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Science in the Age of Invincible Surmise: Nuclear Optimism and the Michigan Memorial–Phoenix Project

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Abstract: The Michigan Memorial–Phoenix Project at the University of Michigan's was an unusual specimen of the post–World War II nuclear research initiative. Its origins were modest; it sprang from a student-led effort to construct a living war memorial—a mission it maintained even as it grew into a peaceful-atom program. Rather than taking advantage of the copious government support for scientific research available after World War II, it drew funds from Michigan alumni and from industry, based on the conviction that these routes offered greater possibility of academic freedom. And its architects conceived of nuclear research unusually broadly, including not just the physical sciences and engineering, but also the biological, social, and human sciences, law, education, medicine, and other areas. These ways in which the Phoenix Project was exceptional nevertheless tell us much about how it was exemplary. The optimism that animated the project contrasts with widespread and well-documented currents of nuclear fear, but indicates a stable vein of nuclear optimism in the early post–World War II era. The suspicion of government secrecy regimes its founders harbored led them to pursue unorthodox patronage relationships for a nuclear research initiative, which nevertheless reveals the flexibility of the contemporary funding context. And the project's unusually broad notion of nuclear research indicates the local flexibility of nuclearity in the late 1940s and early 1950s. This paper is part of a special issue entitled "Revealing the Michigan Memorial—Phoenix Project."

Key words: Phoenix Project, University of Michigan, nuclear science, industry, patronage, Cold War science, peaceful atom.

Abbreviated title: Science in the Age of Invincible Surmise

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The following abbreviations are used: AEC, Atomic Energy Commission; GE, General Electric; GM, General Motors; NAM, National Association of Manufacturers; NAMR, National Association of Manufacturers Records, Hagley Library, Wilmington, DE; PPR, University of Michigan, Phoenix Project Records, Bentley Historical Library, University of Michigan; VPDR, University of Michigan, Vice-President for Development and University Communication Records, Bentley Historical Library, University of Michigan.

"Far from the conventional monument of cold metal or stone, the Phoenix Project will function as a dynamic, working, life-serving tribute to the hero dead. The very name Phoenix symbolizes life rising from the ashes of sacrifice. What more fitting way is there to answer the challenge of our gold star brothers and sisters: 'To you from failing hands, we throw the torch; be yours to hold it high.'"[1]

Imagine the mindset that would lead one to quote "In Flanders Fields" while courting the largess of one of the world's largest corporations.[2] The epigraph above comes from a proposal to the General Electric Company, which University of Michigan faculty and administrators presented in the hope that, by stirring the sentiments of GE executives, they could secure funds for their nuclear research program, the Michigan Memorial–Phoenix Project. Conceived in the wake of World War II, the Phoenix Project had a dual purpose. First, it provided seed grants to faculty across the university, supporting projects related to the peaceful study and applications of nuclear science. Second, it functioned as a living memorial to the members of the Michigan community who lost their lives in the two World Wars. In linking these functions, the Phoenix Project combined two otherwise uncorrelated motives. Michigan promoted nuclear science out of pointed institutional ambition and the project came to embody many of the contradictions that characterized other peaceful-atom projects during the Cold War.[3] At the same time, it began as a memorial before it evolved into a research initiative and it grew from the honest and focused efforts of a few idealistic students, whose convictions shaped its mission and scope.

Little vexes the historian of science more than noble sentiment, sincerely held. Our training teaches us to mistrust our actors, to look for ulterior motives, institutional incentives, ideological currents, and systematic constraints that belie individuals' claims to unfettered agency and their assertions that they employed it with unalloyed rectitude.[4] A common knee-jerk response

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[1] "A Proposal to the General Electric Company," 3 Jan 1950, PPR, Box 1, Folder 6.

[2] "In Flanders Fields," written by the Canadian medical officer John McCrae on the battlefields of Belgium during World War I, remains one of the best-known pieces of writing to emerge from that conflict. It first appeared in *Punch* on December 8, 1915, and has been widely republished, both in print and online.

[3] These are explored, for instance, in Angela N. H. Creager, *Life Atomic: A History of Radioisotopes in Science and Medicine* (Chicago: University of Chicago Press, 2013), esp. ch. 5, on nuclear medicine; John Krige, *Sharing Knowledge, Shaping Europe: US Technological Collaboration and Nonproliferation* (Cambridge, MA: MIT Press, 2016), and Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (Cambridge, MA: MIT Press, 2009), on civilian nuclear power programs; and 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, and Jacob Darwin 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, on irradiation for food decontamination and preservation. The other contributions to this issue explore the Phoenix Project's entanglement with both national and international trends of the later Cold War.

[4] The instinct is deeply rooted. It plausibly stems in part from Thomas Kuhn's admonition to question scientists' textbook narratives presenting a linear accumulation of scientific knowledge, but I. B. Cohen has traced the origins of humanistic mistrust of science and scientists as far back as the seventeenth century. Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 3rd ed. (1962; Chicago: University of Chicago Press,

to lofty sentiment couched in silver-tongued rhetoric is to look for the touch of grey. This is a prudent instinct. The drivers of historical change are often difficult for contemporaries to discern, or impolite for them to discuss, and so they can be systematically omitted from the documentary record. We should be wary, however, of permitting criticism to lapse into cynicism, and remain ready to countenance conviction where we find it.

Some historical animals we cannot fully appreciate without confronting the genuine, individual sentiments that gave them life. The Phoenix Project is one of them. It was by no means isolated from the top-down structural pressures and moral ambiguities of the Cold War, which have dominated historical discussions of nuclear research in that era.[5] But to tell its story only in those terms would be to omit crucial elements that framed its mission, defined its scope, and secured its success. The Phoenix Project arose not just in a particular moment in the history of science, but also in a particular moment in the history of the American consciousness. It was in that moment, in the late 1940s and early 1950s, that the faculty, students, and administrators of the University of Michigan were in the frame of mind to pitch GE using the lachrymose lines of John McCrae.

The literature that addresses the Phoenix Project focuses principally on how it became redolent of well-established national and international Cold War patterns. For Corey Dolgon, the Phoenix Project represents one of the first incursions of corporate interests into the American university campus, which had become the norm by the 1980s.[6] John DiMoia situates the project's international ambitions of the late 1950s in the context of the Atoms for Peace initiative.[7] Focusing on the establishment and early development of the project, however, reveals a project at odds with the rapid alignment of academic and military interests that came to shape the institutions of Cold War science, and more consistent with the attitudes of the interwar period. It therefore offers a wealth of insight into the early post–World War II moment and the place nuclear science—especially nuclear science *not* directed by security concerns—assumed within it. The following proceeds in three parts. First, I examine the process by which the project originated, probing the convictions, sentiments, and ambitions that shaped its goals and organization. My intent is not to deny the importance of the structural pressures imposed by the early Cold War, but rather to show that their mere existence does not justify dismissing the emotional impetus for the project and the wide-ranging effects it had.

1996); I. Bernard Cohen, "The Fear and Distrust of Science in Historical Perspective," *Science, Technology, and Human Values* 6, no. 36 (1981): 20–24. Further commentary on the methodological consequences of this mistrust can be found in Paul Forman, "Independence, Not Transcendence, for the Historian of Science," *Isis* 82, no. 1 (1991): 71–86.

[5] For an excellent synthetic discussion, see Audra J. Wolfe, *Competing with the Soviets: Science, Technology, and the State in Cold War America* (Baltimore: Johns Hopkins University Press, 2013).

[6] Corey Dolgon, "Rising from the Ashes: the Michigan Memorial Phoenix Project and the Corporatization of University-Based Scientific Research," *Education Studies* 24, no. 1 (1998): 5–31.

[7] 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.

