Special Issue Introduction: Historical Peculiarity and the Order of the Phoenix

Joseph D. Martin, Gisela Mateos, David P. D. Munns, and Edna Suárez-Díaz*

ABSTRACT: This special issue, "Revealing the Michigan Memorial—Phoenix Project," highlights the Michigan Memorial–Phoenix Project at the University of Michigan, a program of civilian nuclear research established after World War II that also memorialized Michigan's victims of the two World Wars. It blossomed into a broad-based, multidisciplinary program supporting work into the peaceful uses of the atom, understood broadly. It became the basis for sustained interdisciplinary and international collaboration, a conduit for scientific diplomacy, and a pioneer in the education of nuclear engineers. The Phoenix Project was an unusual and highly local phenomenon, but we nevertheless each find ways in which it is revealing of larger trends in the

* Joseph D. Martin, Department of History, Durham University, 43 North Bailey, Durham, DH1 3EX, United Kingdom, joseph.d.martin@durham.ac.uk; Gisela Mateos and Edna Suárez-Díaz, Centro de Investigaciones Interdisciplinarias en Ciencias y Humanidades, y Facultad de Ciencias, Universidad Nacional Autónoma de México, Av. Universidad 3000, Coyoacán, 04510 Mexico City, Mexico, gisela.mateos@unam.mx, ednasuarez@ciencias.unam.mx; David P. D. Munns, John Jay College of Criminal Justice, 524 West 59th Street, New York, NY 10019, United States, dmunns@jjay.cuny.edu.

The following abbreviations are used: AEC, Atomic Energy Commission; MIT, Massachusetts Institute of Technology; PPR, University of Michigan, Phoenix Project Records, Bentley Historical Library, University of Michigan.

early Cold War. In this introduction, we highlight the revealing dimensions of the Phoenix Project and reflect on the challenges and opportunities posed by writing the history of peculiar entities.

KEY WORDS: Phoenix Project, University of Michigan, nuclear science, patronage, peaceful atom, scientific diplomacy, pedagogy.

ABBREVIATED TITLE: Special Issue Introduction

"*I began to feel after a while that something was chasing everybody here. A fantastic number of discoveries being made and a gnawing worry about What it is All For. I think the Phoenix Project is one answer, a statement of the University's conscience.*"[1]

—Arthur Miller, 1953

In 1965, Alvin Weinberg, Director of the Oak Ridge National Laboratory, bemoaned the technocratic resistance to any reformation of college science curricula that taught students principally or exclusively through pure mathematics and theoretical physics. He critiqued "a certain intellectual snobbishness grown up within the universities which creates a distaste in graduate students for practical work." To Weinberg, such snobbishness, "particularly the deification of research at the expense of engineering, colors much of the advice which the

[1] Arthur Miller, "University of Michigan," *Holiday* 14, no. 6 (1953): 68–71, 128–36, 140–43, on 134.

government gets for dealing with technological problems."[2] One unnamed commentator on Weinberg's talk remarked that "in the United States it is very easy to keep on getting a lot of prestige, and not a little money, for being 'concerned with nothing but ideas.'"[3] This episode captures something familiar to today's historians about Cold War science in the United States. But it would not have been familiar to the staff and students of the Michigan Memorial–Phoenix Project at the University of Michigan in 1965. Michigan was a public university, and its Phoenix Project was a publicly minded program for basic research with applied aims, funded by the private sector rather than government, which took its memorial duty as seriously as its scientific mission. It seems purpose-built to frustrate today's historiographical instincts. How, each of the papers in this special issue ask, can we fit such an undertaking into the established narratives of Cold War science and technology?

Both this special issue and the project it highlights are accidents of history. The research behind all three of these papers found its way onto the program of the 2016 History of Science Society meeting in Atlanta, Georgia. Only at the meeting itself did we realize that we had colleagues working on the same unusual but compelling nuclear research program at the University of Michigan. That chance intersection inspired us to organize a session for the 2017 Society for the History of Technology meeting in Philadelphia, Pennsylvania, in order to explore the topic in more depth and map out the intersections between our projects. This issue grew from that session.

