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## From Modern Physics to the Cold War and Beyond

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### ABSTRACT

This essay is part of a special issue entitled “Looking Backward, Looking Forward: *HSNS* at 50,” edited by Erika Lorraine Milam.

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As an *HSNS* reader, author, and member of the editorial board, I join in celebrating the fiftieth anniversary of a journal that has, under its evolving titles, made a most profound impact on the several generations of historians of science like me, who grew up under its influence. Indeed, it has pioneered and reshaped the historical studies of modern physics, science policy, and the politics of science, especially the relationship between science and the national security state during the Cold War.

It was in the early 1980s when I first encountered the *Historical Studies in the Physical Sciences (HSPS)*, as a graduate student in the intellectual history of physics at the Graduate School of the Chinese Academy of Sciences in Beijing. My main advisor was Xu Liangying, an Einstein scholar who had a fairly complete set of the handsome, hardback *HSPS* annual volumes in his home and who generously allowed his students to borrow them. I remember being impressed by the international cast of the authors publishing in the journal, then edited by Russell McCormach. These included Boris Kuznetsov from

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The following abbreviations are used: *HSPS*, *Historical Studies in the Physical Sciences* and *Historical Studies in the Physical and Biological Sciences*; PSAC, President’s Science Advisory Committee.

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the Soviet Union and Tetu Hirosige from Japan, both writing on Einstein and the revolution in physics at the turn of the twentieth century. They showed me that not only was modern physics universal, so was the study of its history.

Emboldened by their examples and supported by Prof. Xu, I chose to write my master's thesis on the history of quantum mechanics, specifically the discovery of the equivalence of the matrix and wave mechanics in 1926. In formulating and writing it, I was inspired directly by the several pioneering articles in the *HSPS* on quantum physicists and their intellectual-cultural environments. These included V. V. Raman and Paul Forman's paper in the initial volume in 1969 on the historical connections between Erwin Schrödinger, founder of wave mechanics, and Louis de Broglie, creator of the matter wave theory; Martin J. Klein's in 1970 on the intellectual differences between Albert Einstein and Niels Bohr on the quantum theory before the advent of quantum mechanics; and of course the controversial but highly influential (first) Forman thesis in 1971, with its then radical claim of the effects of Weimar culture on the birth of quantum mechanics in Germany in the 1920s.<sup>1</sup> Building on these studies I argued in my thesis that wave and matrix mechanics derived intellectually from two divergent "research programs" championed by Einstein and Bohr (both used the term long before the philosopher of science Imre Lakatos popularized it), respectively, and that the discovery of the equivalence of the two rival theories in 1926 did not end but actually heightened the grammatical debates.<sup>2</sup>

The journal continued to affect deeply my education and research when I enrolled in the University of California, Santa Barbara, to study for a PhD in the history of science in 1986, which coincided with its renaming to *Historical Studies in the Physical and Biological Studies*. In the late 1980s and early 1990s, I chose as my PhD thesis topic the early history of the American President's Science Advisory Committee (PSAC). I did so due in part to my mentor

1. V. V. Raman and Paul Forman, "Why Was It Schrödinger Who Developed de Broglie's Ideas?," *HSPS* 1 (1969): 291–314; Martin J. Klein, "The First Phase of the Bohr-Einstein Dialogue," *HSPS* 2 (1970): 1–39; Paul Forman, "Weimar Culture, Causality, and Quantum Theory, 1918–1927: Adaptation by German Physicists and Mathematicians to a Hostile Intellectual Environment," *HSPS* 3 (1971): 1–115. On the Forman thesis and its impact, see Cathryn Carson, Alexei Kojevnikov, and Helmuth Trischler, eds., *Weimar Culture and Quantum Mechanics: Selected Papers by Paul Forman and Contemporary Perspectives on the Forman Thesis* (London: Imperial College Press, 2011).

2. A revised version of the thesis was published as Wang Zuoyue, "Liangzi lixue de liangge yanjiu gangling" [The two research programs of quantum mechanics], *Ziran bianzhengfa tongxun* [Journal of the dialectics of nature] 13, no. 4 (1991): 41–49.

