FOCUS: NEW PERSPECTIVES ON SCIENCE AND THE COLD WAR

Introduction

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ABSTRACT

Twenty years after the fall of the Berlin Wall, the Cold War looks ever more like a slice of history rather than a contemporary reality. During those same twenty years, scholarship on science, technology, and the state during the Cold War era has expanded dramatically. Building on major studies of physics in the American context—often couched in terms of "big science"—recent work has broached scientific efforts in other domains as well, scrutinizing Cold War scholarship in increasingly international and comparative frameworks. The essays in this Focus section take stock of current thinking about science and the Cold War, revisiting the question of how best to understand tangled (and sometimes surprising) relationships between government patronage and the world of ideas.

WHY REVISIT SCIENCE AND THE COLD WAR? Why now? Recent work on science during the Cold War has both deepened and challenged earlier studies, asking new questions of new sources as well as bringing new perspectives to old issues. The papers presented here exemplify this change not only in the topics they cover but also in their methods, sources, conclusions, and implications for the larger history of science and society during the Cold War era.

In particular, recent work on science during the Cold War has defined both science and the Cold War more broadly than did earlier studies, which tended to focus on the physical sciences in America. Given this focus, the central story in earlier works usually revolved around the rise of Big Science and the military-industrial-academic complex in the United

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States, a tale often told as a modern version of Faust.[1] Recent work, however, is much more international and multidisciplinary in perspective, and Faust is but one of many narrative frames.

Indeed, variation is now the theme, whether it be geographic, institutional, intellectual, or moral. For instance, in recent works the Cold War is not just a military-technical-ideological struggle between two relatively unified blocs. It is instead understood as a global transformation that was fueled and shaped, but not determined, by the conflict between the two superpowers, with this transformation taking on a wide array of local forms.[2]

Similarly, as recent works have clarified, Cold War science was much more than Big Science and Big Weaponry. It was a varied set of concepts, practices, technologies, social and institutional relationships, values, ideologies, and more.[3] It included the physical sciences and weapons research, of course, but also comprised the social and biological sciences as well as a host of technical projects that resist easy categorization. Some recent studies have taken science to include nearly all formalized, instrumental knowledge and its associated technologies and practices, with such technologies and practices sometimes *being* the science, not simply its instruments or applications.[4]

Science during the Cold War thus becomes part of a larger, more complex story (as if the story of a global struggle between two superpowers was not large or complex enough). That new story is the creation of what might be called a "federated" world, one with new global flows of power, knowledge, and wealth that both shaped and were shaped by reconfigured local structures and reinvented identities. Understanding this new relationship between the global and the local is one of the core conceptual challenges for scholars studying this period.

[1] See especially Paul Forman, "Behind Quantum Electronics: National Security as Basis for Physical Research in the United States, 1940–1960," *Historical Studies in the Physical and Biological Sciences*, 1987, *18*:149–229; Daniel Kevles, "Cold War and Hot Physics: Science, Security, and the American State, 1945–1956," *Historical Studies in the Physical and Biological Sciences*, 1990, *20*:239–264; Peter Galison and Bruce Hevly, eds., *Big Science: The Growth of Large-Scale Research* (Stanford: Stanford Univ. Press, 1992); and Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia Univ. Press, 1993).

[2] See, for example, Odd Arne Westad, *The Global Cold War: Third World Interventions and the Making of Our Times* (Cambridge: Cambridge Univ. Press, 2007).

[3] Recent studies of Cold War physical science and engineering that have explored themes beyond the Big Science axis include Edward Jones-Imhotep, "Disciplining Technology: Electronic Reliability, Cold-War Military Culture and the Topside Ionogram," *History and Technology*, 2001, *17*:125–175; John Cloud, ed., *Earth Science in the Cold War*, published as special issue of *Social Studies of Science*, 2003, *33*:629–825; David Kaiser, "The Postwar Suburbanization of American Physics," *American Quarterly, 2004*, *56*:851–888; Joan Lisa Bromberg, "Device Physics vis-a-vis Fundamental Physics in Cold War America: The Case of Quantum Optics," *Isis*, 2006, *97*:237–259; and Patrick McCray, *Keep Watching the Skies! The Story of Operation Moonwatch and the Dawn of the Space Age* (Princeton: Princeton Univ. Press, 2008).