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[2] Alvin M. Weinberg, "Government, Education, and Civilian Technology," in *The Impact of Science on Technology*, ed. Aaron W. Warner, Dean Morse, and Alfred S. Eichner (New York: Columbia University Press, 1965), 61–83, on 68.

[3] Weinberg, "Government, Education" (ref. 2), 75.

The Michigan Memorial–Phoenix Project, which sits at the center of each of our stories, arose from a similarly delicate set of contingencies. It was the project about which the famed playwright and Michigan alumnus Arthur Miller wrote the lines in the epigraph. Many universities erected memorials after World War II, but only one determined that such a memorial should take the form of a research program dedicated to peaceful uses of the atom. The Phoenix Project was rooted in the conviction that peace would flow from greater knowledge. It sponsored seven new laboratories and provided seed grants to hundreds of research projects. It supported twenty yearly positions for faculty research and sixty graduate students. But peace would also come from international cooperation. Foreign scientists and engineers brought back the expertise they gained from the project to their home countries and used it to found their own peaceful nuclear programs.

Phoenix became the cause around which the postwar administration, staff, and alumni of the University of Michigan rallied. They aimed to unite the new science of the atom with the audacious conception that "the war memorial should not merely *be* something, but should actually *do* something." The formal proposal to the Board of Regents called for "a functional memorial," which would "explore the beneficent aspects and implications of atomic energy with the same determination and enthusiasm as the Manhattan project explored the destructive aspects."[4] As each of these articles explores in its own way, a project thus conceived was an anomaly among the many and often colorful postwar reactions to the revelation of nuclear arms and the uncertainty that defined the atomic age.

[4] "The Phoenix Project," proposal for the consideration of the Board of Regents, 1 May 1948, PPR, Box 4, Folder Phoenix History Development of Phoenix Project, 1948–54 (1).

The atomic bomb burst into worldwide consciousness in August 1945.[5] But if the bomb represented a grim punctuation mark at the end of World War II, it was not a period or even an exclamation point; it was a colon. The subsequent postwar period and the Cold War saw the production of thousands of fission and fusion bombs, hundreds of missile silos, submarines, and military bases, and vehicles, and systems to ensure nuclear weapons were commanded and controlled.[6] All aspects of American life transformed to accommodate this new reality. In the cultural sphere, Jackson Pollock's splatter art signaled the sense of instability that accompanied the bomb and postwar American film noir cinema projected a new dark cynicism by portraying ordinary lives going astray. In public life, as civil defense programs and the notorious House Un-American Activities Committee hearings each epitomized in their own way, the atomic age was often driven by fear and anxiety.[7] But in stark contrast to these trends, Michigan's Phoenix Project positioned itself as a beacon of hope and optimism.

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[5] See Richard Rhodes, *The Making of the Atomic Bomb* (New York: Penguin Books, 1988).

[6] George T. Mazuzan and J. Samuel Walker, *Controlling the Atom: The Beginnings of Nuclear Regulation, 1946–1962* (Berkeley: University of California Press, 1984); Eric Schlosser, *Command and Control: Nuclear Weapons, the Damascus Incident, and the Illusion of Safety* (New York: Penguin Books, 2014).

[7] This theme has long been explored, beginning with Alice Kimball Smith, *A Peril and Hope: The Scientists' Movement in America, 1945–47*, rev. ed. (Cambridge, MA: MIT Press, 1971), through Spencer R. Weart, *The Rise of Nuclear Fear* (Cambridge, MA: Harvard University Press, 2012), and Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (University of North Carolina Press, 1999).