A particularly notable feature of the Phoenix Project is that, for fear of government secrecy regimes and from a conviction that private funding presented a clearer path to academic freedom, it eschewed federal funding in favor of industrial patronage. That such an attitude runs so counter to twenty-first century intuitions makes it valuable for deciphering the intuitions that did prevail on the Michigan campus shortly after the war.[8] This paper's second task is therefore to explore the ways in which the Phoenix Project contrasts the well-known stories of the military-industrial-academic complex, which emphasize contexts in which government, corporate, and university interests aligned more tightly.[9]

Finally, the Phoenix Project reveals the malleability of the concept of nuclear science. Gabrielle Hecht has introduced the notion of *nuclearity* to describe the ways in which the designation "nuclear" gets attached to, or decoupled from, various objects, people, and practices.[10] By examining the Phoenix Project, we can see the boundaries of nuclearity being actively constructed, with particular goals in mind. Phoenix administrators took a self-consciously catholic approach to the nuclear, conceiving as "nuclear" any research from any disciplinary perspective motivated by atomic-age challenges and opportunities. Their motivation stemmed in part from their desire to frame a broad-based project that would serve as much of the campus as possible. Their disposition and the actions it guided, taken together, reveal the flexibility of nuclearity in the early postwar era, emphasize that its scope varied locally, and expose the agency that went into exploring that scope.

The Origins of the Phoenix Project

It began with a dance. Early in 1946, the University of Michigan student legislature set into motion its plans for the first postwar J-Hop, the annual January student formal that had been the signature event of the undergraduate social calendar before the war. But the proposal that emerged for an extravagant, multi-day celebration that would incur expenses of $10,000 (about $130,000 in

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[8] The questionable influence of corporate interests on scientific research, especially after the rise of market fundamentalism, has been explored extensively in recent work. See: Philip Mirowski, *Science-Mart: Privatizing American Science* (Cambridge, MA: Harvard University Press, 2011); Naomi Oreskes and Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury Press, 2010); Hans Radder, ed., *The Commodification of Academic Research: Science and the Modern University* (Pittsburgh: University of Pittsburgh Press, 2010).

[9] The stories of the Massachusetts Institute of Technology, Stanford University, and the California Institute of Technology, for instance, are well documented and record the gilded triangulation of academic, governmental, and industrial interest at these institutions. Stuart W. Leslie, *The Cold War and American Science: The Military-Industrial-Academic Complex at MIT and Stanford* (New York: Columbia University Press, 1993); Rebecca S. Lowen, *Creating the Cold War University: The Transformation of Stanford* (Berkeley: University of California Press, 1997); W. Patrick McCray, "Project Vista, Caltech, and the Dilemmas of Lee DuBridge," *Historical Studies in the Physical and Biological Sciences* 34, no. 2 (2004): 339–70; Christophe Lecuyer, "The Making of a Science Based Technological University: Karl Compton, James Killian, and the Reform of MIT, 1930–1957," *Historical Studies in the Physical and Biological Sciences* 23, no. 1 (1992): 153–80.

[10] Gabrielle Hecht, "Nuclear Ontologies," *Constellations* 13, no. 3 (2006): 320–31.

2021 dollars) generated fierce controversy. Letters to the *Michigan Daily*, the student newspaper, charged the J-Hop organizers the sin of profligacy, all the more despicable for its commission in a somber moment.[11] In the wake of this controversy, planning for the 1947 J-Hop included a raffle that would raise funds for a World War II memorial.

Unlike the previous year's proposal for an indulgent party to mark the arrival of peacetime, the suggestion of a memorial fundraiser proved popular. Of the 18,000 students enrolled for the 1946–47 academic year, 12,000 were veterans.[12] Almost all who were not would have had friends and family who had returned from European or Pacific theaters, or who had died there. In this respect, Michigan resembled universities across the United States, the bulk of which erected some type of monument to commemorate the end of the war and recognize its consequence to campus communities. The Michigan student legislature, however, was unusual in its reluctance to follow in the footsteps of other institutions by rededicating a library, planting a tree, or erecting a clocktower. They approved the proposal for the raffle with "the stipulation that the memorial be made a 'functional memorial.'"[13]

Arthur Rebel Derderian, an Armenian-American Navy veteran, business major, and member of the student legislature, took the lead in articulating the proposal "to construct a functional memorial in honor of the University of Michigan students who died in World War II." In a January 1947 memo to the administration setting out the legislature's plans, Derderian wrote, "it must be realized that this Memorial is in honor of Michigan Students who died on the field of battle and as such will be erected by the sincere and whole-hearted efforts of the Michigan Students themselves."[14]

The administration acted quickly on this proposal. Recognizing that a raffle would be insufficient to fund a project of the scale and ambition the student legislature proposed, they assembled a War Memorial Committee charged with deciding on the form of a suitable memorial and raising the funds to support it. Two other students joined Derderian on the committee: Arthur Rude, a law student, Army lieutenant, and 1942 Michigan graduate; and E. Virginia Smith, a sociology undergraduate who had served as a nurse in the Pacific theater (figure 1).[15] The committee, which also included representatives from the faculty, administration, and local alumni community, appointed Erich A. Walter, the dean of students, as chair. The student members, however, "were in no way figureheads" and "were given a very active say in all the decisions," according to Smith.[16]

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[11] For example, Edward C. Moore, "$10,000 J-Hop," letter to the editor, *Michigan Daily*, 23 Jan 1946, 1.
[12] Leonard A. Greenbaum, "Michigan's Phoenix Project—Revisited," *The Michigan Alumnus* 75, no. 7 (1969): 4–9, on 4.
[13] "Legislature Approves IFC Plans for J-Hop: Group Accepts Proposal to Set Up Fund Commemorating Both World War's Dead," *Michigan Daily*, 19 Dec 1946, 1.
[14] Arthur Rebel Derderian, "University of Michigan Memorial Fund," 7 Jan 1947, PPR, Box 1, Folder 1.
[15] Erich A. Walter, "A History of the Phoenix Project," *The Michigan Technic* 69, no. 3 (Dec 1950): 16, 40, 42, 46.
[16] "Role of Three 'U' Vets in Project Emphasized," *Michigan Daily*, 17 May 1948, 3.

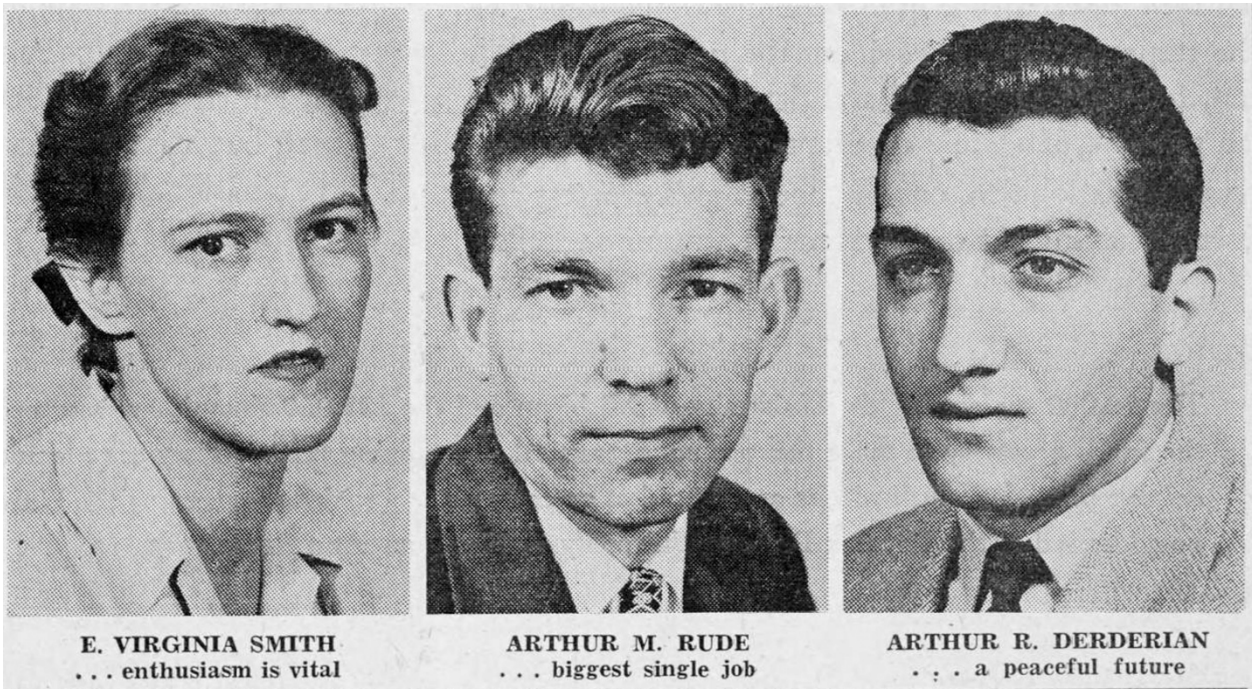

Figure 1. The three student members of Michigan's memorial committee. *Source*: "Role of Three 'U' Vets in Project Emphasized," *Michigan Daily*, 17 May 1948, 3.

