cabled or written to us by responsible authorities; and to avoid, and prevent as far as we were able, the duplication of inquiries which had been so common previously."[22] Military officers presented topics of investigation to the science attachés, who had likely investigated the topic before, thereby eliminating the unnecessary duplication of efforts that plagued military research. "In some cases," Bumstead wrote, "the same subject had been thoroughly 'investigated' within the space of two or three months by as many as six different emissaries, each one quite ignorant of the existence of the others; a situation undeniably trying to the patience of our allies and not creditable to us."[23] In most cases, these "different emissaries" were "ignorant of the existence of the others," but in other cases, the military representatives refused to share their findings with another military

[21] Henry Bumstead, "Report of the London Office," September 30, 1919, Folder "Research Information Service Foreign Offices: London Report of Activities, 1918-1919," NAS.
[22] Ibid.
[23] Ibid.

branch due to age-old rivalry. The science attachés, being an independent service, served as a convenient conduit for sharing information without losing face.

While the science attachés proved useful in preventing unnecessary duplication, they were not perfect. Bumstead wrote to Hale that one pessimistic military attaché "told me that he thought any attempt at co-ordination was doomed to failure." Nobody tried to withhold information from the science attachés, "but, on the other hand," Bumstead wrote, there was "no desire to take any trouble to see that we get it." Without explicit orders from an authority such as the Secretary of War, military officials were busy enough fighting the war to report to a science attaché whenever they obtained new information.[24]

In a sense, along with carrying out investigations, the World War I science attachés became a storehouse of useful knowledge. Their accumulated information and reports concerned subjects including, but not limited to, aeronautics, anti-aircraft methods, anti-submarine methods, bomb-dropping, camouflage, dirigible and kite balloons, explosives, food supply, gas-warfare and masks, gun-sights, influenza, medicine, meteorology, mines, nitrogen fixation, periscopes, photography, pigeon training, psychological tests, pyrotechnics, range-finders, search-lights, secret signals, smoke screens, various new industrial processes in chemistry and metallurgy, and wireless telegraphy and telephony.[25] A sampling of report titles from the Paris branch include:

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[24] Henry Bumstead to George Hale, April 5, 1918, Folder "General Relations: Res Info Service; Foreign Offices: London; General," NAS.

[25] Henry Bumstead, "Report of the London Office," September 30, 1919, Folder "Research Information Service Foreign Offices: London Report of Activities, 1918-1919," NAS; "Memorandum of Reports Received from the Scientific Attaché, American Embassy, London," Folder "General Relations: Res Info Service; Foreign Offices: London; Reports: Listing 1918," NAS; "Memorandum of Reports Received from the Scientific Attaché, American Embassy, Paris," Folder "General Relations: Res Info Service; Foreign Offices: Paris; Reports: Listing 1918," NAS; "Memorandum of Reports Received from the Scientific Attaché, American Embassy, Rome," Folder "General Relations: Res Info Service; Foreign Offices: Rome; Reports: Listing 1918," NAS.

"Training of Pigeons for Night Service and Use of Gas Protection for Pigeons," "Sound Ranging," "Gas Warfare Research in Paris," "Electrical Equipment of the Eiffel Tower," "Intoxications by Munitions in France," and "Remote Control by Wireless."[26] In all, the science attachés produced 1,650 reports.[27]

The following condensed reports from the London office provide a general overview of the work Bumstead conducted in particular fields:

> Anti-submarine.
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> The exchange of reports between the Office of the Scientific Advisor for the Admiralty in charge of anti-submarine investigation, and the United States Naval Experimental Station at New London has taken place through this office. In addition, the office has been called upon, both by the New London station and the British Admiralty, to try and arrange for the exchange of certain experimental devices.
>
> […]
>
> Medical.
>
> This office has regularly transmitted the reports of the British Medical Research Committee, and in return has sent to that Committee the reports of the Division of Medicine and Related Sciences, N.R.C., together with some special American medical reports. We have also obtained, through the kindness of the Medical Research

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[26] "Memorandum of Reports Received from the Scientific Attaché, American Embassy, Paris," Folder "General Relations: Res Info Service; Foreign Offices: Paris; Reports: Listing 1918," NAS

[27] Science Policy Research Division Congressional Research Service, *Science and Technology in the Department of State: Bringing Technical Content into Diplomatic Policy and Operations*, Science, Technology, and American Diplomacy (Washington D.C.: USGPO, 1975), 56.

> Committee, some special cultures of Bacillus Aertrycke, which were urgently needed in Washington, and, in turn, have assisted the British Medical Research Committee in securing some American equipment.
>
> […]
>
> Wireless.
>
> As a matter of routine, this office has exchanged radio publications between the British experimental stations and the research groups of the United States Signal Corps and the Bureau of Standards. A special report was also sent in upon work in progress at Dr. Eccles' laboratory. In connection with the Solar Eclipse of May 29th, this office assisted the British Association Committee in organizing observations in the United States in an attempt to detect the possible influence of the eclipse on the transmission of wireless signals.[28]

The science attachés' collection and distribution of useful information was not limited to military science and technology. It also included information on useful contacts. Bumstead said, "We knew the different laboratories and experimental stations where particular things were being done, had visited most of them, knew their telephone numbers, and had a personal acquaintance with the men who were doing the work."[29] One officer called Bumstead, in the words of Robert Millikan, "the most influential American in England" for his usefulness in establishing contacts between people.[30] Prideful of his accomplishments, Bumstead remembered that he could tell an

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[28] C. E. Mendenhall, Report of Activities, July 16, 1919, Folder "Research Information Service Foreign Offices: London, Reports: Interim," NAS.
[29] Henry Bumstead, "Report of the London Office," September 30, 1919, Folder "Research Information Service Foreign Offices: London, Report of Activities, 1918-1919," NAS.
[30] Robert Millikan, "Henry Andrew Bumstead," *Science* (53 no 1361, Jan 1921) 84.

officer who came to London "where to go, how to get there and whom to see; and we could make appointments for him by telephone in a very short time. As is well known proper introductions are particularly useful in England and we were able to be of distinct assistance in this way also."[31] Over the course of the war, an increasing number of military and civilian investigators immediately sought out the science attachés upon arrival in London, Paris, or Rome.