The question of how this apparent anomaly fits into the larger stories of the Cold War animates each of our projects. After World War II, American universities continued and expanded the arrangements that had occupied many scientists and engineers during the war years. Classified research became widespread, as did large government, military, and industrial contract research. Historians of science have therefore contextualized Cold War–era physical science within the military-industrial complex in the United States, and this has been fruitful ground.[8] But this period did not have the same implications for every region of the world, and not every event that unfolded during this period can be best understood in terms of bi-polar global conflict. Decolonization, state-led development, and competing ideological models of modernization defined the Cold War for most of the world.

The compulsion that the United States and the Soviet Union both felt to outdo each other in all things did in some significant sense order the geopolitics of the era, especially with respect to

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[8] Classic literature includes: Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993); Silvan S. Schweber, "The Mutual Embrace of Science and the Military ONR: The Growth of Physics in the United States after World War Two," in *Science, Technology, and the Military*, ed. Everett Mendelson, Merritt Roe Smith, and Peter Weingart (Dordrecht: Kluwer, 1988), 3–45; Paul Forman, "Behind Quantum Electronics: National Security as a Basis for Physical Research in the United States, 1940–1960," *Historical Studies in the Physical and Biological Sciences* 18 (1987): 149–229; David DeVorkin, *Science with a Vengeance: How the Military Created the US Space Sciences after World War II* (New York: Springer-Verlag, 1992); Daniel J. Kevles, *The Physicists: The History of a Scientific Community in Modern America*, rev. ed. (Cambridge, MA: Harvard University Press, 1995).

science and technology. But the historiography of the past ten years or so has pursued a less Manichean understanding. It seeks a Cold War that "is not just a military-technical-ideological struggle between two relatively unified blocs," but "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."[9] The essays herein proceed in that spirit. We each emphasize an *American* scientific initiative that supports the historiographical understanding of the Cold War as geographically complex and ideologically multifaceted. The Phoenix Project was a highly local entity that found its way into the global currents of the Cold War. We therefore ask what the distinctive features of its particular local context can tell us about our conception of the global atmosphere of the era.

If the Phoenix Project's recalcitrance with respect to the traditional Cold War dyad poses a historiographical challenge, then so does its breadth. Institutionally, intellectually, and internationally, the Phoenix Project supported a cross-section of the hottest topics in postwar science. It thus conveys that many of the issues historians have siloed—insofar as our training so

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[9] Hunter Heyck and David Kaiser, "Introduction: New Perspectives on Science and the Cold War," *Isis* 101, no. 2 (2010): 362–66, on 363. See also: John Krige, *Sharing Knowledge, Shaping Europe: US Technological Collaboration and Nonproliferation* (Cambridge, MA: MIT Press, 2016); Joseph M. Gilbert and Daniela Spenser, *In from the Cold: Latin America's New Encounter with the Cold War* (Durham, NC: Duke University Press, 2008); Hal Brands, *Latin America's Cold War* (Cambridge, MA: Harvard University Press, 2010); Kenneth Osgood, *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad* (Lawrence: University Press of Kansas, 2006); Renata Keller, *Mexico's Cold War: Cuba, the United States, and the Legacy of the Mexican Revolution* (Cambridge: Cambridge University Press, 2015).

often focuses our gaze through lenses calibrated for individual scientific and technical disciplines—can productively be considered as interconnected. Peter Galison's work on experiment in high energy physics noted that the Phoenix Project funded Donald Glaser's early development of the bubble chamber, for which Glaser received the 1960 Nobel Prize in Physics.[10] But bubble chambers co-existed alongside the Phoenix Project's Alice Lloyd Croker Radiation Center for the treatment of cancer and the training of radiation therapists, along with the Radioisotope Laboratory, which calibrated instruments to handle radioactive materials and deployed radioactive tracers in experiments as part of the Cold War biomedical infrastructure of the new atomic life.[11] The achievements of particle physics and atomic biology were joined by the efforts of the Phoenix's Plant Nutrition Laboratory to use radioisotopes to promote plant growth while simultaneously

[10] Peter Galison, "Bubble Chambers and the Experimental Workplace," in *Observation, Experiment, and Hypothesis in Modern Physical Science*, ed. Peter Achinstein and Owen Hannaway (Cambridge: Cambridge University Press, 1985), 309–73.