In keeping with the students' ambitions, Walter set his sights high in soliciting suggestions for an appropriate, functional memorial. Looking beyond the campus community, he wrote to a long list of national and international luminaries asking how they thought Michigan could best discharge its obligation to honor its fallen. Walter's letter emphasized that "the Memorial is to be a functional thing which will keep alive the ideals which our men and women were fighting for," and continued: "I should like to share with you one notion which has been mentioned to our Committee by one of our returned veterans [Derderian]. He said, 'I don't know what form our War Memorial should take. I do feel, however, that it ought to be a light, high in the sky and visible not only to our veterans who are back at the University but to their sons and all future generations of students. They should always see it. It should always remind them of the ideals for which our students gave their lives.'"[17]

Walter received responses from, among others, George Marshall, the US Secretary of State and the architect of the Marshall Plan for postwar aid to Europe, who suggested a scholarship program. The writers C. S. Lewis and Lewis Mumford advocated along similar lines. John Hersey, the author and journalist who rocketed to fame following the publication of his 1946 book *Hiroshima*, recommended an ever-renewing book on world affairs, suggesting, "surely the light to be kept constantly alive is in the mind." Orson Welles floated the idea of a dormitory for returning veterans. E. B. White insisted that a war memorial should uphold the institutions of peace,

[17] Erich A. Walter, letter to luminaries and alumni, 10 Jul 1947, PPR, Box 5, Folder Phoenix History Scrapbook, Early.

recommending a fund to send students to observe the proceedings of the newly formed United Nations. "It occurs to me," wrote Admiral Chester Nimitz, superfluously, "that a profitable approach to the problem might be to form an advisory committee.... Such a group should be able to reach a decision that would give satisfaction to all concerned."[18]

These responses are less noteworthy for their content than for the very fact of their existence. It is telling of his ambitions, first of all, that Walter would seek the council of individuals of such prominence in contemporary American culture, alongside international personages such as Madame Chiang-kai Shek and Winston Churchill (whose secretaries sent apologies for their inability to reply). It is further remarkable that so many would respond to a cold request for input on a quite general question from a relatively unknown dean at a Midwestern state university. The memorial mission, that is, provided a commonness of purpose, both within the Michigan community and beyond; it would prove critical once the committee settled on a form for their memorial.

The recommendation that determined that form did not come from a household name. Walter had also made use of his alumni contacts; Fred Smith, an executive with the Book-of-the-Month Club in New York City, responded to the call, writing to Walter:

> I had occasion, some months ago, to investigate the peacetime research in connection with atomic energy. I undertook this investigation because the atomic commissioner of France, Monsieur Joliot-Currie [*sic*], had stated that the United States with all its wealth and genius, having developed the most destructive weapon in the history of mankind, was now laying down on the job of harnessing their knowledge to civilized pursuits. Bristling at this left-handed compliment, I undertook to prove that Monsieur Joliot-Currie didn't know what he was talking about. I talked to members of the Atomic Commission, I gathered all the information in the possession of the Commission, I talked to three doctors who were described by the Atomic Commission to be foremost in their field of medical research in so far as it pertains to the use of atomic energy. I found out a lot of things, but unfortunately, I found out mostly that Monsieur Joliot-Currie was right.

On the basis of this assessment, he proposed that "the University might take unto itself the administration and coordination of research in some specific phase of peacetime atomic research."[19]

Smith's letter is a remarkable artifact. Joliot-Curie was an avowed communist, adding to the curiosity of an American corporate executive siding with a Frenchman over his own government, however grudgingly. Smith's critique of federal nuclear initiatives speaks to the

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[18] George Marshall, letter to Erich A. Walter, 28 Jul 1947; C. S. Lewis, letter to Walter, 25 Jul 1947; Lewis Mumford, letter to Walter, 27 Jul 1947; John Hersey, letter to Walter, 18 Jul 1947; Orson Welles, letter to Walter, 8 Sep1947; E. B. White, letter to Walter, 31 Jul 1947; Chester W. Nimitz, letter to Walter, 1 Aug 1947, PPR, Box 5, Folder Phoenix History Scrapbook, Early.

[19] Fred Smith, letter to Erich A. Walter, 21 Oct 1947, PPR, Box 5, Folder Phoenix History Scrapbook, Early.

widespread suspicion in the American business community of the US government's ability to effectively oversee the development of a promising new area of science and technology. The letter also reveals something of the social world into which the Phoenix Project was born, and by which it was guided through its early years. Smith had originally discussed the war memorial proposal over lunch with Walter, whom he knew from his student days, in New York. He was later invited to a meeting with Atomic Energy Commission (AEC) scientists called to determine how to establish the project and delimit the range of its research in a way that would ensure the AEC's go-ahead.[20] Subsequent fundraising events and informal planning sessions took place at Michigan football games. It was, by the standards of large, bureaucratic research programs that emerged later in the Cold War, an informal affair. Smith's proposal reflected the ubiquitous belief that the appropriate response to serious national and global challenges was for right-thinking white men to act on their convictions. This racial and gender makeup of the Phoenix administrators and patrons are never discussed overtly in the documentary record, but its homogeneity—E. Virginia Smith was the only woman significantly involved—certainly shaped the informal character that marked early planning for Phoenix.

Fred Smith, as a successful alumnus, had a strong voice in the Michigan community and his proposal struck a chord with the memorial committee, again impelled by the students' enthusiasm. Walter would report that "the student members … kept constantly insisting and reiterating the notion that Mr. Smith's idea was the one we ought to explore and develop if possible."[21] On April 22, 1948, they got their way; the committee recommended to the Michigan Board of Regents that the university establish "a Center to explore the ways and means by which the potentialities of atomic energy may become beneficent influences in the life of man."[22] Just over a week later, on May 1, the Board of Regents approved the proposal and officially launched the Phoenix Project, charging it with pursuing peaceful nuclear research and memorializing those the Michigan community had lost in the two World Wars.[23] The name, and the expansion of the memorial mission to include World War I, were both Smith's suggestions.[24] Ralph A. Sawyer, the dean of the graduate school and a spectroscopist who had studied under R. A. Millikan at the University of Chicago, was named the project's first director.

The Phoenix Project mirrors a number of roughly contemporary undertakings whose identities derived from the problems they were established to solve. The Manhattan Project began with a singleness of purpose born from fear that Nazi Germany would develop and deploy nuclear

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[20] Minutes of a Special Meeting with Dr. Bacher and Dr. Warren, 11 Jun 1948, PPR, Box 5, Folder Phoenix History Scrapbook, Early.
[21] Quoted in "Role of Three" (ref. 16).
[22] War Memorial Committee, letter to the Board of Regents, 22 Apr 1948, PPR, Box 1, Folder 1.
[23] University of Michigan, Board of Regents, *Proceedings of the Board of Regents (1945–1948)* (Ann Arbor: University of Michigan 1948), 1261–62.
[24] Fred Smith, letters to Erich A. Walter, 1 Apr 1948 and 6 Apr 1948, PPR, Box 5, Folder Phoenix History Scrapbook, Early.

weapons before the Allies. The urgency with which it was begun helps explain the momentum that kept it going even after the war in Europe had ended.[25] The Apollo Program set itself the task of getting a human being safely to the moon and back, but the problem it was designed to solve was one of terrestrial politics; we only appreciate its motives against the background of Cold War competition and the space race.[26] Similarly, we must understand the Phoenix Project in terms of its memorial mission. It was not established with a particular technical goal in mind; rather, its architects were overwhelmingly concerned with the *appropriateness* of the project for commemorating the members of the Michigan community who had died during the two World Wars. As the next sections show, this mission, and the notion of propriety that accompanied it, motivated the peculiar manner in which the Phoenix Project was funded and guided how established its scope.

