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The Physics of Spin: Sputnik Politics and American Physicists in the 1950s

NAZI RACE SCIENCE, STALINIST DENUNCIATIONS OF GENETICS: THE twentieth century provided no shortage of examples of the power of politics to corrupt science. Recoiling in horror from such perversions, many scholars argued with great fervor half a century ago that science was—or should be—inherently apolitical. Others insisted with equal vehemence that there was a necessary relationship between science and politics: science could only function properly within one unique form of political system, namely a democracy (see Hollinger, 1983, 1995). More than a tinge of wishful thinking lurked behind these analyses. No Maginot Line has ever demarcated where science ends and politics begins. The politics of knowledge has been a part of scholarly life since at least the age of Plato's Academy—just ask Socrates, or the twice-banished Aristotle. The present Bush administration, it is true, has expended more effort than most American predecessors to smear any distinctions—imposing political tests on science advisers, censoring scientific reports to better reflect political imperatives—but such clumsy cudgels should not mask more pervasive, if mundane, interrelations between the scientific and the political.

To get a feel for the texture of the science-politics nexus, it may help to step back from present-day hectoring and examine episodes

from the recent past. Consider, for example, American physics and politics during the Cold War. On first blush, several areas of overlap stand out: elite atomic diplomacy, low-brow domestic anticommunism, and their occasional intertwining, as in the 1954 security hearing of J. Robert Oppenheimer. Digging a little deeper reveals all manner of additional connections. Who can peel back the "politics" from the "science" in the circulation of cryogenics experts and factory-sized machinery from hydrogen-bomb tests in the Pacific to bubble-chamber laboratories in California (Galison, 1997: 351-52)? Where on the ledger are we to place particle theorist Geoffrey Chew's influential program of "nuclear democracy," which enlisted terms and concepts from a liberal political tradition to interpret the behavior of subatomic particles (Kaiser, 2002a)?

A similar blurring of categories surrounds American physicists' efforts to learn about their Soviet counterparts' work during the 1950s. In this brief paper, I focus on two such episodes. The first involves investigations into the Soviet educational system, in particular its ability to train large numbers of scientists and engineers. The second focuses on efforts to learn how all those Soviet scientific workers spent their time, by making their leading research journals available in English translation. In both instances, the very act of gathering information about the Soviet rivals carried political overtones—overtones, moreover, that were constantly open to competing interpretations. In the first case, the physicists entered late in the game. They remained one interest group among many, vying with other educators, policymakers, bureaucrats, and journalists to control the message and turn it to their advantage. In the second case, the physicists controlled the interpretive field from the beginning, operating in a more organized, purposeful way. As both examples make plain, several leading American physicists proved adept at using the tools of politics to further their own agenda, be it increasing federal aid for science education or garnering behind-the-scenes assistance to launch several new scientific periodicals.

The physicists' adventures in applied Sovietology illustrate the constant intermingling of scientific goals and political means. More

important, they show that such hybrid activities are not the sole province of political bullies or repressive regimes. The physicists' goals might have been lofty—who would argue against increasing access to education or strengthening the bonds of international cooperation in science and learning?—but even those fighting on the sides of the angels are inescapably, irreducibly political actors. The physicists were no political naifs, watching innocently or open-mouthed as others dragged their efforts into a political arena. Rather, political jockeying and public relations—in short, spin—proved constitutive of their activities from the start.

ASSESSING THE SOVIET THREAT

During 1952 and 1953, as the Korean War smoldered on, several analysts began trying to assess Soviet "stockpiles" of scientific and technical manpower—those cadres who seemed so "essential for survival in the atomic age," as one breathless *New York Times* reporter put it (Fine, 1954: 80). Three lengthy studies appeared between 1955 and 1961, each garnering immediate, widespread attention. Pundits and politicians clung to one main talking point, wrenched from all context: the Soviet Union was purportedly training two to three times as many scientists and engineers per year as the United States. The "feverish pace" of training, argued physicist Merriam H. Trytten, longtime director of the National Research Council's Office of Scientific Personnel, proved that the Soviets had subordinated their educational system to their overall policy of "considering scientific and technical personnel as merely another but most important factor in the total national military potential" (Fine, 1954: 80). The reports, it seemed, demanded an obvious response: the United States (and, some were quick to add, its allies in the North Atlantic Treaty Organization, or NATO) must immediately ratchet up the pace at which it produced its own scientific workers. American scientists and educators were losing key "battles" in the "cold war of the classrooms" (Hechinger, 1960).