[11] Relevant examples of the extensive literature on radioisotope's uses and as diplomatic tools include: Angela N. H. Creager, *Life Atomic: A History of Radioisotopes in Science and Medicine* (Chicago: University of Chicago Press, 2013); John Krige, "The Politics of Phosphorus-32: A Cold War Fable Based on Fact," *Historical Studies in the Physical and Biological Sciences* 36, no. 1 (2005): 71–79; María Jesús Santesmases, "Peace Propaganda and Biomedical Experimentation: Influential Uses of Radioisotopes in Endocrinology and Molecular Genetics in Spain (1947–1971)," *Journal of the History of Biology* 39, no. 4 (2006): 765–94; Simone Turchetti, "A Contentious Business: Industrial Patents and the Production of Isotopes, 1930–1960," *Dynamis* 29 (2009): 191–217; Gisela Mateos and Edna Suárez-Díaz, "Clouds, Airplanes, Trucks and People Carrying Radioisotopes to and across Mexico," *Dynamis* 35, no. 2 (2015): 279–305.

exploring how doses of radiation could eliminate pests, prolong shelf-life, and pasteurize food.[12] The uses of the atom extended to the celebrated breakthroughs of Phoenix's Radiocarbon Dating Laboratory, where H. Richard Crane and James B. Griffin's carbon-14 dating studies proved of immeasurable service to archeological projects the world over.[13] Nuclear physics and engineering also appeared far more closely linked, to each other and to industry, in the Ford Nuclear Reactor that trained generations of nuclear engineers in Michigan for the world, as John DiMoia has shown for the case of Korea.[14]

The features that make the Phoenix Project a challenging object for Cold War historiography, that is, are the very features that made it such an effective Cold War enterprise. Its breath means that its most salient features cannot be fully captured from the perspective of history

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[12] On the uses of atomic energy for agriculture and food pasteurization see, Jacob Hamblin, "Let There Be Light… and Bread: The United Nations, The Developing World, and Atomic Energy's Green Revolution," *History and Technology* 25, no. 1 (2009): 25–48; Karin Zachmann, "Atoms for Peace and Radiation for Safety – How to Build Trust in Irradiated Foods in Cold War Europe and Beyond," *History and Technology* 27, no. 1 (2011): 65–90; "Risk Rays for an Improved Food Supply?: National and Transnational Food Irradiation Research as a Cold War Recipe," Deutches Museum, preprint 7 (2013); Helen Anne Curry, *Evolution Made to Order: Plant Breeding and Technological Innovation in Twentieth-Century America* (Chicago: University of Chicago Press, 2016).

[13] Jens Zorn, ed., *On the History of Physics at Michigan* (Ann Arbor: University of Michigan Department of Physics, 1988), 51.

[14] John DiMoia, "Atoms for Sale?: Cold War Institution-Building and the South Korean Atomic Energy Project, 1945–1965," *Technology and Culture* 51, no. 3 (2010): 589–618.

of physics, biology, technology, medicine, or the social sciences, but it also indicates a broad-mindedness about its areas of its applicability that allowed it to exert influence on spheres as disparate as physics, law, education, and international relations. Its irreducibly local nature indicates the difficulty of appreciating the importance of subtle geographical variation in a world shaped by a powerful global ideological axis, but its sensitivity to those same local variations created the opportunities that came to define it. A commitment to educate in multiple areas of nuclear knowledge and to mobilize nuclear technologies as tools for international development, and as commodities, indeed became the main feature of the Phoenix Project.