The Success and Termination of the Science Attachés

Overall, the World War I science attachés proved surprisingly useful. Rear Admiral Roger Welles noted, "As Director of Naval Intelligence during the war I was in a position to observe the activities of the National Research Council through the Scientific Attachés in London, Paris and Rome. I feel sure that the work these Attachés did abroad more than justified their appointment and contributed more than a little in shortening the war. [Their reports] were invariably of great value and assisted in arriving promptly at conclusions which would have been delayed many months without them."[32] Part of their success came from their hosts' generosity. "As far as I had opportunity to observe," Bumstead recalled, "there appeared to be no technical secrets which [the British] were not willing to share fully and freely with the United States." Obtaining information is much easier when you have a willing participant. The British particularly enjoyed working with the science attachés because, before their arrival, the U.S.

[31] Henry Bumstead, "Report of the London Office," September 30, 1919, Folder "Research Information Service Foreign Offices: London, Report of Activities, 1918-1919," NAS.
[32] Quoted in James Angell to William Phillips, November 6, 1919, Folder "Research Information Service Appointments: Scientific Attachés Designation by State Department, 1919," NAS.

Army, Navy, government bureaus, and even private organizations sent special investigators to question the British and French on their developments, "A situation undeniably trying to the patience of our allies and not creditable to us," Bumstead said. The science attachés, serving in their role to eliminate duplication, uncomplicated the lives of foreign officials who furiously and repeatedly answered the same questions. As a result, those officials were inclined to assist the science attachés. Additionally, the science attachés received unremitting assistance from their American colleagues. Bumstead continued, "Our own officials—military, naval, and civilian—made the work of the Research Information Service in London comparatively easy and unqualifiedly pleasant."[33]

The science attachés' success also derived from their clear direction once abroad. Although, Bumstead said, "We had left the United States with only a general idea of what our duties were to be and with very vague notions as to how they might best be carried out," the World War I science attachés were told specifically what information to seek by their superiors in the embassies.[34] In one obscure report, Bumstead fulfilled a request for the average height and weight of 1,000 Canadian soldiers, which turned out to be 5 foot 5.625 inches and 143 pounds. English soldiers, he found out, measured 5 foot 6.25 inches and 131.25 pounds.[35]

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[33] Henry Bumstead, "Report of the London Office," September 30, 1919, Folder "Research Information Service Foreign Offices: London Report of Activities, 1918-1919," NAS.
[34] Ibid.
[35] Henry Bumstead, "Average Height and Weight of a Thousand Canadian Soldiers," Folder "General Relations: Res Infor Service, Foreign Offices: London, Reports: General," NAS; Henry Bumstead, "Average Height and Weight of 1000 English Soldiers," Folder "General Relations: Res Infor Service, Foreign Offices: London, Reports: General," NAS.

U.S. military attachés during World War I had different objectives.[36] They engaged in activities including "espionage, counterespionage, passport control, propaganda activities, interrogation of escaped Allied prisoners of war and enemy deserters, detection of smuggling, and the location of hostile communication facilities," says historian Bruce Bidwell.[37] Wise to these efforts, "the French consistently refused to allow the American attaché in Paris into the field, even in rear areas. So America slumbered on at a time when intelligence and subversive control was leaping ahead among the warrior nations," historian Bradley Smith writes.[38] The transparency with which the science attachés worked, and their complete willingness to engage in open collaboration, spared them of the same fate.

Efforts were made to replace Bumstead, Durand, and Knox after their departures from Europe in 1919. The NRC and Smithsonian Institution sent C. E. Mendenhall, Henry Howe, and Henry Washington to the American embassies in London, Paris, and Rome to serve as science attachés. They performed the duties of science attachés, although lacked any official rank. Smithsonian administrator Charles Walcott and others wrote directly to the Secretary of State asking for the State Department to appoint the three men as official representatives of the United States.[39] The State Department replied by saying that they could not officially recognize the science attachés in connection with American embassies without congressional action. "Unless Congress acts, then the only way for them to retain their titles would be for them to be appointed

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[36] For the role of naval attachés in World War I see Wyman Packard, *A Century of U.S. Naval Intelligence* (Washington D.C.: Office of Naval Intelligence and Naval Historical Center, 1996), 61-65.
[37] Bidwell, *History of the Military Intelligence Division*, 127.
[38] Bradley Smith, "The American Road to Central Intelligence," in Jeffreys-Jones and Andrew eds., *Eternal Vigilance?*, 10.
[39] Charles Walcott to Robert Lansing, June 17, 1919, Folder "Research Information Service Appointments: Scientific Attachés Designation by State Department, 1919," NAS.

by some Department of the Government, such as the Department of Commerce or the Department of the Interior with a nominal salary of $1.00 per year each," which never happened.[40] Hale revealed in a letter to S.L.G. Knox in Rome that the funds for the science attachés came from the President's Emergency Fund.[41]

The 1918 *Annual Report of the National Research Council* said that it "goes without saying that the position of scientific attaché at our principal embassies […] should undoubtedly be continued during times of peace."[42] Similarly, the newly-formed International Research Council, composed of delegates from the national academies of sciences of Belgium, Brazil, France, Great Britain, Italy, Japan, Poland, Portugal, Romania, Serbia, and the United States, requested their governments "to appoint permanent scientific attachés at their principal embassies. The function of the scientific attachés shall be to collect and forward information regarding scientific and technical matters, and to insure the continuity of the relations established during the war by the various scientific and technical missions."[43] Rear Admiral Welles agreed, saying, "I should think that an effort might be made to continue [the science attachés] in peace as well as in war time."[44]

The NRC described the purposes of these potential peacetime science attachés: represent American science, attend meetings, track scientific progress, report findings to Washington,

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[40] Gordon Fulcher to Dr. Merriam, June 12, 1919, Folder "Research Information Service Appointments: Scientific Attachés General, 1919," NAS.
[41] George Hale to S.L.G. Knox, February 11, 1919, Folder "Research Information Service Appointments: Scientific Attachés General, 1919," NAS.
[42] NRC, *Third Annual Report of the National Research Council* (Washington D.C.: USGPO, 1919), 4.
[43] Quoted in ibid. The International Research Council is now called the International Council for Science.
[44] Quoted in James Angell to William Phillips, November 6, 1919, Folder "Research Information Service Appointments: Scientific Attachés Designation by State Department, 1919," NAS.

serve as liaison for traveling American scientists, and promote international scientific cooperation.[45] However, the funds for the service lapsed once the war ended. Bumstead remarked at war's end that the "conditions were so abnormal" during his appointment "that very little of our experience would be directly applicable to conditions in times of peace," though he recommended conducting an experimental trial.[46] The United States terminated its science attaché program.[47] There would be no more American science attachés until after World War II.