The three studies shared many features in common. Each was conducted in Cambridge, Massachusetts by researchers who had them-

selves undergone some of their schooling in Russia and the Soviet Union. Nicholas DeWitt completed the first report, *Soviet Professional Manpower: Its Education, Training, and Supply* (1955), while working at Harvard's Russian Research Center. The center—one of the earliest incarnations of that special Cold War beast, "area studies"—had been established in 1948 with aid from the United States Air Force and the Carnegie Corporation; throughout this period it also maintained close ties with the Central Intelligence Agency (CIA) (Engerman, 2004, and forthcoming). DeWitt, a native of Kharkov, had begun his training at the Kharkov Institute of Aeronautical Engineering in 1939, before the Nazi invasion forced him to flee. He eventually landed in Boston in 1947 and enrolled as an undergraduate at Harvard the following year. In 1952, honors degree in hand, DeWitt began working as a research associate at the Russian Research Center while pursuing graduate study at Harvard in regional studies and economics ("Soviet-School," 1962). The National Science Foundation and the National Research Council jointly sponsored his investigation into Soviet scientific and technical training. Colleagues called him compulsive, an "indefatigable digger," and it showed: his massive follow-up study, *Education and Professional Employment in the USSR* (1961), ran nearly 600 pages, punctuated by hundreds of tables and charts, followed by 260 dense pages of appendices.

The other major report, Alexander Korol's *Soviet Education for Science and Technology* (1957), took shape down the street at the Center for International Studies, located within the Massachusetts Institute of Technology (MIT). Like the Russian Research Center, MIT's center (founded in 1951) also maintained close ties to the CIA, which secretly bankrolled Korol's study (Blackmer, 2002: 144, 159). Korol, like DeWitt, was a Russian expatriate who had first trained in engineering (Knoll, 1957). Korol enlisted aid from several MIT faculty in the sciences and engineering to help him gauge the quality of Soviet pedagogical materials. He completed his study in June 1957; the book's preface, by the center's director Max Millikan, was dated October 18, 1957, barely two weeks after the surprise launch of Sputnik. It was immediately heralded

as "fastidious," "perhaps the most conclusive study ever made of the Soviet education and training system" (Evans, 1957); others marveled at the "400 pages of solid factual data" crammed between the book's covers (Knoll, 1957).

Both authors carefully emphasized caveats and qualifications; neither wanted to get lost in the "numbers game." DeWitt began both of his books by citing the large professional literature devoted to interpreting Soviet statistics. Both of his books also included detailed appendices on the "perplexities and pitfalls" of working with Soviet statistics. Raw data like enrollment figures or graduation rates never speak for themselves, DeWitt cautioned; such social statistics always require careful interpretive work. All the more so in the Soviet case: mundane gaps in data (which afflicted most social-scientific studies) were compounded by the Soviet government's penchant for secrecy and for propagandistic massaging of data (DeWitt, 1955: viii, xxvi-xxxviii, 259-61; DeWitt, 1961: xxxix, 549-53). Korol similarly urged caution, arguing time and again that it was fruitless to compare graduation rates between the Soviet Union and the United States, since the two types of degrees differed so radically in structure and function. Indeed, Korol refused even to tabulate Soviet and American statistics side-by-side in order to avoid "unwarranted implications" (Korol, 1957: xi, 391, 400, 407-8).

DeWitt and Korol urged that Soviet educational trends be seen in the proper light. Although curricula for elite programs of study—such as physics at Moscow State University and at Columbia University and MIT—seemed to be roughly comparable in quality (Korol, 1957: 26-71; Corson, 1959; DeWitt, 1961: 277-80), several mitigating factors stood out. First, they both argued, a large proportion of engineers in the Soviet Union never practiced their craft, working instead in various bureaucratic or administrative posts. Second, the Soviet system was built around extraordinary specialization: the specialty of nonferrous metals metallurgy, for example, was itself carved up into 11 distinct specializations (copper and alloys metallurgy, precious metals refining, and so on). Students selected only one such microtopic and devoted

the bulk of their studies to it. Moreover, well into the late 1950s, Soviet students suffered from widespread shortages of textbooks and poor quality (or missing) laboratory equipment. Student-to-faculty ratios had ballooned immediately after the war and continued to widen over the 1950s. There were also many indications that academic standards were manipulated to fit the central planning committee's "production quotas": both Korol and DeWitt noted internal Soviet reports of pressure to let mediocre students pass when overall numbers looked low (DeWitt, 1955: 107, 125, 252; Korol, 1957: 163, 195, 294, 316, 324, 383-84; DeWitt, 1961: 342, 365, 370, 401).

Most important, a fast-growing proportion of Soviet students were enrolled in extension-school or correspondence programs. Unlike regular full-time students, these students held full-time "production" jobs and pursued their studies largely alone, reading over textbooks (when these were available) and occasionally sending written assignments in to overworked professors, most of whom juggled 65 to 80 such students at a time. Even Soviet education officials routinely remarked on the inferior quality of this type of training, especially for hands-on fields such as science and engineering. Yet enrollments in extension and correspondence programs were soaring, even as regular full-time enrollments remained flat. By 1955, extension and correspondence students comprised about one-third of all engineering enrollments; five years later, they accounted for more than half of enrollments in all fields combined (DeWitt, 1955: 94-95; Korol, 1957: 142-43, 355, 364; DeWitt, 1961: 210, 229-31, 235, 316).