Funding Phoenix, Courting Industry

In January of 1951, a brief note appeared in *Physics Today* describing "the University of Michigan's privately financed atomic energy research project," named after the phoenix bird, which, the announcement noted, befitted a project that "provides a note of quiet optimism unsullied by any inclusion of contracts for classified federal research at Michigan."[27] Phoenix Project administrators, that is, elected to cut themselves off from the tremendous financial investment the US government was primed to make in science, particularly nuclear science, in the early postwar years. They would have to reach their $6.5 million fundraising goal in other ways.

Skepticism of government largess is understandable given the uncertainty that surrounded nuclear science following World War II. Especially in the late 1940s, government-funded nuclear research came with expectations of secrecy. As Mario Daniels and John Krige have documented, the distinction between basic and applied research, which became a prominent feature of early Cold War scientific rhetoric, was in large part a political tool to cleave apart "open" research, which could develop and travel in line with the widely held scientific ideal of free exchange of information, and "secret" research, which would be subject to more stringent regimes of government control.[28] The Phoenix Project was conceived squarely on the open/basic side of this divide; for a living memorial to carry out classified government research that might plausibly be connected to nuclear weapons would have appeared unseemly.

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[25] For the standard account, see Jeff Hughes, *The Manhattan Project: Big Science and the Atom Bomb* (New York: Columbia University Press, 2003).
[26] John M. Logsdon, *John F. Kennedy and the Race to the Moon* (New York: Palgrave Macmillan, 2010).
[27] "The Phoenix Project: Ann Arbor's Research Center," *Physics Today* 4, no. 1 (1951): 29.
[28] Mario Daniels and John Krige, "Beyond the Reach of Regulation?: 'Basic' and 'Applied' Research in the Early Cold War United States," *Technology and Culture* 59, no. 2 (2018): 226–50.

Phoenix therefore "rejected all classified research on the basis that such secrecy would bar students from those areas."[29] It did not shy away from applied research, and in fact many of its early initiatives were directed toward areas of general interest to the automotive and metallurgical industries, but its architects did endeavor to ensure that external support came with as few strings attached as possible. Concern about classification regimes therefore ensured they remained suspicious of government funding, even when it became clear that their worst fears about it were unfounded.

Michigan administrators harbored specific concerns early in their planning that the US government, and the Atomic Energy Commission in particular, might oppose the Phoenix Project outright. H. Richard Crane, a Michigan physicist who had been involved in wartime radar research at the Massachusetts Institute of Technology's Radiation Laboratory, communicated the view that "the Atomic Energy Commission will want to control any work done here and that the University could not hope to dominate peace-[time] uses of atomic energy or any part thereof." The memorial planning committee further worried about the fickle commitment of a government agency whose priorities might change with the political winds.[30] These concerns were reinforced by Michigan Senator Homer Ferguson, who suggested to the committee that "the University may anticipate jealousy on the part of the AEC as knowledge of the plans to establish an atomic research center becomes widespread," and cautioned that "it is well known in Washington that the government is anxious to keep all atomic affairs under government jurisdiction."[31]

AEC officials managed to allay some of these concerns. In February 1948, Erich Walter, along with Ralph Sawyer and the radiologist and medical school professor Fred Hodges, travelled to Washington to discuss the plans for the Phoenix Project with AEC personnel.[32] Following this meeting, Carroll L. Wilson, the AEC General Manager, wrote to the memorial committee calling the Phoenix Project a "welcome addition to the research facilities of the nation" and noting that "funds of the Atomic Energy Commission for basic research, its fellowship program and its training facilities are planned to assist in development of programs of this broad type."[33] This goal of this meeting appears, however, to have been to ensure that the AEC would not stand in the Phoenix Project's way, rather than to win its investment. Skepticism continued to run deep about the compatibility between federal funding and the project's ethos, and on that basis the memorial committee elected not to pursue AEC support.

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[29] "Assets of the Phoenix Atomic Research Program," n.d., VPDR, Box 2, Folder Phoenix Project Correspondence.
[30] Minutes of a meeting held 21 Nov 1947, PRR, Box 1, Folder 1.
[31] Minutes of the meeting of the Special Gift Committee, 27 Dec 1949, PPR, Box 2, Folder 7.
[32] "Suggested Remarks for Mr. Marvin L. Niehuss," Board of Directors of the Michigan Alumni Association Luncheon Meeting, 15 Oct 1948, PPR, Box 2, Folder 17.
[33] Carroll L. Wilson, letter to the University of Michigan War Memorial Committee, 24 Mar 1948, PPR, Box 1, Folder 1.

Having spurned the most obvious patron, Phoenix's administrators looked to Michigan alumni and to industry. A fundraising drive targeting alumni seems like an obvious strategy for a university memorial, but it was also a new undertaking for Michigan. No comprehensive database of alumni existed in 1948 and the only previous appeal for alumni giving had been a selective one to help build the Michigan Union in the mid-1910s.[34] The Phoenix Project motivated a somewhat more audacious objective: "Every former student of the University of Michigan is *expected to give something*."[35] Many did. Although fundraising efforts fell well short of this quixotic goal, they generated high giving rates—in excess of 25% in some regions.[36]

Table 1. Phoenix Project Fundraising sources through June 1952

	Received July 1, 1951–June 30, 1952		Campaign Totals	
	No.	Amt.	No.	Amt.
Individuals	1,266	$125,732	29,568	$2,510,930
Corporations	57	603,360	250	3,061,869
Foundations	3	13,200	19	114,200
Total	1,326	$742,292	29,837	$5,688,072

Source: Progress Report of the University of Michigan Development Program for 1951–52, July 31, 1952, VPDR, Box 16, Folder Historical; Histories—Development Program and Specific Appeals, 1952–1977. The amounts column for the campaign totals does not add, which likely reflects minor sources of income not included in the table.

The fundraising team, led by the energetic alumnus and General Electric executive Chester H. Lang, made extensive use of its personal contacts and employed social occasions such as football games to enlist alumni support. The Phoenix fundraising committee even accepted a helping hand from the Michigan marching band, which devoted the halftime show of the 1951 Rose Bowl to the Phoenix Project.[37] A similar halftime routine, performed to mark the project's tenth year during a 1958 game against the University of Illinois, was committed to video. It had the band transmute successively into an atom, a mushroom cloud (while a bugler played "Taps"), a piston—representing the use of radioactive tracers in the sort metallurgical research relevant to the automobile industry—and a human figure being probed by a Geiger counter, before finishing in

[34] "Handbook for Special Gift Workers," ca. 1949, PPR, Box 2, Folder 17.
[35] Memo to fundraising staff, ca. 1949, PPR, Box 2, Folder 17.
[36] "University of Michigan Memorial Phoenix Project, Final Report by Kersting, Brown & Co., Inc.," 30 Jun 1951, VPDR, Box 16, Folder Michigan Memorial–Phoenix Project, Final Report. The city of Spokane, Washington, alone achieved a 100% giving rate among its resident alumni.
[37] E. J. Blackert, Alumni Chairman, State of Texas, letter to alumni, 7 Feb 1951, PPR, Box 2, Folder 15.

the shape of a phoenix bird.[38] Firm fundraising success followed on the heels of these efforts. By the summer of 1955, Phoenix had exceeded its initial goal and raised $7.4 million, of which approximately $2.7 million had come from alumni bequests.[39]

Alumni enthusiasm was particularly effective at generating one-time gifts that could help launch the project without an infusion of government funds. The Phoenix campaign further motivated the establishment of the university's permanent development apparatus in 1953. But the project could not sustain itself on individual bequests alone. To make up the shortfall, and to secure a more stable source of continuing funding, Phoenix fundraisers turned to industry. Whereas alumni sentiment offers a clear response to the perceived threat of government secrecy regimes, the appeal to industry is less intuitive. The project's fundraising success and contemporary statements from industrial actors, however, both indicate the in-principle viability of a university-based, industry-funded nuclear research program in the late 1940s.