Science in the Interwar Years

University science faculties grew with an energetic pace after the Great War. New technologies such as vacuum cleaners, washing machines, refrigerators, rayon, electric lights, and improved streetcars gave science a distinctive grandeur.[48] While American universities trained record numbers of scientists, record numbers also sought postdoctoral study in Europe. Soon, American scientists returned to the United States better trained and with bigger ambitions, establishing the United States as the new beacon for postdoctoral students. In a sense, the Europeans trained their replacements.

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[45] NRC, *Third Annual Report*, 4-5. On efforts to continue the science attachés after World War I see George Hale to A. Leuschner January 12, 1920, Folder "Research Information Service Foreign Offices: Continuation Proposed, 1919," NAS; William Durand to James Angell, October 11, 1919, Folder "Research Information Service Foreign Offices: Continuation Proposed, 1919," NAS; Henry Bumstead to James Angell, October 1, 1919, Folder "Research Information Service Foreign Offices: Continuation Proposed, 1919," NAS; Gordon Fulcher to George Hale, April 30, 1919, Folder "Research Information Service Foreign Offices: Continuation Proposed, 1919," NAS.

[46] Henry Bumstead to James Angell, October 1, 1919, Folder "Research Information Service Foreign Offices: Continuation Proposed, 1919," NAS.

[47] Science Policy Research Division, *Science and Technology in the Department of State*, 56.

[48] Kevles, *The Physicists*, 170-72.

Contributing to the sense that the United States was the new beacon for the brightest minds, American physicists started achieving outstanding triumphs of their own: Ernest Lawrence invented the cyclotron to accelerate particles; Harold Urey proved the existence of deuterium, an isotope of hydrogen, soon after the English physicist James Chadwick identified the neutron; and Carl Anderson discovered the positron.

No less important for the growth of American science was the influx of European refugees, especially Jews. Those who made the journey included Hans Bethe, Albert Einstein, Enrico Fermi, James Franck, Leo Szilard, Theodore von Kármán, John von Neumann, Edward Teller, and Eugene Wigner. By 1941, the United States accepted around one hundred refugee physicists. Many eventually made important contributions to the Manhattan Project to create the first atomic bombs.[49] Several of them had received or would receive the Nobel Prize.[50]

Notable and capable physicists such as Werner Heisenberg, a pioneer of quantum mechanics and author of the famous Uncertainty Principle—which reveals the impossibility of precisely measuring multiple factors of a particle simultaneously, such as position and velocity (the more closely one measures the position, the more one obfuscates the velocity and vice versa)—remained in Germany. They would presumably contribute to a German war effort, which worried American and refugee scientists. Physicists Hans Bethe and Victor Weisskopf seriously considered kidnapping Heisenberg to cripple any future German atomic bomb project.

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[49] Charles Weiner, "A New Site for the Seminar: The Refugees and American Physics in the Thirties," in Donald Fleming and Bernard Bailyn, eds., *The Intellectual Migration: Europe and America, 1930-1960* (Cambridge: Harvard University Press, 1969), 217.

[50] Though anti-Semitism in the United States disadvantaged Jewish scientists. Princeton almost rejected Richard Feynman from graduate study for being Jewish. The chairman of Harvard's chemistry department said, "We know perfectly well that names ending in 'berg' or 'stein' have to be skipped." Quoted in James Gleick, *Genius: The Life and Science of Richard Feynman* (New York: Pantheon Books, 1992), 85.

Weisskopf said, “We knew that Heisenberg was a very good physicist and could effectively lead the German project and that seemed very dangerous. We thought that kidnapping Heisenberg would greatly limit the German project.”[51]

Growing tensions in Europe drove scientists in the United States to urge preparedness. Nazi Germany threatened both political stability and intellectual freedom. Dismissing the excessively theoretical “Jewish science” of Einstein’s relativity, German Propaganda Minister Joseph Goebbels led a book burning in 1933 featuring Einstein’s work and remarked, “The era of exaggerated Jewish intellectualism is now at an end […] you do well at this hour to entrust to the flames the intellectual garbage of the past.”[52]

Coordinating Scientific Research

In the United States, Vannevar Bush proselytized the benefits of preparedness in war precisely when another conflict in Europe seemed inevitable. The nostalgic pipe smoker pined for the past yet realize the inevitable approach of the future. Bush spearheaded American scientific research during World War II.

Bush grew up in a changing world. Gas-powered cars, motion pictures, telephony, electricity, and radio blossomed after his birth in 1890.[53] The young tinkerer was a dedicated,

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[51] Quoted in Thomas Powers, *Heisenberg's War: The Secret History of the German Bomb* (New York: Alfred A. Knopf, 1993), 256.
[52] “Book Burning – Historical Film Footage,” United States Holocaust Memorial Museum: https://www.ushmm.org/wlc/en/media_fi.php?ModuleId=10005852&MediaId=158.
[53] G. Pascal Zachary, *Endless Frontier: Vannevar Bush, Engineer of the American Century* (New York: Free Press, 1997), 21-22.

self-confident, and sometimes confrontational student that received his Ph.D. in electrical engineering from MIT in 1916.

During World War I, Bush worked on a detector to locate enemy submarines. The device never found any German submarines, although it managed to detect British submersibles. Bush became increasingly frustrated with his ineffectual efforts. “I had learned quite a bit about how not to fight a war,” he said. “That experience forced into my mind pretty solidly the complete lack of proper liaison between the military and the civilian in the development of weapons in time of war.”[54]

Other groups in the military had also worked on submarine detection during the war. The NRC had set up its own committee to analyze the problem. Bush lamented not knowing of them and therefore not combining efforts on submarine detection—the exact issue science attaché S.L.G. Knox simultaneously focused on in Rome. Bush complained, “The reason that they were not [combined] was that there was no centralizing group able to bring together parallel efforts and compare them.”[55] Bush would spearhead just such a coordinating group. He determined to eliminate the frustrating and ineffective duplication of a bloated government, to put America’s house in order. The ambitious Bush quickly advanced in rank within MIT (vice-president in 1932), the Carnegie Institution (president in 1939), and the National Advisory Committee for Aeronautics (the predecessor to NASA). He championed the need for federal funding and organization of science.