Only after delineating each of these factors at length did DeWitt broach numerical comparisons. Focusing on the Soviet five-year "diploma" programs—roughly akin to American-style training at the undergraduate and master's degree levels—he presented some interesting findings. Total enrollments in the United States were substantially greater than in the Soviet Union: three times as great as the regular full-time student population in 1953-1954, for example, and still one-third larger if one included all the extension and correspondence students

in the Soviet tally. Yet the balance of fields was quite different. In the United States, roughly one out of four students majored in scientific or technical fields, while in the Soviet Union it was three out of four. In particular, DeWitt found that by the mid-1950s, the Soviets were graduating about 95,000 students per year in engineering and applied sciences—including the extension and correspondence students—versus 57,000 in the United States (DeWitt, 1955: 168-69). (When he revisited the numbers in the early 1960s, he found that the gap had widened: 172,600 per year in the Soviet Union as compared to 68,100 in the United States) (DeWitt, 1961: 341-42). Here was the fabled "two to three times" ratio, a figure repeated ad infinitum by journalists, politicians, and several scientists.

At once, coverage of DeWitt's wide-ranging, sophisticated study collapsed to this lone number. In fact, his ratio began to attract attention even before his first book had been published. In early November 1954, a front-page article in the *New York Times* announced that "Russia Is Overtaking U.S. in Training of Technicians" (Fine, 1954). The article's author had interviewed DeWitt and featured the "two to three times" finding; the journalist also likely drew upon an article in *Science* that DeWitt had published a few months earlier (DeWitt, 1954). Three days after the *Times* article appeared, President Dwight Eisenhower was forced to comment at a press conference on how he planned to overcome the "manpower gap" (Clowse, 1981: 51). The *Washington Post* greeted publication of DeWitt's book with its own broad headline, "Red Technical Graduates Are Double Those in U.S." ("Red Technical," 1955). As soon as DeWitt's book appeared, CIA director Allen Dulles began trotting out the "two to three times" finding at opportune moments, urging congressional action to reverse the purported gap (Clowse, 1981: 25-26). Atomic Energy Commission chair Lewis Strauss and Assistant Secretary of Defense Donald Quarles likewise peppered public lectures with the statistic (Strauss, 1957: 226; Quarles, 1955: 353). During spring 1956, meanwhile, Democratic House members of the Joint Committee on Atomic Energy touted the same data when demanding a "crash

program" to beat back the Soviet lead in scientific personnel (Clowse, 1981: 25-26).

Before Sputnik, at least some observers tried to put the numbers in perspective, much as DeWitt had urged all along. Lee DuBridge—former scientific director of U.S. radar development during World War II and at the time president of the California Institute of Technology—tried to pour some cold water on the media frenzy when he testified before the newly formed National Committee for the Development of Scientists and Engineers in June 1956. (Eisenhower had established the elite 21-member committee just two months earlier, no doubt to respond to Democrats' bluster on the manpower issue.) "It is true that in Russia more men and women received degrees in science and engineering last year than in the United States," DuBridge began.

> So what? Maybe that is because in the past 100 years they have so neglected their technical strength that they must now exert strenuous efforts to build it up. If this is true, then our rate of production should not be determined by their weakness—only by our own. Let us ask how many engineers we need to do our job, and not take over their figures from the numbers they require to do their job (DuBridge, quoted in National Science Foundation, 1956: 13).

DuBridge might have mentioned another of DeWitt's findings to bolster the point: even after the Soviets' recent burst in scientific and technical training, they still lagged behind the United States in accumulated numbers of scientists and engineers available to the workforce (DeWitt, 1955: 223-25, 255).

More typical, however, was the lesson that Senator Henry "Scoop" Jackson (D., Wash.) read in DeWitt's numbers. Jackson released a special report entitled "Trained Manpower for Freedom" on September 5, 1957, exactly one month before Sputnik revved the rhetoric of manpower still

higher. With the Soviets marching forward on the scientific manpower front—he invoked the now-familiar ratio—Jackson urged that nothing was "more precious" than the immediate development of all potential scientific talent in the United States and its NATO allies. More than 10 pages spelled out various training programs to address the critical shortfall, including fellowships for high school and college students, special summer study institutes, and awards for students and teachers who excelled in science education. These resources, Jackson explained with a telling metaphor, "should be used as catalytic agents which, so to speak, can initiate educational chain reactions extending over the broadest possible scientific and technological front" (Jackson, 1957; see also Krige, 2000: 88-93).

Sputnik further galvanized these discussions. Congress was on recess when news of the satellite broke. Not missing a beat, Senator Jackson proclaimed from Seattle that it was a "devastating blow" to the country, adding that Eisenhower should declare "a week of shame and danger" (Jackson, quoted in Clowse, 1981: 8). DeWitt despaired of the "hysterical" reaction sweeping the country (DeWitt, quoted in Bigart, 1957: 3). It must have been especially galling to hear his own statistic echoed over and over again, stripped of all nuance and subtlety Responding to the satellite, for example, former President Herbert Hoover groaned that "the greatest enemy of all mankind, the Communists, are turning out twice or possibly three times as many" scientists and engineers as the United States (quoted in Divine, 1993: 52-53). Senator Lyndon Johnson (D., Tex.) quickly convened hearings before his Senate Defense Preparedness subcommittee within a week of the satellite's launch, before which General James Doolittle (famous for his Tokyo bombing raid during World War II) brandished the same dire figure. During closed sessions of the hearings, CIA director Dulles returned to the "manpower gap." Details of Dulles's testimony remained secret, but Johnson alerted the press that Dulles had confirmed that the Soviets were "now outstripping the U.S. in developing a scientific and technological manpower pool" (quoted in Divine, 1993: 67; see also Clowse, 1981: 59-60).