Signals from some of the most prominent mid-century industrialists underwrote the instinct that industrial concerns would be receptive to the Phoenix Project's overtures and could be convinced to support the project even absent the promise of specific payoffs. Alfred P. Sloan Jr., the Chairman of the Board of General Motors, published an article in *Collier's* magazine in 1951 entitled "Big Business Must Help Our Colleges." Sloan set out a vision that cast America's universities and its corporations in a collaborative role. He leaned heavily on the rhetoric of free enterprise: "It is vital—if we are to perpetuate our free society—that we find a way to keep our colleges, universities and technological institutions virile, progressive and—above all else—free." The way they would remain so, he suggested, was through adequate, non-governmental financial support. Universities that accept federal funding, on Sloan's view, "must accept political control, whether they like it or not."[40]

Sloan saw an opportunity for corporations to reduce the reliance of educational institutions on federal support. In particular, he understood universities as the natural places to carry out fundamental research that industry might be less willing to conduct in-house and considered corporate support for such research a natural way to ensure that it remained open to commercial exploitation. Drawing an analogy to mining, he wrote: "To accomplish any constructive purpose, ore must be extracted and refined. But first it must be discovered. Just so with fundamental knowledge. Its discovery starts in the academic area as pure research."[41] Sloan's vision reveals a point of ideological alignment: Michigan's administrators and researchers, with the ideal of an appropriate memorial in mind, sought funds that would be free of both classification

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[38] A video of the entire twenty-one-minute performance is available online: "Michigan Marching Band - Phoenix Show," Bentley Historical Library, University of Michigan, accessed 4 Jul 2019, https://bentley.mivideo.it.umich.edu/media/1_rsxz74f4. The portion recognizing the Phoenix Project begins around 12:50.

[39] Alan W. McCarthy, letter to Chester H. Lang, 2 Jun 1955, PPR, Box 1, Folder 11.

[40] Alfred P. Sloan Jr., "Big Business Must Help Our Colleges," *Collier's*, 2 Jun 1951, 13–15, 67, on 13.

[41] Sloan Jr., "Big Business" (ref. 40), 15.

regimes and explicit development targets; Sloan argued that by supporting fundamental research at universities, corporations could insulate promising new areas of scientific research from government control. The *Collier's* article was distributed to Phoenix fundraising staff as a model for how to engage corporations—especially those in the Detroit/Ann Arbor area, a mid-century hub of automobile manufacturing and other heavy industry. Those fundraisers went into the field primed to sell their industrial contacts on the necessity "to keep the non-military development of the atomic project out of the control of the central government,"[42] an emphasis that is consistent in correspondence between Phoenix representatives and prospective industrial patrons.

Sloan's argument was representative of attitudes percolating in the business community in the early postwar era, which helps explain the strategy's success. The National Association of Manufacturers (NAM), one of the most powerful industrial organizations in the country, commanding considerable lobbying power in Washington, DC, came out strongly in favor of corporate support for education. From 1944 to 1951, NAM published a monthly newsletter entitled *Trends in Education–Industry Cooperation*, which included opinion pieces, announcements of industry-sponsored fellowships, and news reports on matters such as evolving legal frameworks and industry's access to nuclear materials. The cartoon shown in figure 2, from the June 1946 issue, illustrates the publication's ethos.

Members of the American business community also received repeated messages from NAM leadership suggesting that industry could benefit by supporting education. Earl Bunting, the NAM president, wrote to its membership to report on a resolution unanimously passed by the NAM's 160-member board of directors in 1951, shortly after Sloan's editorial appeared: "Business enterprises must find a way to support the whole educational program, effectively, regularly and now."[43] The argument for this position, in this communication and others, was couched in the language of responsibility. A 1948 resolution codifying the NAM's basic views on education asserted: "All phases of American society are beneficiaries of the educational system, but no single group, class or partisan interest has a preferred claim. The contribution of education to the whole American culture creates in each segment of society a responsibility for its support and development."[44]

Underlying the high-minded and abstract rhetoric about shared responsibility was NAM's more specific interest in limiting the federal government's involvement in education, a cause for which it lobbied fiercely in the early post–World War II era. The NAM, as encoded in its policy on federal aid to education that the board of directors adopted in 1956, opposed the practice as a matter of principle.[45] And although NAM acknowledged that the federal government had a useful

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[42] Werner Schroeder, letter to Dewey Fagerburg, 15 Jul 1950, PPR, Box 1, Folder 7.
[43] Earl Bunting, letter to NAM membership, 27 Dec 1951, NAMR, Series I, Box 103, Folder Positions Education.
[44] "Industry's View on Financial Support for Education," Dec 1951, PPR, Box 1, Folder 21.
[45] "Recommendation of the Government Policy Committee on Federal Aid to Education," 10 Feb 1956, NAMR, Series I, Box 103, Folder Positions Federal Aid to Education.

role to play in supporting scientific research, it advocated for this role to be circumscribed to areas that lacked foreseeable profitable uses.[46]

Figure 2. Industry and Academia collaborate on a blueprint for a more prosperous America. *Source*: *Trends in Industry–Academia Cooperation* 2, no. 6 (1946): 8, in NAMR, Series I, Box 270, Folder Committee – Cooperation with Education, April–June, 1946. Reprinted by permission of the National Association of Manufacturers, courtesy of the Hagley Museum and Library.

[46] "Recommendation of the October 14, 1948 Meeting of the Patents and Research Committee to the Board of Directors," NAMR, Series I, Box 165, Folder Research General, 1946–1938.

NAM's fierce opposition to federal involvement in education would be easy to interpret within the widespread anti-communism of the early Cold War. Indeed, NAM, a staunchly conservative organization, was predisposed to see federal interest in supporting education as redolent of the Soviet system of state-controlled schooling. But whereas anti-communist rhetoric was common in NAM's expressions of opposition to federal involvement in supporting education, it was less common in its justifications for industry support of education. In that context, industry's bête noir was not global communism, but Franklin Roosevelt's New Deal. The business community was still smarting from the blame slapped on it for precipitating the Great Depression through its carelessness. Industry emerged from World War II eager to use its contributions to wartime work as a platform for burnishing its image in American society. As Wallace F. Bennett, then NAM president, explained in 1949: "*We must regain the faith of the people who work for us.*"[47]

These motives cannot be fully disentangled. The New Deal's conservative critics often regarded it as creeping socialism. But in industrial circles, anticommunism could be assumed as a shared and somewhat abstract ideological tenet. The more pressing worry in the late 1940s, as the Phoenix Project was taking shape, was the role industry would play in postwar American society, concerns that were amplified in the business community when it became clear that the Republican administration of Dwight Eisenhower would not seek to roll back Roosevelt's New Deal initiatives.[48] Would its influence wane in the face of expanded federal power? Would it be able to overcome the unsavory image it had acquired during the Depression? These questions, which stemmed from concerns rooted in the interwar period, were the ones that motivated corporate actors to go beyond mere opposition to federal involvement in education and to understand industry as having an *obligation* to support educational programs and university research. Support for education was part and parcel of the strategy of capitalizing on the successful wartime mobilization of industry to solidify the place of industrial interests in the postwar world.[49]

The prevalence of this attitude ensured that, despite its reliance on industrial funding, Phoenix could be sold as something other than an industrial research program. A 1948 publicity pamphlet describing its aims boasted: "Phoenix brings a new, fresh approach to atomic energy problems. As a non-governmental, non-industrial program, it does not insist on immediate or practical research results. It sponsors the most fundamental projects as well as efforts to apply science to specific problems.... Because Phoenix can go whichever way it chooses and is responsible only to itself, it has rejected all classified research on the basis that such secrecy would bar students

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[47] Wallace F. Bennett, "Which Door to the Future?," 1949, NAMR, Series I, Box 2, Folder Freedom General. Bennett, a Republican, would be elected to the US Senate, representing Utah, in 1951 and would serve four terms. Original emphasis.

[48] Kim Phillips-Fein, *Invisible Hands: The Businessmen's Crusade Against the New Deal* (New York: W. W. Norton & Co., 2009), 56–58.

[49] See Mark Wilson, *Destructive Creation: American Business and the Winning of World War II* (University of Pennsylvania Press, 2016), esp. 129–30.

from those areas."[50] But despite the distance from practical, industrial ends that appeared in such contexts, the larger focus on freedom and independence resonated with contemporary industry's ideological aims.