[4] See, for example, Jacob Hamblin, *Oceanographers and the Cold War: Disciples of Marine Science* (Seattle: Univ. of Washington Press, 2005); Ronald Doel, "Constituting the Postwar Earth Sciences: The Military's Influence on the Environmental Sciences in the USA after 1945," *Social Studies of Science*, 2003, *33*:635–666. On large-scale, sociotechnical projects in the Cold War era see Thomas P. Hughes, *Rescuing Prometheus* (N.Y.: Pantheon, 1998); and Hughes and Agatha C. Hughes, eds., *Systems, Experts, and Computers: the Systems Approach in Management and Engineering, World War II and After* (Cambridge, Mass.: MIT Press, 2000). For an excellent example of the technology being the science, in this case computer science, see Atsushi Akera, *Calculating a Natural World*: *Scientists, Engineers, and Computers during the Rise of U.S. Cold War Research* (Cambridge, Mass.: MIT Press, 2007). An interesting, if controversial, exploration of the Cold War's influence on the philosophy of science is George Reisch, *How the Cold War Transformed Philosophy of Science: To the Icy Slopes of Logic* (Cambridge: Cambridge Univ. Press, 2005).

The essays in this section by Zuoyue Wang and Kristie Macrakis exemplify such new transnational and comparative approaches to science during the Cold War. The essays by David Engerman, Rebecca Lemov, and Paul Erickson reflect the new interest in the history of the human sciences.[5] All of the following essays focus on the physical and social sciences, revealing some of the range of new themes and approaches. Recent work on the biological sciences during the Cold War—including environmental and ecological science, the carryover of radiation experiments from nuclear weapons work to biological research, and investigations of human-machine systems—paints a still broader picture, as do the growing number of studies of science in American popular culture.[6]

THEMES AMID THE VARIATIONS

The essays that follow do what good "second generation" historical work always does—they take the draft of history written by the first generation and add complexity and nuance, particularizing the grand narrative and often destabilizing it. But they do not stop there; they also point to themes amid the variations. Some are elaborations upon earlier themes, but others are markedly new constellations.

The first common theme is that Cold War science needs to be understood from a transnational perspective. As Zuoyue Wang shows, two big parts of the story of science during the Cold War were the Americanization of science in other countries (such as China) *and* the transnationalization of science in America, which Wang persuasively suggests were two sides of the same coin. This picture of a simultaneous Americanization

[5] Other exemplars of international and comparative perspectives include John Krige and Kai-Henrik Barth, "Introduction: Science and Technology in International Affairs," *Osiris*, N.S., 2006, *21*:1–21; Gabrielle Hecht and Paul N. Edwards, *The Technopolitics of Cold War: Toward a Transregional Perspective* (Washington, D.C.: American Historical Assoc., 2007); Richard H. Beyler, "The Demon of Technology, Mass Society, and Atomic Physics in West Germany, 1945–1957," *History and Technology*, 2003, *19*:229–241; Alexei Kojevnikov, "The Phenomenon of Soviet Science," *Osiris*, N.S., 2008, *23*:115–135; Konstantin Ivanov, "Science after Stalin: Forging a New Image of Soviet Science," *Science in Context*, 2002, *15*:317–338; John Krige, *American Hegemony and the Postwar Reconstruction of Science in Europe* (Cambridge, Mass.: MIT Press, 2006); and Jacob Hamblin, "Exorcising Ghosts in the Age of Automation: United Nations Experts and Atoms for Peace," *Technology and Culture*, 2006, *47*:734–756. On some of the new interest in the history of the human sciences see Sonja Amadae, *Rationalizing Capitalist Democracy: The Cold War Origins of Rational Choice Liberalism* (Chicago: Univ. of Chicago Press, 2003); Hunter Crowther-Heyck, *Herbert A. Simon: The Bounds of Reason in Modern America* (Baltimore: Johns Hopkins Univ. Press, 2005); Jennifer S. Light, *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America* (Baltimore: Johns Hopkins Univ. Press, 2003); Jamie Cohen-Cole, "The Creative American: Cold War Salons, Social Science, and the Cure for Modern Society," *Isis*, 2009, *100*:219–262; Mark Solovey, "Project Camelot and the 1960s Epistemological Revolution: Rethinking the Politics-Patronage-Social Science Nexus," *Social Studies of Science*, 2001, *31*:171–206; Philip Mirowski, *Machine Dreams: Economics Becomes a Cyborg Science* (Cambridge: Cambridge Univ. Press, 2002); Sarah Igo, *The Averaged American: Surveys, Citizens, and the Making of a Mass Public* (Cambridge, Mass.: Harvard Univ. Press, 2007); and Ron Robin, *The Making of the Cold War Enemy: Culture and Politics in the Military-Intellectual Complex* (Princeton, N.J.: Princeton Univ. Press, 2001).