In the frenzied weeks after Sputnik, Korol's book suffered similar misreadings. Reporting on the book's release, one *Washington Post* article began by exclaiming, "The free world must radically change its ways to meet the challenge of the Soviet Union's power to marshal brains and resources for priority projects" ("U.S. Sponsored," 1957). An exact inversion of Korol's point—as he had been at pains to make clear—and yet the reporter attributed this alarmist conclusion to Korol himself. Another *Post* article interwove coverage of Korol's book with quotations from Eisenhower's post-Sputnik addresses, giving the appearance that both had called for the "absolute necessity of increasing our scientific output" in trained personnel (Evans, 1957).

Senators from both parties leapt into the fray, flogging the purported manpower gap and demanding immediate action. Administration officials and congressional leaders immediately began drafting emergency legislation to bulk up the nation's scientific and technical workforce. Education lobbyists and key members of Congress eagerly hammered the "two to three times" figure, seeing at long last their one opportunity to break through years of legislative logjam and enact federal aid to education. (In fact, nearly a century had passed since the last successful federal legislation offering general aid to education: the 1862 Morrill Act, which established the land-grant college system.) For years, federal education bills had foundered on three main points: a long-standing aversion to federal "meddling" in education, which most Americans believed should remain a local concern; sticky questions about how to handle federal aid to parochial schools while maintaining a separation between church and state; and (especially after the Supreme Court's 1954 *Brown v. Board of Education* ruling) equally thorny issues about whether school districts must complete desegregation before receiving federal monies (Clowse, 1981, chap. 4; Rudolph, 2002, chaps. 1, 3). Suddenly Sputnik, combined with DeWitt's figures, allowed proponents of federal education aid to redefine the debate. The nation needed a new "National Defense Education Act" (NDEA), its backers declared, using the manpower scare to tie education to national security.

Even in the light of Sputnik and the DeWitt and Korol studies, the NDEA hardly sailed through Congress. The connection between the new education bill and national security was by no means self-evident; it required constant, vigilant repetition. Several prominent scientific policymakers expressed their skepticism. James Conant—former president of Harvard and wartime science adviser, more recently Eisenhower-appointed high commissioner to West Germany—brushed off the manpower scare in cables to Eisenhower, and argued against adding large numbers of federal fellowships for graduate students in the sciences. National Science Foundation director Alan T. Waterman likewise took his concerns directly to the president and to several of his close aides. The last thing the nation needed, Waterman tried to make plain, was a "crash" program that would further overload university science classrooms. During open hearings on the NDEA that spring, representatives of several professional engineering societies downplayed the manpower gap, labeling media accounts overblown—a "public relations coup by the Russians"—and bristling at the notion that they were suddenly a weak link in the nation's defense (Clowse, 1981: 35-37, 56-58, 85-87).

While leading policymakers like Conant and Waterman advised caution, many influential physicists eagerly gave aid to NDEA's proponents. Quickest to respond was Columbia University's pugnacious physics Nobel laureate, I. I. Rabi. Eisenhower had known Rabi since his days as Columbia's president; by this time, Rabi served as chair of Eisenhower's Science Advisory Committee (precursor to the President's Science Advisory Committee, or PSAC). Meeting just a week and a half after Sputnik's launch, Rabi pressed Eisenhower to use the satellite as a pretext for bulking up American scientific manpower (Clowse, 1981: 11; Divine, 1993: 12-13; Rudolph, 2002: 108). Soon after that, Elmer Hutchisson, director of the American Institute of Physics (AIP), opined to reporters from *Newsweek* that the entire American way of life could well be "doomed to rapid extinction" unless the nation's scientific reserves were expanded quickly (quoted in Clowse, 1981: 19). Behind

the scenes, Hutchisson alerted his AIP colleagues that they had "the opportunity of influencing public opinion greatly." He saw "an almost unprecedented opportunity," he wrote in a memo to the AIP Advisory Committee on Education, "to take advantage of the present public questioning concerning the quality of science instruction in our schools" (Hutchisson, 1957a).

Take advantage they did. Edward Teller, already a household name as the "father of the hydrogen bomb," had helped Senator Jackson prepare his "trained manpower" report. Now he hit the same theme when speaking with the press. "We have suffered a very serious defeat," he exclaimed, "in a field where at least some of the most important engagements are carried out: in the classroom" (quoted in Divine, 1993: 15). University of Chicago physicist and educator Robert Havighurst remained underwhelmed by reports of a post-Sputnik manpower gap; yet that hardly dissuaded him from advising Democratic lawmakers on how best to exploit those reports to push through their federal education legislation (Clowse, 1981: 67). Even cooler heads, such as Cornell's Hans Bethe—a Los Alamos veteran and past president of the American Physical Society—found themselves tossing off DeWitt's number in the weeks and months after Sputnik, often without knowing exactly where it came from or on what basis it had been computed (Bethe, 1958; see also Marshak and Thompson, 1957; Allison, 1958; and Seitz, 1958).