At the close of the initial Phoenix fundraising drive, the majority of funds had come from industry, and most corporate gifts were unrestricted. The university was cautious about the terms under which it accepted restricted gifts. A meeting of the fundraising committee convened in February of 1950 to address just that question, reaching the conclusion that appeals could be made to support general areas of interest, but *not* to fund particular projects with pre-articulated goals, which the committee felt would work at cross-purposes to the project's commemorative mission: "broad enough to satisfy the moral obligations of the Phoenix Project; but fine enough to get under the tent of 'business expense' rather than 'charitable contributions.'"[51]

The majority of the 250 corporate gifts Phoenix had attracted by 1952 were under $50,000 and represented the intervention of "a senior officer of the company who [was] a Michigan alumnus." Larger gifts came predominantly from the regional automotive and metallurgical industries, and were either unrestricted, or "were designated for research programs sufficiently general as to not embarrass the research program of the University."[52] These included gifts from: the American Motors Corporation ($150,000); the Chrysler Corporation ($250,000); the Detroit Edison Company ($110,000); the Ford Motor Company ($1,000,000); the General Motors Corporation ($1,500,000); and the National Steel Corporation, Great Lakes Steel Division ($110,000).[53]

The memorial mission promoted the curious ideological alignment between the Phoenix Project and its industrial patrons, which helped to extract such gifts. The memorial function remained central, even as Phoenix became established—raising money, breaking ground on a new building to house its operations, and dispensing its first grants. Michigan fundraisers, leery of government secrecy regimes and guided by the compass of the memorial function, sought funding that was unrestricted, or restricted as little as possible. The place industry occupied in American society during the transition from wartime to peacetime disposed corporate actors, who were mindful of the suspicion that had surrounded private enterprise during the Depression, to accept such an arrangement. Giving to educational institutions served the dual function of preempting an even greater reliance on expanding federal funding, especially in areas like nuclear science, and of signaling the industrial sector's commitment to the abstract ideal of the free pursuit of knowledge—

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[50] "Assets of the Phoenix Atomic Research Program," University of Michigan records 1948–, Bentley Historical Library, Box 2, Folder Phoenix Project Correspondence.

[51] Minutes of the National Special Gift Committee Meeting, 1 Feb 1950, PPR, Box 2, Folder 7. Corporations' charitable arms often capped contributions to particular causes, whereas business expenses were in principle unrestricted.

[52] "Phoenix Project Final Report" (ref. 36).

[53] "Phoenix Atomic Research Program Detroit Key Prospects List," 7 Oct 1959, VPDR, Box 16, Folder Phoenix Atomic Research Program Minutes 1958–59.

where "free" was meant to imply freedom from centralized government control of the type that Michigan scientists and administrators also sought to avoid. "Industry likes to work with Phoenix," a 1955 promotional article bragged: "The project has no bureaucratic red tape, no security restrictions. It can set up long-term projects while the government is limited by the policy of annual appropriations.... It is able to take on long-range basic research which industry needs but isn't in a position to do itself."[54] Industry's willingness to enter such a relationship gave the Phoenix Project unusual flexibility, which it used to pursue an unusually broad range of investigations for an initiative that billed itself as a nuclear research program.

Catholic Nuclearity

Determining the scope of the Michigan Memorial–Phoenix Project meant deciding what it meant for research to be "nuclear"—a decision that was by no means trivial, especially in the early postwar years. Gabrielle Hecht has focused productive attention on the conditions under which various things—materials, tools, labor, knowledge—came to be considered nuclear. Designating artifacts and activities as nuclear, Hecht argues, is a decision—one that is made differently in different times and places. It reflects local politics, geographies, and technical regimes. These complexities belie historians' impulse to write nuclear histories with reference to bombs and reactors, and to neglect the wider range of things that were (or could be) classified as nuclear in assorted times and places.[55]

The Namibian uranium mines at the center of Hecht's analysis are a far cry from the Eero Saarinen–designed North Campus of the University of Michigan, where the Phoenix headquarters were constructed, but that is rather the point: nuclearity was similarly contingent in both sites, and resulted in different boundaries in each. In the late 1940s and early 1950s, it was unclear what those boundaries should be. For most Americans, the nuclear was bound up with bombs. Apocalyptic imagery suffused postwar novels and films; nuclear fear became a tool of national and international politics.[56] Yet just a few years earlier, in the 1930s, "nuclear" had designated the most rarefied arena of physical investigation. The Phoenix Project emerged in explicit opposition to both of those trends, seeking instead to invoke the longer tradition of understanding the atomic nucleus and its emanations as the seat of mysterious, life-giving powers and to connect them to the theoretical and practical concerns of the age.[57]

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[54] Philip Gustafson, "They Build Atom's Road to Peace," *Nation's Business*, Mar 1955, reprint, VPDR, Box 2, Folder Phoenix Project Board of Governors.

[55] Gabrielle Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge, MA: MIT Press, 2012), esp. 13–16.

[56] Spencer Weart, *The Rise of Nuclear Fear* (Cambridge, MA: Harvard University Press, 2012), ch. 6. Paul Boyer, *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age* (New York: Pantheon Books, 1985), 109, notes that "remarkably tenacious" utopian associations coexisted with nuclear fear, a point the Phoenix Project bears out.

[57] Weart, *Nuclear Fear* (ref. 56), ch. 1; Luis Campos, *Radium and the Secret of Life* (Chicago: University of Chicago Press, 2015).

One way that Phoenix planners sought to put a friendlier face on the atom was to present postwar efforts as a continuation of the University of Michigan's prewar contributions to theoretical physics research. From 1928 until 1941, Michigan hosted an annual summer symposium in theoretical physics. Bringing together the luminaries of American physics (such as J. Robert Oppenheimer, Ernest Lawrence, and Isidor Isaac Rabi) with some of the most eminant Europeans physicists who fled a troubled continent (including Enrico Fermi, Hans Bethe, and Niels Bohr), the Michigan summer symposium helped galvanize the American community of theoretical physicists during the interwar period. Melba Phillips, for instance, who would go on to a distinguished career at the University of Chicago and serve as the first woman president of the American Association of Physics Teachers, recalled the 1929 symposium as her first exposure to quantum mechanics.[58]

The tradition of the summer symposia cropped up frequently as Michigan's representatives justified their new peaceful-atom initiative. It allowed the Phoenix Project to appear continuous with prewar institutional commitments to nuclear science—even though its conception owed little, if anything, to the summer symposia—as well as assuming the role of a pathbreaking new initiative. In discussions of how to connect Phoenix with the legacy of the summer symposia, the question of how to define the nuclear naturally arose. A meeting designed to mobilize Detroit-area alumni in support of Phoenix generated "considerable discussion … as to what a nuclear physicist was as opposed to a theoretical physicist." The Michigan physicists on hand assured the attendees that "nuclear physics is just a branch of theoretical physics and there is really no distinction."[59] It was appropriate, therefore, to conceive of a project with a nuclear focus to claim the legacy of an influential series of symposia dedicated to theoretical physics more broadly.

Physics—theoretical and experimental—did indeed feature in the portfolio of research projects that Phoenix funded. In November 1952, Donald Glaser was awarded $3,000 of Phoenix funds to investigate "New Methods of Detecting Ionizing Radiation by its Effect on Phase Changes,"[60] work that led to his 1960 Nobel Prize in Physics for the invention of the bubble chamber. But Phoenix was never sold as a program devoted to the physical sciences alone.

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[58] Melba Phillips, interview by Katherine Sopka, 5 Dec 1977, Niels Bohr Library and Archives, American Institute of Physics, College Park, MD, accessed 2 Apr 2019, www.aip.org/history-programs/niels-bohr-library/oral-histories/4821. Michigan's summer symposia await focused historical scrutiny, but prominent physicists report experiences similar to Phillips's and suggest that the symposia did a great deal to shape their thinking. See, for example, George Uhlenbeck, "Uhlenbeck on the Ann Arbor Summer Symposia," University of Michigan Physics Department, accessed 2 Apr 2019, https://michiganphysics.com/history/history-by-person/uhlenbeck-on-the-ann-arbor-summer-symposia/.

[59] "Miscellaneous Notes Taken at the Luncheon and Meeting of Detroit Alumni in Ann Arbor," 23 Nov 1949, PPR, Box 2, Folder 7.