Beyond its intellectual and applied accomplishments, the Phoenix Project offers historians a perspective on an overlooked worldview. The project was, notably in the aftermath of World War II, an intensely optimistic and civic minded endeavor. It rejected secrecy, embraced internationalism, and held out a hopeful vision of the atom's power to transform society for the better and people's power to oversee those transformations wisely, while also embracing the opportunities opened up by the new nuclear market. It deserves more attention than it has yet received as a site for the intersection of multiple actors that made "Atoms for Peace" a viable intervention.[15]

The Phoenix Project, in summary, adds important new dimensions to many stories of the atomic age, including: the US university-military-industrial complex; the centrality of nuclear weapons the Cold War; the international flow of scientific and technical knowledge and knowhow; and the shaping of new cultural forms via new images of nuclear destruction but also

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[15] So far, the only published study on the impact of the Phoenix Project in Atoms for Peace is DiMoia, "Atoms for Sale?" (ref. 12).

visions of unlimited potential.[16] Moreover, the speed with which it began contributing to these processes is indicative of its importance. The Phoenix Project promised to "turn atomic energy into pathways of peace," and it launched in November 1948, a full five years before Dwight D. Eisenhower's famed "Atoms for Peace" speech.[17] The eponymous program that ensued led to the establishment of the International Atomic Energy Agency, drove investment in nuclear power development and other non-military applications of nuclear science, and distributed them internationally as an exercise of American soft power.[18] The Phoenix Project is notable both as an antecedent to Atoms for Peace and as an eventual party to it. As one of the first systematic peaceful atom initiatives, the Phoenix Project was in a strong position to shape the postwar domestic agenda for civilian nuclear research. And as it matured, it was well situated to collaborate with Atoms for Peace in its efforts to enact its global mission.

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[16] The best treatments of these themes include: Rhodes, *Making of the Atomic Bomb* (ref. 5); Schlosser, *Command and Control* (ref. 6); Elaine Tyler May, *Homeward Bound: American Families in the Cold War Era* (New York: Basic Books, 1988); Michael D. Gordin, *Five Days in August: How World War II Became a Nuclear War* (Princeton, NJ: Princeton University Press, 2015); Leslie, *Cold War* (ref. 8); Margot A. Henriksen, *Dr. Strangelove's America: Society and Culture in the Atomic Age* (Berkeley: University of California Press, 1997).

[17] Unsigned and undated speech, PPR, Box 4, Folder Phoenix History Development of Phoenix Project, 1948–54 (1).

[18] Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War, 1953–1961: Eisenhower and the Atomic Energy Commission* (Berkeley: University of California Press, 1989); John Krige, "Atoms for Peace: Scientific Internationalism, and Scientific Intelligence," *Osiris* 21 (2006): 161–81.

The peculiar local shape that the Phoenix Project took depended on the focused efforts of a few earnest students and the persistence of an alumnus with a vision. Its success was predicated upon unproven fundraising strategies in a context in which the status of non-governmental nuclear research was uncertain. It is in the midst of uncertainty where private corporations' interests align with the Phoenix Project, thus making it a peculiar case of the relation between universities and industry, without the participation of the military complex. For us, this correspondence raises questions about how we should interpret episodes that appear to our historiographical eyes to consist of delicate processes, which might easily have gone differently.[19] How should historians contextualize the atypical and the outré? What can we extrapolate from examples that appear to be extraordinary, rather than representative? Each of the papers here tackles these questions in a different way.

For Joseph D. Martin, the extraordinary aspects of the Phoenix Project open our eyes to what was possible, in institutional terms, in a Cold War era we usually associate with strong, top-down pressures that weighed on and shaped science. Martin recalls expressing to Charlotte Sleigh his frustration with trying to write about the eccentric physicist and outsider artist Bern Porter, one of the pioneers of the SciArt movement on which Sleigh has written, because he and his story were so unusual as to be indicative of almost nothing at all.[20] Sleigh's sage response was that such

[19] This framing implies that some counterfactual instincts bear on historical reasoning, a claim that is not uncontroversial. For a defense, see Gregory Radick, "Presidential Address: Experimenting with the Scientific Past," *British Journal for the History of Science* 49, no. 2 (2016): 153–79.