The physicists' public relations campaign worked. When reporting on the state of science education in the United States and Soviet Union throughout the protracted NDEA debates, many journalists focused narrowly on physics (counting up, for example, the number of hours high school students spent in physics classrooms in the two countries). Many clamored that the nation needed to increase the reserves of American physics students at once or face a deadly shortage (Clowse, 1981, chap. 9; Divine, 1993: 15-16, 92-93, 159-62). Only a rare observer worried that the physicists had oversold the situation (Miller, 1958).

In the end, the constant media push, coupled with skillful backroom negotiating, paid off: just before the congressional session was set to expire, the NDEA's backers managed to get the bill voted on and passed by both houses of Congress. The bill's closest analyst concluded that its proponents "were willing to strain the evidence to establish a new policy," using the manpower scare as a "Trojan horse" to sneak their legislation through (Clowse, 1981: 87, 91). After much haggling, the bill's price tag weighed in at around $1 billion (about $7 billion in 2006 dollars), more than doubling previous federal expenditures on education. Eisenhower—ever the fiscal conservative—grudgingly signed the bill into law in early September 1958. During its first year in operation, the act paid out 1,000 graduate-student fellowships, equal in scale to the graduate fellowship program separately funded by the National Science Foundation. (Eisenhower and the Congress likewise boosted funding for the NSF in response to Sputnik: its budget shot up 300 percent for fiscal year 1959, and the proportion earmarked for science education hit its highest mark ever, at 45 percent of the total budget) (Lucena, 2005: 41). By the end of its original four-year authorization, the NDEA had aided 7,000 graduate students and nearly half a million undergraduates. It also provided separate funds to universities to expand their graduate programs. Additional funds were allotted directly to states based on their student numbers, providing an added incentive to rapidly increase enrollments. All aid was restricted to the key "defense" areas of science, mathematics, engineering, area studies, and foreign languages (Clowse, 1981: 151-55, 162-67; Divine, 1993: 164-66; Geiger, 1993, chap. 6).

Lost in all the hoopla were several critical points. Even putting aside the major caveats that DeWitt and Korol had delineated with such care—uneven quality of training, severe specialization, and the huge numbers of extension and correspondence students inflating the Soviet statistics—the numbers themselves deserved a closer look. In tabulating graduates in engineering and applied sciences in the Soviet Union and United States, DeWitt had included three main categories: engi-

neering, agricultural specialists, and health fields; these were the fields that, when tallied, produced the "two to three times" ratio (DeWitt, 1955: 167-69; DeWitt, 1961: 339-42). Yet when repeating the number, not one commentator stopped to ask how a superabundance of agricultural specialists might lead to military supremacy—least of all given the Soviet Union's catastrophic history of collective farming in the 1930s, or the scientific lunacy of agronomist Trofim Lysenko's biological theories, which received state mandate soon after World War II. Similarly for health professionals: no doubt an important segment of the labor force, but would more nurses lead to better bombs or missiles? Nearly everyone who picked up DeWitt's numbers used the label "science and engineering," never pausing to consider just which fields of science or engineering they represented.

DeWitt had, in fact, included data on graduation rates in the natural sciences and mathematics for both countries, presented just as clearly as the information on agricultural and health specialists had been (DeWitt, 1955: 167-69; DeWitt, 1961: 339-42). Playing the numbers game with these data produced a rather different picture. Up through the mid-1950s (and, indeed, into the early 1960s, as DeWitt's follow-up study found), the United States maintained a two-to-one lead over the Soviet Union in numbers of students who completed higher education in science and math each year. (In fact, that ratio held steady well into the 1970s) (Ailes and Rushing, 1982: 65). Lumping science and engineering graduates together (and dropping agriculture and health), the ratio came out as 4:3 in favor of the Soviets—a larger share than the United States, to be sure, but a far cry from the claimed "two to three times." Moreover, if one followed DeWitt's own advice and discounted the Soviet engineering totals by about 10 percent (to account for different categorizations of fields between the two countries), then the ratio shifted to closer than 5:4. In other words, the much-ballyhooed Soviet lead shrank by a factor of ten, down to a mere 24 percent—a lead, moreover, that included a preponderance of students who earned their engineering diplomas armed almost exclusively with a textbook and a mailbox.

Lies, damned lies, and statistics: the "manpower gap" proved no more threatening than the fictitious "missile gap" had been. And yet it still generated sufficient hot air—from high-ranking officials, widely read journalists, and influential physicists—to inflate American science classrooms far beyond any previous enrollment patterns. Indeed, the physicists' public relations campaign, aided by an eager press, buoyed an unnaturally high demand for physicists for the next decade and a half, ensuring that their discipline would grow faster than any other field (Kaiser, 2002b, and forthcoming).