In 1940, Bush pleaded to President Roosevelt to support the creation of an agency dedicated to military research. Such an agency would reconcile the frustrations of duplication

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[54] Vannevar Bush, *Pieces of the Action* (New York: William Morrow and Company, 1970), 74.
[55] Ibid.

and planning that Bush personally faced during World War I. He brought a single sheet of paper describing the proposed agency's functions to his meeting with the President. Roosevelt, charmed by the intelligent engineer, and well aware of the Nazi army's looming presence over Europe, granted Bush's wish—allegedly within ten minutes—and approved the creation of the National Defense Research Committee (NDRC) with Bush as chairman. The NDRC, subsumed under the Office of Scientific Research and Development (OSRD) in 1941 with congressional funding, coordinated U.S. scientific research, including the Manhattan Project, during World War II.

In early 1942, Vannevar Bush appealed to President Roosevelt to create an atomic bomb program, convincing Roosevelt of its feasibility and importance.[56] Bush remembered Roosevelt saying, "If this bomb is going to be what you tell me, it had better come into existence in our hands," meaning better the Unites States have it first than the Germans or Russians.[57] Roosevelt placed an inordinate amount of trust in Bush's call to action. Fortunately, Bush proved to be a competent mentor. As with the creation of the NDRC, Roosevelt faithfully heeded his unofficial science adviser's advice. If World War I was a chemist's war, World War II would be a physicist's war.[58]

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[56] Zachary, *Endless Frontier*, 196-203; Richard Rhodes, *The Making of the Atomic Bomb* (New York: Simon & Schuster, 1986), 405-06; Leslie Groves, *Now It Can Be Told: The Story of the Manhattan Project* (New York: Harper and Brothers, 1962), 7-10.

[57] Bush, *Pieces of the Action*. 279.

[58] Einstein receives gratuitous credit for "writing" a letter to Roosevelt about an atomic bomb project and the possible dangers if Germany got the atomic bomb first. Leo Szilard actually drafted the letter that Einstein signed, but this letter only led Roosevelt to create an ineffective committee to look into the issue. Bush said in his memoir that Einstein's letter "may have stirred the President's interest; I just do not know. He never mentioned it to me, and I feel that he did not really grasp what might be involved until much later." Einstein hardly contributed to the Manhattan Project. Bush did not trust him. Einstein briefly work on a problem related to gaseous diffusion, but was cut off soon afterward. Bush, *Pieces of the Action*, 58; Zachary, *Endless*

Under the direction of Bush's OSRD and, by proxy, the War Department, the government spent several billions of dollars on scientific research and development. Most of the money went to two projects: the Radiation Laboratory (Rad Lab) at MIT where radar was further developed and the Manhattan Project, which developed the atomic bomb. The colossal Manhattan Project ultimately cost $2 billion in 1945 USD (World War II as a whole cost the United States nearly $300 billion) and employed over 125,000 people at its peak in 1944.[59]

With a major American effort to develop an atomic bomb underway, it was logical to assume that the Germans were also furiously working toward an atomic bomb of their own. It also seemed plausible that their research was well ahead of their American counterparts'. After all, nuclear fission, the underlying process behind an atomic bomb, had been originally discovered in Germany, appearing to give them a head start. What was the state of Germany's nuclear program and other advanced weapons? The United States sent the Alsos Mission to find out. Lieutenant Colonel Boris Pash commanded the mission while physicist Samuel Goudsmit served as the chief scientific adviser. By following closely on the heels of the advancing Allied front and capturing and interrogating scientists, uncovering secret laboratories, and even exposing a small but defunct German atomic pile, Alsos determined that Germany would not develop the atomic bomb by the war's end.[60]

Frontier, 204; also see Fred Jerome, *The Einstein File: J. Edgar Hoover's Secret War against the World's Most Famous Scientist* (New York: St. Martin's Press, 2002), ch. 4.

[59] Congressional Research Service, *Costs of Major U.S. Wars*, by Stephen Daggett (n.p., 2010), 2; Alex Wellerstein, "How Many People Worked on the Manhattan Project?," entry posted November 1, 2013, http://blog.nuclearsecrecy.com/2013/11/01/many-people-worked-manhattan-project/.

[60] On the Alsos Mission, see Samuel Goudsmit, *Alsos* (New York: American Institute of Physics Press, 1996).

Alsos was an undisputed success from an intelligence perspective. Every main objective was accomplished. The missions, under cover of the Allied forces, marched into enemy territory and stole scientific research, material, and personnel. More importantly to the Americans, the Soviets were denied that bounty. The operations succeeded because the rules of the game change during wartime. In war, international relations have already soured. There is no fear of instigating conflict—that already happened. As such, there are no barriers to stealing an enemy's secrets. In fact, it is *assumed* that the adversary is spying on you. War liberates one from the ordinary rule of law. Therefore, peace is the *enemy* of intelligence gathering because it comes with rules. How, then, can one bend or break the rules without anyone finding out? How can one continue to obtain scientific intelligence in times of peace? A new crop of science attachés, it turns out, were considered to play a role.

Science: The Endless Frontier

Nearing World War II's conclusion, Vannevar Bush doubled-down on his obsession with organization and turned his attention toward coordinating post-war scientific research. He had a conversation on the topic with the President. "Roosevelt called me into his office and said, 'What's going to happen to science after the war?' I said, 'It's going to fall flat on its face.' He said, 'What are we going to do about it?' And I told him, 'We better do something damn quick.'"[61]

In a confusing charade, Bush got President Roosevelt to ask Bush to write to Roosevelt about the situation of post-war science. When Bush saw an opportunity to implement his

[61] "At 80, Scientist Bush Looks Back at Eventful Years," *Boston Globe*, September 20, 1970.

carefully crafted, and usually highly influential, plans, especially if it meant mingling among the Washington elite, he took it. Bush submitted the resulting report, *Science: The Endless Frontier,* after Roosevelt's death. In it, Bush extolled the benefits of increasing government funding of the sciences in peacetime.

Echoing Karl Compton in the Depression, Bush wrote, "Basic research leads to new knowledge. It provides scientific capital. It creates the fund from which the practical applications of knowledge must be drawn. New products and new processes do not appear full-grown. They are founded on new principles and new conceptions, which in turn are painstakingly developed by research in the purest realms of science."[62] In other words, basic scientific research leads to new technologies, which lead to new industries, which lead to new jobs. Bush also proposed the creation of a National Science Foundation to coordinate basic research in the United States.