Lawrence Badash's influence, and in part to the growing interest in the field in the recent institutional, social, and political history of science and technology in the United States that had been fostered by the journal. Under John Heilbron's editorship, it had published several innovative studies in these directions in the early 1980s. These included Lillian Hoddeson's 1981 article on the discovery of the transistor at Bell Labs in the late 1940s, Barton J. Bernstein's 1982 essay on the 1954 security case of the physicist J. Robert Oppenheimer, Robert Seidel's 1983 study on the Lawrence Radiation Laboratory after World War II, and Allan Needell's 1983 paper on the early history of the Brookhaven National Laboratory.<sup>3</sup> In 1986, it published Nathan Reingold's wide-ranging and nuanced analysis of post-World War II American science policy through an examination of the views of a major player, Vannevar Bush.<sup>4</sup>

In retrospect, the appearance of the journal's first issue in 1987 must be regarded as a turning point in the studies of Cold War American science both at the journal and more broadly in the history of science field. It features rigorous, empirical studies by a number of then mostly young scholars on various aspects of American science and technology during the Cold War era. These included David DeVorkin's paper on early space research under military sponsorship, Hoddeson's on the Fermilab, Stuart W. Leslie's on military research at Stanford, Needell's on space research in universities, Seidel's on military laser R&D, and, mostly notably, Forman's on quantum electronics.<sup>5</sup>

Straightforwardly titled "Behind Quantum Electronics: National Security as Basis for Physical Research in the United States, 1940-1960," this second Forman thesis, with its claim of American physicists' often unwitting and

3. Lillian Hoddeson, "The Discovery of the Point-Contact Transistor," *HSPS* 12, no. 1 (1981): 41-76; Barton J. Bernstein, "In the Matter of J. Robert Oppenheimer," *HSPS* 12, no. 2 (1982): 195-252; Robert W. Seidel, "Accelerating Science: The Postwar Transformation of the Lawrence Radiation Laboratory," *HSPS* 13, no. 2 (1983): 375-400; Alan A. Needell, "Nuclear Reactors and the Founding of the Brookhaven National Laboratory," *HSPS* 14, no. 1 (1983): 93-122.

4. Nathan Reingold, "Vannevar Bush's New Deal for Research: Or the Triumph of the Old Order," *HSPS* 17, no. 2 (1986): 299-344.

5. David DeVorkin, "Organizing for Space Research: The V-2 Rocket Panel," *HSPS* 18, no. 1 (1987): 1-24; Lillian Hoddeson, "The First Large-Scale Application of Superconductivity: The Fermilab Energy Doubler, 1972-1983," *HSPS* 18, no. 1 (1987): 25-54; Stuart W. Leslie, "Playing the Education Game to Win: The Military and Interdisciplinary Research at Stanford," *HSPS* 18, no. 1 (1987): 55-88; Allan A. Needell, "Preparing for the Space Age: University-Based Research, 1946-1957," *HSPS* 18, no. 1 (1987): 89-109; Robert W. Seidel, "From Glow to Flow: A History of Military Laser Research and Development," *HSPS* 18, no. 1 (1987): 111-47; Paul Forman, "Behind Quantum Electronics: National Security as Basis for Physical Research in the United States, 1940-1960," *HSPS* 18, no. 1 (1987): 149-229.

sometimes perverse integration into the Cold War national security state (with “the illusion of autonomy”), both stirred controversy and proved stimulating and influential to an extent rivaling that associated with the first one. Three years later, the journal published Daniel J. Kevles’ response to the paper, in which he did not question the reality of the integration, but contended that it took place, especially after the outbreak of the Korea War, with most physicists’ willing support and with largely positive effects on the development of American physics broadly conceived.<sup>6</sup> Naomi Oreskes and John Krige, both frequent authors in the journal, have regarded the Forman-Kevles dialog as the central historiographical starting point in this area. It has “defined the debate about Cold War science” in many ways, according to Oreskes, and represented, to Krige, valuable “‘political’ interventions” in shaping what should count as science.<sup>7</sup>

For me, when I was working on a historical study of the founding of the Stanford Linear Accelerator Center (SLAC), with a focus on PSAC’s roles in the process in the 1950s and 1960s, I framed it in part as a contribution to the Forman-Kevles debate. In it I argued that the ascendancy of scientific groups like PSAC in American public policy-making, especially in the aftermath of the Soviet launching of Sputnik in 1957, indicated the need to move away from thinking of scientists and the state as two separate and monolithic entities, and to examine the intermixing and how the science-state relationship could shift due to changing domestic and international political dynamics. When the paper was completed it was natural for me to submit it to the *HSPS*, and its appearance in 1995 in the journal made it one of my earliest major scholarly publications in English and a highlight in my career development.<sup>8</sup>

In 1998, after receiving my PhD in 1994 and while working as a manuscript processor in the UCSB Special Collections, I was excited to be invited by the

6. Dan Kevles, “Cold War and Hot Physics: Science, Security, and the American State, 1945–56,” *HSPS* 20, no. 2 (1990): 239–64.