PUBLISHING THE ENEMY

The huge escalation in physics training that followed in the wake of DeWitt's and Korol's studies had many effects on the discipline. Among them, physicists' research journals bulged as never before: all those new PhDs had to earn their degrees conducting publishable research, and publish they did, in record quantities. American physicists soon had additional materials vying for their attention, including a string of translated Soviet physics journals that the American Institute of Physics began to publish in 1955. First to appear was the translated version of *Zhurnal eksperimental'noi i teoreticheskoi fiziki* (*Journal of Experimental and Theoretical Physics*), published under the title *Soviet Physics JETP*. This was a close analog to the US-based *Physical Review*: a research journal dedicated to all aspects of basic physics. During the next two years the institute added a raft of other parallel journals to its roster: *Technical Physics* (akin to the *Journal of Applied Physics*), *Acoustics* (similar to the *Journal of the Acoustical Society of America*), and the physics section of *Doklady Akademii Nauk SSSR* (*Proceedings of the Soviet Academy of Sciences*, similar to the brief letters to the editor that appeared in the *Physical Review* and later in *Physical Review Letters*).

The translation effort reflected new realities, both geopolitical and disciplinary. Before World War II, most American physics departments required PhD candidates to pass language exams in both French and German, to ensure that students would not be cut off from vital

developments in their fields. Given the provenance of the world's most important physics research at the time, few departments had bothered with any other languages, Russian or otherwise. Nor had many university libraries gone out of their way to stock Russian-language journals. After the war, these disciplinary considerations became overlaid with political ones. When a recent student of Hans Bethe's suggested in 1948 that the University of Wyoming (where he now taught) subscribe to the Soviet *Zhurnal*, he was warned that he was "treading on dangerous ground and that such 'redness' was little tolerated" (Clohessy, 1948). Even at major centers like the Synchrotron Laboratory at Caltech, physicists had to seek permission from Atomic Energy Commission authorities before sending reprints of published articles to colleagues behind the Iron Curtain; the commission likewise requested detailed lists of all such reprints received from Soviet sources (Bacher, 1956, 1961). By the end of the 1950s, however, with increasing signs of the depth and breadth of Soviet physicists' research, many American physicists became convinced that they could no longer afford to remain ignorant of Soviet progress. Within a few years, fully half of the PhD-granting physics departments in the United States had added Russian alongside German and French as an acceptable option for language exams (American Institute of Physics, 1961).

Amid this dawning recognition that Soviet research could no longer be ignored, the American Institute of Physics sought to establish some regular and reliable means of receiving copies of the Soviet journals. One year after Stalin's death, with tentative signs that some sort of scientific relations might be reestablished between the two sides of the Cold War, the institute joined the International Council of Scientific Unions (part of UNESCO) to negotiate with the Soviet Institute of Scientific Information. Representing the International Council, the director of the Royal Belgian Observatory—a most appropriately named Paul Bourgeois—inquired of his Soviet counterpart if a deal might be struck: each scientific body could airmail the page proofs of its forthcoming journals to the other on a regular basis, allowing rapid

incorporation of titles and abstracts in their respective abstracting journals. Professor D. Panov of the Soviet Institute of Scientific Information agreed that the exchange of page proofs would be mutually beneficial (Panov, 1954).

An important start, but soon several officers of the American Institute of Physics decided that only translating the abstracts would be insufficient. With reports of scientific "manpower" booming in the Soviet Union, institute officials appealed to the National Science Foundation to help them close the information gap. "Can we afford not to keep abreast of the scientific output of this rapidly growing mass of scientific talent?" they asked. Closing their appeal, they argued simply, "the easiest way of losing in any race is to underestimate your opponent." Apparently the National Science Foundation agreed: it promptly awarded the institute a grant to study the feasibility of translating the full contents of the Soviet physics journals (Hutchisson, 1954).

One of the institute's first moves was to conduct a survey of nearly 700 randomly selected members to see if the translation journals might find a welcome audience (and hence the needed subscription revenues). A strong majority of respondents agreed that the translation efforts would be worthwhile. Their justifications are telling: 76 percent said that the institute should publish the translated journals "because of the technical value of the research now in progress in the USSR," while 71 percent endorsed the project "because of the national danger of underestimating the strength of the USSR, particularly as far as scientific advances are concerned." At least some physicists assented to the latter only with some hesitation. One wrote that "I dislike thinking that this is a justification for keeping informed about Russian science, but under the present circumstances I believe the answer is yes." Others remained more skeptical that the institute's translation efforts—worthy as they may be scientifically—would really have national security value. "Their published work would not give us enough information to judge their strength," wrote one. "It would be dangerous to estimate any nation from its publications without full knowledge of context—censorship

policy, classification of information, etc. I say, translations will give at best *illusory* basis of estimating strength," explained another. Still one more respondent found the whole business distasteful: "I believe AIP has no business in intelligence work. This should be taken care of by the appropriate government agency" (American Institute of Physics, 1954).