[6] See, for example, Angela Creager, "Nuclear Energy in the Service of Biomedicine: The U.S. Atomic Energy Commission's Radioisotope Program, 1946–1950," *Journal of the History of Biology*, 2006, *39*:649–684; Donald Worster, *Nature's Economy: A History of Ecological Ideas*, 2nd ed. (Cambridge: Cambridge Univ. Press, 1994); Evelyn Fox Keller, *Making Sense of Life: Explaining Biological Development with Models, Metaphors, and Machines* (Cambridge, Mass.: Harvard Univ. Press, 2002); Soraya de Chadarevian and Harmke Kamminga, *Molecularizing Biology and Medicine: New Practices and Alliances, 1910s–1970s* (Amsterdam: Harwood Academic, 1998); N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago: Univ. Chicago Press, 1999); David Serlin, *Replaceable You: Engineering the Body in Postwar America (*Chicago: Univ. Chicago Press, 2004); David Seed, *American Science Fiction and the Cold War (*New York: Routledge, 1999); and M. Keith Booker, *Alternate Americas: Science Fiction Film and American Culture* (New York: Praeger, 2006).

of world science and internationalization of American science fits well with other recent work on Western Europe, India, Japan, and Korea, though the relative lack of studies on science in Africa, the Middle East, and Latin America during this period makes it difficult to know whether this model would fit those regions as well.[7]

Comparative studies, like that of Kristie Macrakis, also provide new insights into Cold War science and technology, revealing complexities and ironies that challenge our narratives and moral frames. As Macrakis's essay shows, in the realm of espionage America's democratic ideology helped produce a powerful technophilia. Massive, passive surveillance technologies seemed the best window on the closed society of the Soviets while also appearing to be in keeping with democratic traditions. The legacy of investment in such systems, however, was a set of powerful technologies that seem better suited to monitoring America's own citizens than the new threats of the twenty-first century.[8]

The second common theme is the importance of local context and individual agency. While the interpenetration of science and the state is part of nearly every story of science during the Cold War, recent works emphasize the varied ways that the relationship between individual scientists and state power was mediated, often with surprising results. In Wang's essay, for example, the State Department and the Immigration and Naturalization Service took opposing views on Chinese students in the United States, highlighting the diversity of actors and agencies *within* the federal government.

Context and agency shaped the intellectual products of the era as well. Paul Erickson tells how a set of analytic tools developed to study war (game theory) became vital to peace studies, and even to evolutionary biology. Likewise, David Engerman's essay highlights the unexpected—and sometimes unwanted—results of military-funded social research, such as the Refugee Interview Project of the Russian Research Center. This study concluded that the Soviet political system was less monolithic, more stable, and more popular than American leaders wanted to believe. Together, these and other histories build on earlier work that had emphasized the importance of federal (and often military) patronage in enabling all kinds of research to be done. However, they caution that the source and scale of the new patronage did not determine the outcomes of research, which at times ran counter to the interests and expectations of the patrons.