[60] "Executive Committee for the Michigan Memorial–Phoenix Project, Meeting of November 18, 1952," PPR, Box 1, Folder 26. Michigan lacked cryogenic facilities at the time, so the bulk of Glaser's research was conducted at the University of Chicago. Donald A. Glaser, "Elementary Particles and Bubble Chambers," Nobel Lecture, 12 Dec 1960, NobelPrize.org, accessed 7 May 2019, https://www.nobelprize.org/uploads/2018/06/glaser-lecture.pdf.

Promotional materials for the project placed strong emphasis on its breadth, noting, for example, that it "considers atomic age problems in sociology and law as important as those in physics and chemistry."[61] The rhetoric that swirled around the project consistently sought to break the strong connection that persisted in the popular imagination between the nuclear and physics. "The release of the energy of the atom through fission," a report to Michigan president Ruthven claimed, "is destined to alter almost all aspects of our civilization and culture and that it is essential for the University to take part in these developments and to contribute to the advance of knowledge in all phases of the impact of nuclear energy on our life."[62]

Phoenix was thus founded with the understanding that "nuclear" research could describe *any* project distinctive to, inflected by, or directed at the problems of the nuclear era. "The Michigan Memorial—Phoenix Project is unique for its broad approach to the problems of the atomic age," one funding proposal boasted, noting that "all fourteen University schools, colleges, and related institutions will take part in the Project."[63] The challenge of distancing non-military nuclear and nuclear-adjacent research from the legacy of the bomb was a common one after World War II. One approach to this challenge was to identify focused areas, such as radioactive tracer research, with clear applied potential but only tangential military relevance. Another was to disavow the nuclear label. These approaches were both on display, for instance, at the University of Chicago, whose Institute for Nuclear Studies and Institute for the Study of Metals were, like the Phoenix Project, founded with industrial patronage and sought to skirt secrecy regimes. The Institute for Nuclear Studies pursued a mission of basic nuclear research, appropriately circumscribed and focused initially on tracer studies.[64] The Institute for the Study of Metals' director, Cyril Stanley Smith, vociferously opposed its characterization as a "nuclear" or "nucleonics" institutes, on the grounds that its scope was broader and that surrounding it with nuclear rhetoric would frighten away potential donors.[65] Neither approach would serve a research program with a memorial mission, however. Phoenix administrators framed its scope so that as much of the Michigan research community could participate in the project as possible, and consistently sought to emphasize their success supporting projects from a diversity of disciplines.

Naturally, much of the research Phoenix supported was in the physical sciences and engineering—more so after 1957, when the Ford Nuclear Reactor opened, following a $1 million

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[61] "Assets of the Phoenix Atomic Research Program," 15 Dec 1958, VPDR, Box 1, Folder Phoenix Correspondence.
[62] Ralph A. Sawyer, memo to Alexander G. Ruthven, 15 Apr 1949, PPR, Box 2, Folder 4.
[63] "Proposal to General Electric" (ref. 1).
[64] Matthew Shindell, "From the End of the World to the Age of the Earth: The Cold War Development of Isotope Geochemistry at the University of Chicago," in *Science and Technology in the Global Cold War*, ed. Naomi Oreskes and John Krige (Cambridge, MA: MIT Press, 2014), 107–39.
[65] Joseph D. Martin, "The Simple and Courageous Course: Industrial Patronage of Basic Research at the University of Chicago, 1945–1953," *Isis* 111, no. 4: in press.

bequest from the Ford Motor Company.[66] But a significant portion of the wider Michigan community bought into the expansive conception of the nuclear Phoenix promoted, and throughout the 1950s Phoenix funded a considerable breadth of research. The project's second annual progress report, released in November 1952, described research Phoenix had supported in seventeen of the university's departments and institutes, including projects from law and political and social sciences alongside the physical and biological sciences.[67] The 1957 report introduced a similar assortment of projects by touting "achievements … as varied as they were significant." It gave particular attention to the Phoenix-funded Alice Crocker Lloyd medical research center, named after the former Dean of Women who had died of cancer, and research into the irradiation of food for preservation and decontamination, one of the first Phoenix efforts to bear fruit.[68] Within Phoenix, that is, there was not just one way to be nuclear. Nuclearity at Michigan was a broad church—catholic in the common sense, if not the ecclesiastical one—and so within it we can see a microcosm of the complex blend of hopes and fears, ambitions and anxieties, that characterized the early nuclear era.

The efforts Phoenix supported in anthropology and law highlight the opportunities such a catholic approach to delineating nuclear research offered. Aside from the bubble chamber, the best know product of Phoenix funding is likely its radiocarbon dating program. Willard Libby, a physical chemist at the University of Chicago (and future AEC Commissioner), had developed his method for carbon-14 dating through the late 1940s. It was therefore ripe for exploitation within the Phoenix Project, which, eager to broaden the scope of nuclear research, established a radiocarbon dating laboratory in 1950.[69] Through the 1950s, the physicist H. Richard Crane collaborated with James B. Griffin of Michigan's Museum of Anthropology both to hone the technique and to assemble a list of dates of artifacts in the museum's collections.[70] The success and longevity of their collaboration became one prominent means by which Phoenix administrators re-inscribed their commitment to the project's breadth. A 1958 funding appeal boasted of a program

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[66] On the significance of the Ford Nuclear Reactor both for the Phoenix Project and as a representative example of nuclear pedagogy in Cold War America, see David P. D. Munns, "Teaching in a Swimming Pool: The Ford Nuclear Reactor and the Training of the Atomic Age," *Historical Studies in the Natural Sciences* 51, no. 2 (2021): this issue. Launching of the reactor naturally necessitated building a closer relationship with the government, from which fissile material had to be leased up until the passage in 1964 of the Private Ownership of Special Nuclear Materials Act.

[67] "The Michigan Memorial–Phoenix Project, Second Annual Progress Report," 1952, PPR, Box 1, Folder 9.

[68] "The Michigan Memorial–Phoenix Project, Seventh Annual Progress Report," 1957, VPDR, Box 1, Folder Dev. Council Board of Directors, 1958–59. For a discussion of the broader context of food irradiation research, see Hamblin, "Let There Be Light" (ref. 3).

[69] H. Richard Crane, "University of Michigan Radiocarbon Dates I," *Science*, 124, no. 3224 (1956): 664–72.

[70] Crane, "Michigan Dates I" (ref. 69); H. Richard Crane and James B. Griffin, "University of Michigan Radiocarbon Dates II," *Science* 127, no. 3306 (1958): 1098–105. The series would run to fifteen papers between 1956 and 1972, the first three published in *Science* and the remainder in the *American Journal of Science, Radiocarbon Supplement*.

"unique in its scope" because it ranged "literally from archaeology to zoology,"[71] and radiocarbon dating was routinely given top billing, alongside medical and legal research, in news releases and glossy progress reports emphasizing the wide dispersal of the Phoenix Project's funding.

It is possible that a physicist of Crane's background would have been drawn to radiocarbon dating in any event. As a Manhattan Project veteran and early cyclotron researcher who in the 1930s had conducted the critical experiments providing evidence for the production of neutrinos in beta decay, he moved in the circles of physicists most closely attuned to the properties of the nucleus and new opportunities to exploit it.[72] The framework the Phoenix Project provided nevertheless created both the incentive and resources to build a productive, cross-disciplinary collaboration. And that collaboration would be integral to Michigan's presentation of the Phoenix Project as an undertaking that had not only conceived of nuclearity in a uniquely broad way, but which had achieved notable successes by doing so.

Phoenix-funded work on the legal implications of nuclear science functioned similarly. The dean of the Michigan Law School, E. Blythe Stason, had been trained as an engineer and taught engineering at Michigan while completing his law degree.[73] He saw in the Phoenix Project an opportunity to blend these areas of expertise, and secured one of the most sizable early grants from the Phoenix Project to fund a program of research and a series of symposia on the legal issues arising from nuclear science and technology.

Stason's efforts led to an influential 1952 summer symposium on "industrial and legal problems of atomic energy." It was followed up by a 1956 workshop, which, Stason was proud to report, "included not only lawyers but also engineers, A.E.C. staff members, scientists, health officials, and economists—a truly 'inter-disciplinary' undertaking."[74] These efforts resulted in two books. The first, the proceedings of the 1952 symposium, convinced a reviewer for the *Stanford Law Review* that "lawyers, engineers, and economists will have to move together in exploring the *terra incognita* of the economic atom."[75] *Atoms and the Law*, a 1959 volume that aimed to summarize the range of issues the Phoenix-funded foray into nuclear law had identified and mapped out, including injuries caused by radiation, state and national regulatory law, and international control

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[71] "Assets of the Phoenix Program" (ref. 61).