These few dissenting voices notwithstanding, the National Science Foundation agreed to the institute's request for $40,000 to cover the first year's operation (over $300,000 in 2006 dollars), and by the autumn of 1955 AIP was hard at work producing the first volume of *Soviet Physics JETP*. Robert Beyer, a physicist at Brown University and an associate editor of the *Journal of the Acoustical Society of America*, who had extensive Russian language skills, agreed to take on editorial duties for *Soviet Physics JETP*. According to initial estimates, Beyer would devote one-quarter of his time to the translation journal, aided by one secretary and two typists—the latter would prepare the final copy of the journal pages, which could then be printed by photo-offset methods. Yet soon these best-laid plans hit some snags. For starters, how could they keep costs in line as the number of pages continued to grow? The Soviet *Zhurnal* grew by 150 percent between 1955 and 1956, throwing Beyer's initial cost estimates far off course. Much as with the *Physical Review*, meanwhile, the mathematical complexity of the material to be published in *Soviet Physics JETP* continued to increase, putting additional strain on the in-house typesetting operation at Brown (Beyer, 1956a, 1957).

On top of these familiar problems, the translation journals offered a new set of headaches as well. Beyer had trouble keeping to the expected production schedules in part because of wild fluctuations in the time it took to receive original copies of the *Zhurnal*: some issues arrived within two or three weeks of their publication, while others languished in the international mail for as long as two months (Beyer, 1956a). Another challenge facing the institute was copyright issues, since the Soviet Union had not yet formally entered into stan-

dard international copyright agreements. Several months into their operation to translate the *Zhurnal*, officers of the American Institute of Physics discussed the rumor that the Soviets might sign on to the international statutes. "If this were true," they reasoned, "steps would have to be taken to assure our right legally and ethically to continue translation of JETP." After consulting with the chief deputy librarian at the Library of Congress, the institute officers were relieved to learn that the rumor probably had little basis. All the same, they decided to continue pursuing their current strategy—"informal establishment of friendly relations with the Russian editor"—but not to get too friendly: "It is strongly suggested that we never mention to him the issue of consent or right to translate" (Barton, 1955).

The challenges did not stop there. One basic question was how to transliterate Cyrillic characters into the Latin alphabet, at a time when various national and international bodies backed competing schemes. Another was finding competent translators who were equally comfortable with the Russian language and with the technical content of the *Zhurnal*. Perhaps most perplexing was how to handle nontechnical material. From the start, Beyer, AIP director Hutchisson, and their colleagues debated whether or not to reprint formulaic appeals to party loyalty, nationalistic addresses delivered by Soviet physicists before government bureaucrats, and similar propaganda within *Soviet Physics JETP*. Should such material appear in full translation, only in condensed abstracts or summaries, or simply be quietly left out altogether (Beyer, 1955; Hutchisson, 1955)?

The issue was tested by the lead article in the March 1956 issue of the *Zhurnal*, which printed Academician A. N. Nesmeianov's address to the Central Committee of the Communist Party of the Soviet Union. Nesmeianov, president of the Soviet Academy of Sciences, received Comrade Khrushchev's "deep gratitude," the article noted, for his description of "new successes of Soviet physics." Nesmeianov was followed at the podium by Igor Kurchatov, scientific director of the Soviet nuclear weapons project. Kurchatov closed his speech with the

hope that American physicists would join their Soviet counterparts in lobbying the American government to outlaw all use of nuclear weapons. Beyer had a translation of the lengthy article prepared and sent to Hutchisson and several other advisers, alerting them that unless something was done, the piece would be published in the October 1956 issue of *Soviet Physics JETP*. Beyer reasoned in a somewhat lawyerly fashion that since the offending paragraph "appears within quotation marks, I can see no objection to its publication" (Beyer, 1956b). Hutchisson reassured the editor; he found the piece "quite interesting," and concluded that it presented little cause for alarm: "Surely this article is not likely to make many communists in this country" (Hutchisson, 1956). And so the address to the party faithful appeared on time in the October issue (Nesmeianov, 1956).

The American Institute of Physics officers were not above engaging in a bit of propaganda of their own. Just one month after the surprise launch of Sputnik in October 1957, they launched a vigorous campaign to increase the circulation of their translation journals. First came letters to trusted senior colleagues, such as J. Robert Oppenheimer, asking them to comment on whether or not they used the translated Soviet journals in their own research or had recommended them to colleagues or librarians. Their goal was clear: "we would like to take every possible advantage of the tremendous interest of the country at this time in Soviet physics" (Hutchisson, 1957b). The next iteration of their form letter turned up the rhetorical heat: a "glaring deficiency" of the nation's scientific infrastructure had been the failure to secure up-to-date information from the foreign scientific literature. "The recent launchings of two space satellites by the Soviet Union have now brought this problem into electrifying focus." Responding to the fast-moving currents, the institute aimed to get "every major library and scientific institution in the country" to order subscriptions to all four of their Soviet translation journals (Hutchisson, 1957c). To aid in this quest, the institute officers solicited written testimonials from leading physicists about the journals' importance—along with permission to

use the statements in the institute's subscription campaign. The appeal worked, and quickly: by early January 1958, the institute had begun to circulate a five-page memo of glowing endorsements from esteemed physicists, several urging that the translated journals were "indispensable" (American Institute of Physics, 1958).