The success of the report partly stemmed from the fear that the United States would slip back into a depression after the war. Basic research offered the sublime idealism of an enticing tool for creating new jobs to ward off a depression. Also, the report came at the end of a war whose apparently decisive weapons were products of basic research. *Science: The Endless Frontier* was published two months before the war's conclusion so does not mention atomic bombs, but by the time the report became widespread the bombs had been dropped and seemed to support Bush's arguments. Otto Hahn, Fritz Strassman, Lise Meitner, and Otto Frisch's discovery of nuclear fission was not prompted by the knowledge that it would lead to an atomic bomb; neither was the science that led to radar. If their discoveries led to practical applications, so would future discoveries, Bush thought.

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[62] Vannevar Bush, *Science: The Endless Frontier* (Washington D.C.: USGPO, 1960), 19.

In *Science: The Endless Frontier*, Bush also professed the importance of the international exchange of scientific information. He thought that if other countries funded and conducted basic research in the sciences, why should the United States not obtain their results, therefore eliminating the need for duplicating their efforts? His World War I experience with submarines still haunted him; the World War I science attachés provided the perfect blueprint for the solution to his problems. An appendix to *Science: The Endless Frontier* by the Committee on Science and the Public Welfare suggested "as an experiment," that science attachés serve in select U.S. embassies toward this end: "They should be men of high professional scientific attainments whose tenure of the post would be temporary—perhaps 1 or 2 years—and whose principal duties would be concerned with facilitating […] various aspects of scientific cooperation."[63]

In the new post-war world where science and foreign policy were intricately bound together, especially after the invention of atomic weapons, scientists appeared to have a wealth of skills that diplomats could use. Had not the World War I science attachés been celebrated for their accomplishments?

The London Science Office

Soon after entering office, President Harry Truman set up the President's Scientific Research Board to produce reports on science in government. In addition to the science attaché proposal in *Science: The Endless Frontier*, the 1947 President's Scientific Research Board report

[63] Ibid., 114.

Science and Public Policy "recommended that appropriate development of this kind of scientific foreign service be considered an essential part of the national science program."[64]

As a result of *Science: The Endless Frontier* and *Science and Public Policy,* and in an effort to continue the scientific rapport with the British that had been built up during the two world wars, the State Department sent biochemist Earl Evans to London in late 1947 as a science attaché, the first deployed since World War I. He became part of the London Science Office that the State Department had recently taken over from the Department of Commerce. Secretary of State George Marshall wrote that the office would be "permanently attached to the Embassy."[65] The official duties of the London Science Office included:

> 1) to aid and facilitate the exchange of scientific personnel between this country and Great Britain, 2) to develop and maintain close personal contact with British government agencies and other research institutions in the United Kingdom, 3) to obtain answers to questions asked by government and other scientific agencies in the United States, 4) to stimulate the exchange of scientific and technical reports, especially where these are not generally available by usual channels, etc.[66]

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[64] The President's Scientific Research Board, *Science and Public Policy: A Program for the Nation*, by John Steelman (Washington D.C.: USGPO, 1947), 40.
[65] Science Policy Research Division, *Science and Technology in the Department of State*, 14. The London Science Office was also referred to as the London Office of Science and Technology. The program paralleled the British Commonwealth Scientific Office operating in Washington since 1940.
[66] Committee to Assist U.S. Mission on Science and Technology, "Report of Subcommittee on Dissemination of Information," October 3, 1947, Folder "Agencies and Departments, State: Committee to Assist US Mission on Science & Technology," NAS.

Thirteen science attachés were stationed at the London Science Office from 1947 through 1951. Their short stays were disappointingly uneventful. They reported back to Washington on unclassified British science and medicine and facilitated the exchange of publications.[67] One later history noted, "Behind this move was the backlog of unpublished wartime research and the inability of periodicals to handle it expeditiously because of the paper shortage."[68] Their reports covered lackluster topics such as "British Government Plans for Developing Inventions," "Present Conditions of Internal Medicine and Cardiology in Great Britain," and "Research in Plant Physiology and Horticulture in Great Britain."[69] They did not cover atomic energy or classified military intelligence, the Holy Grail of information at the time. That task had been delegated elsewhere.

Since the science attachés at the London Science Office did not report on atomic energy or military matters, their reports received a cold reception. In fact, a copy of the "Report on the Present Conditions of Internal Medicine and Cardiology in Great Britain" is still sealed closed by the original rusty staples.[70]

The Science Policy Research Division of Congress later published a scathing examination of the London Science Office, concluding, "This first essay of the Department of State into the interaction of diplomacy with science and technology, despite the apparently strong

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[67] Science Policy Research Division, *Science and Technology in the Department of State*, 14.
[68] "What Happened to Science in State," *Chemical and Engineering News* (January 9, 1956): 112.
[69] "Résumé of the Work of the Science Staff in London, Folder "Agencies & Departments, State: London Scientific Office," NAS. For a detailed report by Joseph Koepfli on typical work conducted by the London science attachés, see Joseph Koepfli, September 1, 1948, Box 1, Folder "Early Science Attachés," Caltech Archives.
[70] George Burch, "Report on the Present Conditions of Internal Medicine and Cardiology in Great Britain," April 27, 1948, Folder "Agencies & Departments, State: London Scientific Office," NAS.

initial support it had received, must be accounted a failure."[71] Their reasoning included: the program lacked preparation, nobody made sure the reports reached their proper destination, the science attaché never received any feedback and was unaware of his readership, and there was no direction.[72] Basically, these science attachés lacked all of the benefits that their World War I counterparts had. Making matters worse, the Office of Naval Research had scientific representation in London with overlapping functions, creating waste, unnecessary duplication, "and a drying up of information sources."[73] Ironically, the London science attachés created the very problem of duplication that the World War I science attachés were praised for eliminating. As for the program's effectiveness:

> The utility of the reports generated by the team was doubtful; there is no evidence that any action resulted from them, either as useful information or as inputs to policy analysis. The dwindling size of the enterprise suggests that it was not especially useful to the Embassy either. […] no durable relationships or arrangements appear to have been established. […] The scientists who urged and manned the experiment appeared to assume that the mere presence of highly qualified scientists in a diplomatic setting would be beneficial. […] But neither the expertise possessed nor the information accumulated by the Scientific Officer […] was useful […] There was no strategy to use the expertise and there was no procedure to assure use of the information […] no effort was exerted to show how

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[71] Science Policy Research Division, *Science and Technology in the Department of State*, 16.
[72] Ibid.
[73] Department of State International Science Policy Survey Group, *Science and Foreign Relations: International Flow of Scientific and Technological Information*, by Lloyd Berkner, report no. 3860, General Foreign Policy Series 30 (Washington D.C.: USGPO, 1950), 107-09.