[20] Charlotte Sleigh and Sarah Craske, "Art and Science in the UK: A Brief History and Critical Reflection," *Interdisciplinary Science Reviews* 42, no. 4 (2017): 313–30.

stories are still worth telling because they broaden our notion of how it is possible to exist in the world. We can extend that example from individuals to institutions. Exceptional examples remind us of the agency it is possible for institutional actors to exercise, even in contexts marked by imposing structural constraints. And the way it was possible for an institution to press against these constraints, and exert influence nevertheless, can prompt us to reconsider the tightness of those constraints and to think carefully about the particular places where they exerted more or less force.

Gisela Mateos and Edna Suárez-Díaz remind us that what has been portrayed as extraordinary from one perspective is often representative from another. The commitment to educate in multiple areas of nuclear knowledge and to mobilize technologies as tools for development and as commodities, not as weapons, soon became one of the main features of the Phoenix Project. This was possible in large part due to the project's close relation with the Atomic Industrial Forum and later with the Fund for the Peaceful Atomic Development, Inc., both academic–industrial conglomerates that pushed for the implementation and legal changes required by the Atoms for Peace initiative. Synergies took place between the University of Michigan and the industries of the Forum and the Fund (many of them Detroit-based), and equally important were the connections between the Mexican academic elites and the Phoenix Project, always with the mediation of US government agencies such as FOA/ICA. In different ways, this article unravels the entanglement of diplomacy and training, so characteristic of the Cold War's developmentalist optimism; but this entanglement is a two-way experience. As the first nuclear engineers of the country were trained between 1955 and 1963 at Ann Arbor, the officials in charge of the Phoenix and the Fund learned how to navigate the official channels of the US Department of State and to couple their offer to align it to foreign needs. The Mexican Program thus became a template for future experiences with other countries.

David P. D. Munns shows us that exceptional cases are rarely exceptional all the way down. Yes, the Phoenix Project had an unusual origin story, but it later joined in trends that were representative of many state universities in the Midwest, West, and South. These are just the sort of institutions that standard accounts have tended to gloss over, or to miss entirely. But they were also the institutions that pioneered the programs that to train the nuclear engineers who staffed the technocratic infrastructure of the Cold War. The Phoenix Project, despite its extraordinary origins, became representative of the nuclear engineering programs that were, by design, *ordinary*, and moreover contrived to make nuclear engineering ordinary. As Munns argues, nuclear technology became public and visible in the 1950s, notably as part of education and industry. Students playing with nuclear reactors gained from their education and experience the knowledge and assurance that they could administer their modernist state. That engineering and social knowledge concerned running the technology of the atomic age via "containment, reactor instrumentation and control, and safety systems," knowledge that scientists, engineers, and technocrats also learned in order to run the complex economic, social, and often military infrastructure of the state that always threatened to run out of control.[21]

The cases that catch historians' eyes, and that we therefore use to form our judgments about historical eras, tend to be the most remarkable, and thus the most contingent. And we often seize on the most extraordinary aspects of these stories, leaving much work to be done to determine how they might be limited. Such is the situation we find ourselves with respect to the history of Cold War science, and particularly the American university's place in it. The received narrative, which emphasizes the military-industrial-academic complex that took hold at a few

[21] Helen J. Lum, "Twentieth Anniversary of the Ford Nuclear Reactor," Oct 1977, PPR, Box 5, Folder Phoenix. History, 20th anniversary.

coastal institutions, captures critically important aspects of the Cold War context, but it can also distort our understanding if we try to read other cases through it. The Phoenix Project is extraordinary with respect to this story but, as this issue aims to show, it is representative of many of the stories of Cold War science that have yet to be told.