The institute received some behind the scenes aid with their Soviet journal efforts as well. A few months before the Sputnik launch, the Atomic Energy Commission had begun underwriting the National Science Foundation's grant to the institute to support the translated Soviet journals—a kind of bureaucratic shell game. Within weeks of Sputnik, citing "headline events," the National Science Foundation proposed that the Atomic Energy Commission nearly double its annual subsidy for the translation program—from $44,000 to $75,000 (about $540,000 in 2006 dollars)—and expand into neighboring areas such as metallurgy, applied mathematics, and chemical engineering. They also recommended widening the group of silent contributors to include the Central Intelligence Agency and the Air Force Technical Intelligence Center. The CIA and the Air Force group had already begun their own translation efforts, focusing primarily on Soviet scientific monographs rather than journals. Before Sputnik, these materials had been restricted to internal use; even news of their existence had been carefully guarded. After Sputnik, the Air Force group agreed to begin sharing up to 70 percent of its translated materials, on condition that no trace of the materials' origins in the Air Force be revealed. Under such cloak-and-dagger schemes, the federal government greatly expanded its effort to translate and circulate the latest Soviet scientific publications (Salisbury, 1957; Waterfall, 1957).

The public relations campaign, backed by enhanced federal support, worked well. By September 1959, subscriptions to *Technical Physics*, *Acoustics*, and the physics section of *Doklady* had each nearly doubled, while subscriptions to *Soviet Physics JETP*—always the best-selling of the institute's Soviet journals—climbed an impressive 27 percent to reach nearly 1,000 paying customers. The new infusion of

cash allowed the institute to launch several more Soviet translation journals, such as *Astronomy*, *Crystallography*, *Solid State*, and *Uspekhi*, a journal of review articles akin to *Reviews of Modern Physics* (Tober, 1959). (Meanwhile, the success of the translation effort helped spell the end for language exams: over the course of the 1960s, several departments loosened their requirements or dropped them altogether, citing lack of need.) By 1960, the American Institute of Physics, its volunteer army of translators, and several branches of the federal government had guaranteed that the latest developments in Soviet physics would be available to American readers. Once again, leading physicists like Hutchisson had succeeded in aligning the political and scientific stars.

CONCLUSIONS

The physicists' notion of quantum-mechanical "spin" provides a telling metaphor for their political activities. Spin is a quantity inherent to elementary particles. It cannot be removed or washed away; it is ever-present and irreducible. Scientists' engagement with political affairs is likewise a necessary part of the scientific life. Individual scientists and professional scientific bodies always need to engage in some form of political participation. We stand little hope of understanding these ubiquitous interactions if we continue to parse "science" and "politics" as circles on a Venn diagram, perhaps sharing some overlapping region here or there, but distilled into pure forms on either side. The "incursion" of politics into scientific practice does not lead always and only to "bad science"—the nightmarish caricatures of legitimate science done in by totalitarian regimes. Nor is it limited to the often bitter, knock-down, drag-out fights over congressional appropriations, such as what led to the demise of the Superconducting Supercollider in the early 1990s (see esp. Kevles, 1995). Rather, political participation—including that most political of activities, spin—is what enables scientists to get their jobs done in

the first place, garnering resources, attracting students, sharing the fruits of their labors, and (at least on occasion) helping to set national policies and priorities.

In the examples examined here, physicists' spin proved crucial. Sputnik had no automatic political valence; technopolitical events rarely do. Opinion polls conducted soon after the satellite's launch showed no single stampede of opinion among American citizens. Most respondents were more ambivalent than frightened or spurred to any particular conclusion (Lubell, 1957). Only with determined lobbying by physicists and others did Sputnik and associated claims about a "manpower gap" vis-à-vis Soviet scientists become transformed into a political event requiring a specific political response. Precisely this type of lobbying throughout the postwar decades helped to drive an unprecedented explosion in physics enrollments in the United States, outstripping every other field in rates of growth (Kaiser, forthcoming). So, too, did physicists' skillful public relations work—seizing again on the opportunity provided by Sputnik—result in the establishment of several major new publishing ventures. By parlaying a modest exploratory grant proposal into a significant governmental priority, officers at the American Institute of Physics managed to expand the raft of research journals with which all those fresh graduate students would occupy their time.

Acknowledging the suffusion of scientific practice with politics, rather than ignoring the issue or wishing it away, might inspire effective measures to meet more recent challenges. From denials of global warming to religious attacks on the big bang—a less-publicized but festering offshoot of the "intelligent design" controversy over biological evolution (Revkin, 2006; Overbye, 2006)—physical scientists face numerous political challenges today. Claiming wide-eyed innocence of all things political has not always served as a winning strategy, especially when faced with such disciplined and experienced political opponents. Perhaps it's time to face facts and take the political kid gloves off. Physicists, embrace your spin.

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