> they could be relevant; no preparation was undertaken to assure that they would be relevant.[74]

One would think that this embarrassing failure would have doomed any future science attaché program. The government had simply thrown scientists at a relatively unimportant issue, expecting them to contribute in some unforeseen way. Little forethought happened. The "experiment" in London had failed. Yet toward the end of the last science attaché's stay at the London Science Office in the early 1950s, the State Department *escalated* the program. They deployed science attachés to *multiple* U.S. embassies across Europe. What changed? Hadn't the State Department learned from its mistakes? The government, it turns out, began thinking about the question of how to gather scientific intelligence in peace.

Scientific Intelligence

Science and technology commanded respect after a war fought with advanced weapons and weapons systems. The potential dangers of atomic, biological, and chemical warfare hastened a national security need for scientific and technological intelligence on other countries. "No iron curtain is utterly impenetrable" America's *de facto* science tsar Vannevar Bush wrote in an article for *Life* magazine.[75] With careful planning, by then Bush's well-trodden *modus operandi*, scientific intelligence could reduce an enemy's element of surprise.

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[74] Science Policy Research Division, *Science and Technology in the Department of State*, 16-17.
[75] Vannevar Bush, "Scientific Weapons and a Future War," *Life* (November 14, 1949): 130.

Bush now strategized about scientific intelligence and research in peacetime. In the Army and Navy alone there were three distinct missile programs. Duplication of this kind infuriated Bush, who was reminded of working on the ineffectual submarine detector during World War I. Bush wanted an organization that could coordinate research and development among the military branches, eliminate duplication, and provide quality reviews of projects.[76] Toward this end, Bush helped launch the interim Joint Research and Development Board (JRDB), formally created by the Secretaries of War and Navy in 1946.[77] Serving as its chairman, Bush tapped radio scientist Lloyd Berkner, a colleague from the Carnegie Institution, to serve as Executive Secretary.

A small Policy Council within the JRDB provided scientific input. The Policy Council included members from the JRDB (including Berkner), Army, Navy, and, importantly, the Central Intelligence Group (CIG), the precursor to the Central Intelligence Agency (CIA). One level deeper, Berkner established a scientific advisory committee to advise the Policy Council, with physicist I. I. Rabi as its chairman.[78] Such sub- and sub-sub-committees are the Russian nesting dolls of government. The JRDB and CIG held a series of meetings together regarding scientific intelligence, eventually agreeing on a program for action. The program included setting up a scientific intelligence branch within the CIG and preparing estimates on foreign scientific capabilities.[79]

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[76] Allan Needell, *Science, Cold War, and the American State: Lloyd V. Berkner and the Balance of Professional Ideals* (Amsterdam: Hardwood, 2000), 110-11.
[77] Zachary, *Endless Frontier*, 317-18.
[78] This advisory committee included Georges Doriot, Caryl Haskins, Alfred Loomis, I. I. Rabi, and William Shockley.
[79] "Program for Joint Research and Development Board – Central Intelligence Group Cooperation in the Field of Scientific Intelligence," January 1947, RG 330 Entry NM-12 341, Research and Development Board, Box 1, Folder "JRDB 2/5 – Agenda of 5th Meeting," National Archives at College Park [hereafter NACP].

In January 1947, National Intelligence Authority (NIA) Directive 7 allocated specific intelligence collection responsibilities to specific government agencies. However, the directive assigned scientific intelligence to "each agency in accordance with its respective needs."[80] The Atomic Energy Commission (AEC), JRDB, and others called on the CIG to produce scientific intelligence, though the CIG was "unable fully to meet these requirements because of the general lack of properly qualified collectors of scientific intelligence," the minutes of an NIA meeting reveal.[81]

CIG Director Rear Admiral Roscoe Hillenkoetter deliberated on how to collect scientific intelligence: "Some quarters have proposed the designation of scientific attachés to missions abroad. I have no present solution, but CIG is working closely with Dr. Vannevar Bush to obtain, as may be possible, qualified scientific collectors. Several plans, including one of obtaining scientists and then giving them a course of intelligence, are under discussion."[82] Within the intelligence community, science attachés were thought of as intelligence gatherers from the very beginning. They had an "unquestioned" desirability by the CIG and Intelligence Advisory Board (IAB), which was created to inform NIA recommendations.[83]

In September 1947, the IAB released a memorandum on the appointment of science attachés. "The new responsibilities of the [CIG] cannot be met with the existing facilities for the collection of scientific intelligence," the document states. "Solution of the problem is necessary." The memo continues, "The appointment of Scientific Attachés to U. S. Missions in countries

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[80] NIA Directive 7, "Coordination of Collection Activities," January 2, 1947, CIA Records Search Tool [hereafter CIA CREST], 1.
[81] NIA, "Minutes of Meeting," June 26, 1947, CIA CREST, 13.
[82] Foreign Relations of the United States [hereafter FRUS], C. Thorne, Jr. and David Patterson, eds., *Emergence of the Intelligence Establishment, 1945-1950* (Washington D.C.: USGPO, 1996), "Minutes of the 10th Meeting of the National Intelligence Authority," document 319.
[83] "Scientific Attachés," August 28, 1947, CIA CREST.

having the greatest scientific potential appears to be essential." Their work "would be for the common benefit of all agencies."[84] The intelligence community demanded science attachés in the name of national security.

The National Security Act of 1947 created, among other things, the National Security Council (NSC), the Research and Development Board (RDB), an outgrowth of the JRDB, and the CIA. Among its provisions, the National Security Act called for the CIA to "collect intelligence through human sources and by other appropriate means […] correlate and evaluate intelligence related to the national security [… and] provide overall direction for and coordination of the collection of national intelligence outside the United States."[85] In 1948, the CIA Office of Collection and Dissemination called for a government agency to establish science attachés with CIA financial support if needed; if no agency "proves willing, even with financial assistance, the CIA [should] establish and administer a system of scientific attachés as a service of common concern."[86]

The question arises of whether the intelligence community ever intended science attachés to covertly spy for the United States. An anonymous document released in 2002 sheds light on