If the first theme is global perspective and the second local variation, then the third must be instrumentalism. This third theme is multifaceted, combining the "scientization" of previously unformalized bodies of knowledge and practice (e.g., military strategy, espionage, interview technique); the instrumentalization of science both in its methods and its goals; and the application of this formal, instrumental knowledge to the reconstruction of minds, bodies, and behaviors. Put another way, in many recent studies, science is technoscience, technology is technopolitics, and both are instruments for the reconstruction of self and society.[9]

[7] Dong-Won Kim and Stuart W. Leslie, "Winning Markets or Winning Nobel Prizes? KAIST and the Challenges of Late Industrialization," *Osiris*, N.S., 1998, *13*:154–185; Krige, *American Hegemony* (cit. n. 5); Hiroshi Ichikawa, "Introduction: A Perspective on the Historical Study of Science and Technology during the Second World War and the Cold War in Japan," *Historia Scientiarum*, 2006, *16*:1–4; Benjamin Elman, "New Directions in the History of Modern Science in China: Global Science and Comparative History," *Isis*, 2007, *98*:517–523; Zuoyue Wang, "Science and the State in Modern China," *Isis*, 2007, *98*:558–570; and Suzanne Moon, "Justice, Geography, and Steel: Technology and National Identity in Indonesian Industrialization," *Osiris*, N.S., 2009, *24*:253–277.

[8] See also Kristie Macrakis, *Seduced by Secrets: Inside the Stasi's Spy-Tech World* (Cambridge: Cambridge Univ. Press, 2008).

[9] The term "technopolitics" comes from Gabrielle Hecht, *The Radiance of France: Nuclear Power and*

As Rebecca Lemov suggests in her essay, the new scale and scope of this instrumental, technopolitical science blurred the lines between natural and artificial, real and unreal. Which was the more significant tool, the now omnipresent focused interview or the never built "introspectometer"? To Lemov, both mattered, and to say that the introspectometer was a fantasy while the focused interview a reality misses both the tangibility of dreams and the plasticity of experiments and data. Lemov's work suggests that when the world becomes a laboratory, and the laboratory the world, then the lines between experiment and simulation, representation and reality, subject and object all grow fuzzy. The barriers between what is, what ought to be, and what might be, grow porous as well. The "hybrid" is a common trope in descriptions of postmodern life; studies like Lemov's suggest that one of the fundamental aspects of science during the Cold War was the collapse and reconstruction of traditional boundaries, from those that define the state to those that limn the body.[10]

CONCLUSION: SUMMARY AND DEPARTURE

One of the defining features of these new works is their emphasis upon the varieties of Cold War science. If one were to venture a summary, it might run something like this: the Cold War shaped science in profound ways, but there was no single, monolithic Cold War Science. (To adapt Stephen Shapin's phrase, there was no Cold War Science, and this is a Focus Section about it.) Rather, science during the Cold War took many forms in many places, with science–state relationships varying markedly from nation to nation, agency to agency, institute to institute, and individual to individual.

Amidst such variation, there were some common patterns: science during the Cold War became a much more international, even global, endeavor; it became a more formalized and a more instrumentally oriented enterprise even as it was less structured by traditional disciplinary boundaries; it involved the development of new techniques and technologies for gathering, storing, representing, and modeling new data; and it became part of projects for remaking not only war but also the world, state, society, and self. As the Cold War slips ever more squarely into the realm of history, these studies should help us reconsider that dramatic era of our recent past, and of the places of science and technology within it.

National Identity After World War II (Cambridge, Mass.: MIT Press 1998). The term "technoscience" was popularized by Bruno Latour and is now common in STS-style analyses of the postwar period.

[10] See also Rebecca M. Lemov, *World as Laboratory: Experiments with Mice, Mazes, and Men* (New York: Hill and Wang, 2005); and Emily Martin, *Flexible Bodies: Tracking Immunity in American Culture from the Days of Polio to the Age of AIDS* (Boston: Beacon Press, 1994).