7. Naomi Oreskes, “Introduction,” and John Krige, “Concluding Remarks,” in Oreskes and Krige (eds.), *Science and Technology in the Global Cold War* (Cambridge, MA: MIT Press, 2014), 1–9, on 2, and 431–41, on 437, respectively. See also Oreskes, “Science in the Origins of the Cold War,” *ibid.*, 11–29.

8. Zuoyue Wang, “The Politics of Big Science in the Cold War: PSAC and the Funding of SLAC,” *HSPS* 25, no. 2 (1995): 329–56. My recollection is that when I contacted the editor, John Heilbron, with my initial inquiry, he asked that I send the manuscript to both Forman and Kevles, who were then serving as associate editors of the journal, for “physical sciences in the twentieth century” and “twentieth-century science in its social and cultural setting,” respectively. The paper was revised and included in my book *In Sputnik’s Shadow: The President’s Science Advisory Committee and Cold War America* (New Brunswick, NJ: Rutgers University Press, 2008).

Office for History of Science and Technology at UC Berkeley, where the journal was based, to participate in a fruitful conference held there on physics and politics. Cathryn Carson, Ethan Pollock, Peter Westwick, and James H. Williams, then young scholars on campus, organized the conference, which was titled “Physicists in the Postwar Political Arena: Comparative Perspectives,” and selected papers from it for a special issue of the journal, which appeared in 1999. My involvement in both gave me a welcome opportunity to share research and test ideas related to my long-time interest in the history of U.S.-China scientific interactions since President Richard Nixon’s trip to Beijing in 1972. I was especially gratified and encouraged when the editors, in their “Foreword” for the special issue, highlighted my paper as an example on “writing histories in something other than a national key.”<sup>9</sup> In a way, such positive reactions have led to my subsequent and current focus on Chinese scientists educated in the United States in the 1940s—both those who stayed in the U.S. and those who returned to China afterward—as an experiment in transnational history of science.

Spending a semester teaching the history of science at UC Berkeley as a visiting lecturer in spring 1999 gave me an opportunity to gain a first-hand appreciation of the operations of the journal, especially the efficiency of the staff headed by executive editor Diana Wear. In fall that year I started my current position at the California State Polytechnic University, Pomona, but continued of course to follow the journal, especially the growing number of high-quality, influential articles and special issues related to science and policy in the post-WWII period, increasingly with an international or transnational perspective. I also served as a peer reviewer, wrote several book reviews, and had my own book, *In Sputnik’s Shadow*, on the history of PSAC, reviewed in the journal in this period.<sup>10</sup>

My involvement in the journal increased in 2007 when I became an associate editor, just as the journal was relaunched as *Historical Studies in the Natural Sciences* the next year and changed from a biannual to a quarterly publication, under the collective leadership chaired by Carson. Actively participating in the editorial process has confirmed for me that the journal is indeed one of the best

9. Cathryn Carson, Ethan Pollock, Peter Westwick, and James H. Williams, “Editors’ Foreword,” *HSPS* 30, no. 1 (1999): i–ix, on ix. Zuoyue Wang, “U.S.-China Scientific Exchange: A Case Study of State-Sponsored Scientific Internationalism during the Cold War and Beyond,” *HSPS* 30, no. 1 (1999): 249–77.

10. Jacob Darwin Hamblin, “Science and Technology for Every Man, Woman, and Child” (book review) *Historical Studies in the Natural Sciences* 40, no. 2 (2010): 259–67.

places to publish especially at the beginning of one's scholarly career: through a variety of measures, we try to foster a spirit of collegial collaboration among the editors, authors, and the reviewers, which in turn leads to encouragement and support especially for young scholars and scholars from non-English-speaking areas to develop and improve their work. It is responsible at least in part for the rewarding geographical, disciplinary, rank, and gender diversity of the authors and the topics of their papers in the journal. Modern physics and American Cold War science still occupy an important place in the journal, but more studies now branch out to other disciplines such as biological, geological, and environmental sciences (perhaps the name changes also helped!), and in places outside of the United States and western Europe, e.g., in Asia, Latin America, and Russia.

Finally, let me wish that the journal that has done so much for the scholarly development of people like me and for the intellectual vitality of the history of science in the last fifty years continue to be a stimulating and supportive forum for generations to come!