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[84] IAB, "Appointment of Scientific Attachés," September 1947, CIA CREST.
[85] A copy of the act can be found at: https://www.intelligence.senate.gov/sites/default/files/laws/nsact1947.pdf
[86] OCD, "Scientific Attachés and Related Problems," March 19, 1948, CIA CREST. What specific information did the intelligence community want from the potential science attachés? For the most part, memos within the intelligence community are extremely vague on the matter. Most simply call for increased "scientific and technological" intelligence. The aforementioned Office of Collection and Dissemination report, though, does mention specific information. Namely, thy wanted biographical information on foreign scientists. Hillenkoetter recommended an NSCID on the matter, which was "unanimously concurred" by the Intelligence Advisory Committee. NSCID 8 placed the gathering of biographical information of foreign scientists in the CIA's hands. NSC, "National Security Council Status of Projects as of May 17, 1948," May 17, 1948, CIA CREST; NSCID 8 "Biographical Data on Foreign Scientific and Technological Personalities," May 25, 1948, CIA CREST.

the issue. The document bears no individual, committee, or departmental author. It has the simple title "Scientific Attachés" and lists "Problems to be considered" for the potential program. The problems include "the type of person needed to collect this information […] training before departure from the U. S. […] most important countries where attachés should be assigned" and, tellingly, "whether an overt and/or covert method of collection is the most desirable or necessary."[87] In 1948, the Office of Collection and Dissemination addressed this question more clearly. Science attachés would generally use overt means of collection, however, "Covert collection may have to be resorted to when it is determined which essential elements cannot be had by normal overt operations."[88] Science attachés were considered potential covert spies, equivalent to the World War I military attachés constantly receiving the cold shoulder abroad.

The Berkner Report

In 1947, President Truman appointed the Hoover Commission to increase efficiency in the federal government. One task of the Commission was to analyze the government's intelligence gathering capabilities. The Eberstadt Committee of the Hoover Commission concluded with the warning: "Failure properly to appraise the extent of scientific development in enemy countries may have more immediate and catastrophic consequences than failure in any other field of intelligence."[89] More specifically, in a report to the NSC, the Intelligence Survey Group concluded that U.S. scientific and technological intelligence displayed "a lack of

[87] "Scientific Attachés," March 8, 1948, CIA CREST.
[88] OCD, "Scientific Attachés and Related Problems," March 19, 1948, CIA CREST.
[89] Quoted in "Scientific Intelligence," 1951, RG 263 Entry A1 15, Records Relating to the Historical Review Program, Box 1, Folder "CIA Progress Report: Sec. III," NACP.

coordination. Responsibilities are scattered, collection efforts are uncoordinated, atomic energy intelligence is divorced from scientific intelligence generally, and there is no recognized procedure for arriving at authoritative intelligence estimates in the scientific field, with the possible exception of atomic energy matters."[90]

Truman agreed with the report and subsequently approved National Security Council Intelligence Directive (NSCID) 10 on "Collection of Foreign Scientific and Technological Data."[91] This intelligence directive placed the responsibility for the collection of scientific information within the State Department. "In order to provide for the collection of the data," NSCID 10 says, "the Department of State […] will appoint, as practicable, specially qualified scientific and technical personnel to selected United States Missions for this collection responsibility."[92] This edict gave the State Department responsibility for deploying science attachés abroad.

A State Department task force soon recommended that "a scientist of national repute" should create a report "to examine into the whole matter of science and foreign relations and to formulate recommendations regarding the role and functions of the Department in connection" to science.[93] Undersecretary of State James Webb and Secretary of State Dean Acheson asked Lloyd Berkner, former Executive Secretary of the JRDB, to produce the study.

Working at a furious pace, Berkner produced the report *Science and Foreign Relations* in May 1950. The Berkner Report's most important recommendations included the creation of a

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[90] FRUS *Emergence of the Intelligence Establishment, 1945-50*, "Report from the Intelligence Survey Group to the National Security Council," document 358.
[91] FRUS *Emergence of the Intelligence Establishment, 1945-50*, "National Security Council Intelligence Directive No. 10," document 429.
[92] Ibid.
[93] Department of State International Science Policy Survey Group, *Science and Foreign Relations*, 1.

Science Office within the State Department to advise on foreign policy issues and the institution of "Science Staffs," headed by science attachés, at U.S. diplomatic missions abroad. The duties of these science attachés included "[Facilitating] the exchange of scientific personnel, information, and materials [… Cooperating] with groups representing other United States programs abroad [… and advising] missions on scientific matters."[94] They would serve for two years and have a staff for administrative and clerical assistance. An appendix clarified that the science attachés should be "mature and distinguished scientists […] whose reputations will command the respect of the scientists and governments of the foreign countries."[95]

Unbeknownst to many of his colleagues and collaborators on the Berkner Report, Berkner produced an additional Secret Supplement to *Science and Foreign Relations*. During a meeting with the Undersecretary of State, the minutes of the meeting note, "Dr. Berkner pointed out that while the unclassified portion [the Berkner Report] has been designed to stand alone, it should be considered as a cover for the classified section."[96] The Secret Supplement discusses scientific intelligence. Notably, Berkner considered assigning the science attachés the opportunity to administer interrogations. "Given wide accreditation and sufficient travel funds, the Science Officers detailed to European missions can be of great assistance in the work of the peripheral posts as advisers and, as occasion demands, as specialist interrogators to cover disciplines not included in the post or team staff."[97] However, the science attachés could not

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[94] Ibid., 104.
[95] Ibid., 123.
[96] "Under Secretary's Meeting May 8, 1950," RG 59 Entry A1 396-C, Minutes of the Under Secretary's Meetings, 'UM Minutes' 1-287, 1949-50, Box 1, Folder "UM Minutes-Memos, 1/3/50-6/28/50," NACP.
[97] "Scientific Intelligence," April 19, 1950, RG 59 Entry A1 3008-A, General Records Relating to Atomic Energy Matters, 1948-1962, Box 64, Folder "Study on International Flow of Scientific and Technological Information," NACP, 16.

appear closely connected to the intelligence community. “Intelligence, though vitally concerned, must maintain an indiscernible role in this function of the overseas Science Staffs, first because there is a strong reluctance on the part of many United States scientists to associate themselves with intelligence activities, and second because such known association would inevitably tend to cut these scientists off from many of their most fertile sources.”[98] If Berkner got his way, the science attachés would be an intelligence tool.

The New Science Attaché Program

A 1919 memorandum to George Hale, the first chairman of the NRC, presciently said, “During the war it was easy to get able scientists to represent the National Research Council abroad, as cooperation with the Allies was a matter of great importance. As soon as peace is declared it will be a different matter. Men with the proper combination of qualities are rare and would not be attracted by such a position.”[99] Over thirty years later, this memo succinctly summarized the position State Department science adviser Joseph Koepfli found himself in. With difficulty, Koepfli eventually found his first science attachés, who went abroad in the early 1950s. The new science attachés did not initially meet a receptive foreign audience as their World War I counterparts had. Instead, foreigners often accused the science attachés of being spies during the post-World War II era when science and national security were interrelated. One issue of the French Communist Party journal *La Nouvelle Critique*, contributed to by physicist Frédéric Joliot-Curie, accused American science attachés of espionage in no uncertain terms. The

[98] Ibid., 23.
[99] Gordon Fulcher to George Hale, April 30, 1919, Folder “Research Information Service Foreign Offices: Continuation Proposed, 1919,” NAS.

Berkner Report, the journal said, "points out […] that American science must be revivified by exterior help: a blood transfusion must be given from abroad."[100] Hence, the American government was using its science attachés to covertly facilitate this transfusion.

As it turns out, the science attachés were not spies. The CIA never informed them of their plans to use them as vectors to gather scientific information. Why? For one, the CIA intentionally kept their distance from the science attachés because they did not want to compromise their "completely open and undisguised posture."[101] Secondly, Koepfli was adamantly against the science attachés doing any kind of covert activity. Lastly, atomic energy intelligence fell to the AEC. A report to the State Department on the issue stated, "The [AEC] has general responsibility […] to collect information, either overtly or otherwise, abroad" on atomic energy.[102]

What did this new crop of science attachés do? For the most part, they did exactly what the Berkner Report called for with varying degrees of success. They reported back to the State Department on scientific issues in foreign countries, set up scientific conferences, advised embassy staff on relevant scientific issues, did a bit of scientific research, lectured, toured laboratories, and facilitated travel for scientists affected by McCarthyism hysteria. The State Department itself, which oversaw the science attachés, ironically provided the science attachés with their most useful function by constantly denying traveling scientists visas and passports.

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[100] "Summary Translation of Brochure," Joseph Koepfli Papers, Box 2, Folder "Korean War Germ Warfare," Caltech Archives.
[101] IAC, "Proposal to Strengthen Certain Intelligence Information Collecting Activities," September 9, 1953, CIA CREST.
[102] "The Role of the Department of State, as Carried on by U/A, in the Atomic Energy Aspects of International Science and Technology," RG 59 Entry A1 3008-A, General Records Relating to Atomic Energy Matters, 1948-1962, Box 64, Folder "Study on International Flow of Scientific and Technological Information," NACP.

The affected scientists then turned to the science attachés for travel assistance. For the next five years, the science attachés excelled at their cover story, but unknowingly failed the aims of the intelligence community.

By 1956, every American science attaché position went vacant. Budget cuts and the turmoil surrounding former State Department employee Alger Hiss for being a potential spy wreaked havoc on the State Department, forcing them to eliminate the program. Only after the 1957 Sputnik crisis did President Dwight Eisenhower reinstitute the science attachés.

Conclusion

When one compares and contrasts the World War I science attachés with their post-World War II counterparts, it is possible to explain why the former were considered so effective while the latter, especially at the London office, were not. In fact, three major reasons present themselves: context, direction, and assistance.

The World War I science attachés had the good fortune—for their success at least—of being deployed during wartime. Immediate and definite concerns prompted their posts. War itself is mayhem. With a mission to eradicate duplication and coordinate research, contacts, and information, there was no lack of pressing issues or military personnel demanding their services. Their success is analogous to that of the Alsos Mission; wartime circumstances change everything. The science attachés at the London Science Office after World War II, however, were deployed not as a result of demand, but rather as an experiment to see if they could make themselves useful. Unable to report on the most pressing issues, atomic energy matters or military intelligence, they had virtually no audience in Washington for their reports. Ironically,

the London Office science attachés duplicated the Office of Naval Research's efforts, becoming the very thing that they were supposed to eliminate.

The importance of context can also be seen in the science attachés of the 1950s resulting from the Berkner report. While they were conceived as an aid to the intelligence community, they actually excelled at the tasks their cover story demanded, especially facilitating the exchange of information and assisting with scientists' travel, because the context of McCarthyism opened an opportunity for someone to help scientists wrongly targeted during the Red Scare panic. Their success, however, depended on dispelling rumors that they were actually espionage agents. The rumors themselves were a result of the post-war, post-atomic bomb context in which national security depended on science.

The World War I science attachés had unambiguous direction from the outset. Their mission was clear. They were given concrete problems to solve abroad. They were asked specific questions that demanded specific answers. Their reports went directly to those who requested them. Subsequent science attachés had none of this. The State Department sent chemist Richard Arnold to Bonn, Germany in 1952. Before leaving, he attended a training session for new science attachés. When he asked what a science attaché actually did, he said, "everybody told me the same thing. 'I don't know, you'll have to play it by ear, and develop your own program. It's up to you to decided, and after you've had an experience in Germany, maybe you can tell us about what you think a science attaché ought to do and ought not to do.'"[103] Not only did the intelligence community resist giving the science attachés an objective, but so did the State Department. The mission itself was an afterthought. Similarly, following Sputnik I, President

[103] Richard Arnold, interview by Ronald Doel, Evanston, IL, August 10, 1994, https://www.aip.org/history-programs/niels-bohr-library/oral-histories/31208.

Eisenhower reestablished the program not to fulfill a specific objective. Instead, his move was political. Deploying the science attachés was a way to combat criticism of American science and technology. Never mind what they did abroad so long as the act of sending them abroad placated domestic critics.

Henry Bumstead consistently praised the British for giving him access to their material during World War I. War forged a cooperative connection between the two countries. Importantly, the World War I science attachés made the lives of their hosts easier, thereby facilitating cooperation. Later science attachés faced the exact opposite circumstances. They were denied access to material and people because foreigners perceived them as spies. Their image abroad converged to that of their military attaché colleagues. Though the intelligence community did secretly hope to eventually use the science attachés in such a capacity, no such arrangement ever took place. The science attachés remained dumbfounded as to how they could be perceived as anything other than honest envoys for scientific advice and collaboration. Despite their innocence, foreigners were reluctant to "throw open secrets" to the new batch of science attachés, not initially realizing that the science attachés' goals were not to steal secrets. When such skepticism washed away, and when foreigners realized that the science attachés could provide them with needed services, such as making travel arrangements or providing advice on how to attend American universities, things changed for the better. At the beginning of his term in Bonn, Arnold met with two prominent German scientists and convinced them that he was not a spy. "Within a week I had more invitations to more places to visit during my 14 months than I could possibly make."[104] All iterations of the science attachés achieved their greatest successes when they had a motive, direction, assistance, an audience, and were honest.

[104] Ibid.