[72] H. Richard Crane, interview by Charles Weiner, 18 Jun 1974, Niels Bohr Library and Archives, College Park, MD, https://www.aip.org/history-programs/niels-bohr-library/oral-histories/4564-2.

[73] "E. Blythe Stason, Law Dean, Is Dead," *New York Times*, 11 Apr 1972, 44. For discussions of Stason's continuing involvement in Phoenix and Phoenix-related efforts, see Gisela Mateos and Edna Suárez-Díaz, "'The Door to the Promised Land of Atomic Peace and Plenty': Mexican Students and the Phoenix Memorial Project," *Historical Studies in the Natural Sciences* 51, no. 2 (2021): this issue.

[74] E. Blythe Stason, "Preface," in *Atoms and the Law*, ed. E. Blythe Stason, Samuel D. Estep, and William J. Pierce (Ann Arbor: University of Michigan Law School, 1959), v–viii, on v. As the scare quotes indicate, this is an early use of the term "inter-disciplinary."

[75] David F. Cavers, "Reviewed Work: *Lectures on Atomic Energy, Industrial and Legal Problems*," *Stanford Law Review* 6, no. 2 (1954): 400–403, on 403.

of nuclear energy and materials.[76] An early jump on these issues secured Michigan's place as a nexus for the emerging field of nuclear law.

As a result of his efforts, Stason was tapped to chair the American Bar Association's Special Committee on Atomic Energy in 1953, a body that would advocate intensely and effectively for modifications to the Atomic Energy Act of 1946, which had effected a government control over nuclear material.[77] Following a meeting the committee in Ann Arbor—which occurred two months before Eisenhower's landmark Atoms for Peace speech of December 1953—Stason informed Congress's Joint Committee on Atomic Energy that "the time has now arrived for the adoption of a positive program for the more extensive development of atomic energy for peacetime purposes," and that "private capital be encouraged to enter the field in order to expedite the development."[78]

Michigan's early foray into nuclear law demonstrate both how the mission and scope of the Phoenix Project prompted a particular conception of the nuclear, shortly after World War II when such conceptions remained malleable. It reflects the sense of agency to shape the future that permeated the project, a sense that was born out in the case of the influence Stason was able to exert on the initiative to reform the Atomic Energy Act. Phoenix administrators understood themselves to have some influence over how nuclear research would be parameterized, at a national as well as a local level. Stason and his law-school colleagues, as beneficiaries of Phoenix's largess, positioned themselves to guide the legal frameworks in which atomic science would develop—a possibility that, if it was not created by the Phoenix Project, was encouraged by its commitment to catholic nuclearity.

The research Phoenix funded in its first decade or so of operation could all have been considered "nuclear" according to a contemporary understanding of the term that was broad, but not controversially so. In that sense, it did not employ a concept of nuclearity that was conspicuously out of place in contemporary national discourse. The approach to delineating nuclearity at work at Michigan was nevertheless distinctive for the active effort it involved to distribute attention and resources across any area that fell within the scope of that understanding. Like other non-military nuclear research initiatives, Phoenix evinced an emphasis on basic research, a sense of continuity with abstruse prewar research programs, and distaste for heavy-handed directives from its patrons. Unlike other initiatives, however, it was animated by a memorial mission that encouraged the active expansion of its topical boundaries in as many

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[76] *Lectures on Atomic Energy, Industrial and Legal Problems, Delivered at University of Michigan Law School, June 26–June 28, 1952* (Ann Arbor: University of Michigan Law School, 1952); Stason et al., eds., *Atoms and the Law* (ref. 74).

[77] "Report of the Sixth Annual Atom Day and Dedication of the Ford Nuclear Reactor," 16 Nov 1956, Ford Motor Company Non-Serial Publications Collection, Accession 951, Ford Motor Company Archives, Dearborn, MI, Box 38.

[78] US Congress, Hearings before the Joint Committee on Atomic Energy, *To Amend the Atomic Energy Act of 1946*, 83rd Cong., 2nd sess., 10, 11, 12, 13, 14, 17, and 19 May 1954, 57–58.

directions as feasible. As a result, a distinctively ecumenical attitude toward nuclear research became a stable feature of the program's identity.

Conclusions

In 1951 James P. Adams, the University of Michigan provost, told a campus audience: "In due time historians will attempt to characterize the era in which we live as a part of the history of our civilization. As they view it in retrospect, they may see a number of distinguishing features, but I venture to suggest one which will be clearly discernible. It is an age of *invincible surmise*."[79] He was wrong. Historians, and historians of science in particular, have looked back on the early Cold War as an age of anxiety—an era jittery with nuclear fear, its denizens cowed by the threat of McCarthyism.[80]

But Adams's lofty sentiments reveal much about his own time and place. In their contribution to this special issue, Gisela Mateos and Edna Suárez-Díaz focus our attention on the contexts in which optimism emerges as a collective emotion. In Mexico, among a particular cadre of government elites, that meant a feeling that forging a collaboration with the United States, built around nuclear technology, offered an advantage in economic, technical, and competitive development. That context, as Mateos and Suárez-Diaz show, was local and depended a great deal on the personal relationships among the key actors. In that respect, the story in Michigan was similar. The origins of the Phoenix Project were marked by considerable optimism, fed by the local sentiments of the student–veterans who initated the memorial effort. The fundraising push, although marked by fear of heavy-handed government control, rested on optimism about industrial munificence and leveraged personal relationships with alumni while schmoozing at football games. And the conviction that a home-grown nuclear research program—which might have been large by prewar standards, but which was dwarfed by the efforts of the AEC, the national laboratories, and other government-funded efforts—could confront the most serious challenges of the nuclear age borders on the quixotic.

That set of attitude makes sense, however, if we focus on the continuities with interwar sensibilities and practices that the Phoenix Project as represented. Rhetorically, Phoenix was sold as emblematic a new nuclear age, but it was also presented as the heir to Michigan's legacy as an incubator of quantum physics. The model of corporate patronage it pursued can also be understood as an attempted return to normalcy, as resistance to the quick shift toward federal contracts dictated by national funding priorities and an affirmation of local sources of support, negotiated through informal networks. Michigan had long prided itself on its ability to attract private donations despite its status as a public university, and so its reliance on industry to fund

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[79] James P. Adams, "What Is the Place of Research in a University?," 1951, VPDR, Box 3, Folder Speeches, Miscellaneous, 1952–58.

[80] Jessica Wang, *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (Chapel Hill: University of North Carolina Press, 1999).

Phoenix represents the continuation of patterns with which it was familiar.[81] The scale of industrial fundraising mobilized for the Phoenix Project was new for the University of Michigan, but the mode of fundraising—exploiting personal connections with well-placed corporate contacts—was not. As Cold War funding patterns stabilized through the 1950s—in part due to the 1954 revision to the Atomic Energy Act, which loosened government control over nuclear material and was itself informed by Phoenix-funded legal research—Michigan's stance toward federal funding would soften, but its early reluctance is indicative of the enduring influence of prewar attitudes in shaping the postwar world.[82]

As the other contributions to this special issue amply show, the Phoenix Project was far from immune to Cold War pressures. Nevertheless, attending to both its continuities with the interwar period and the characteristic optimism that animated it points the way to several historical and historiographical lessons about Cold War science. The first is the extent to which we have understood the early Cold War through the prism of the late Cold War. When looking back through the haze of the Vietnam War, the arms race, the brutal racism that erupted in response to the Civil Rights movement, and other developments of the 1960s, 1970s, and 1980s, it is easy to see Adams's optimism as aberrant or naïve. But the story of the Phoenix Project's origins indicates that his attitude was widespread and helped guide some noteworthy scientific enterprises.[83]

Second, the focus on a few exceptional but not necessarily exemplary institutions has shaped, and in some ways distorted, our view of this era. Although universities like Stanford, MIT, and Caltech managed to build themselves into powerful national research universities by buying into the military-industrial complex, they were also, like Michigan, responding to local as well as national incentives. They instantiate one mode in which Cold War universities operated, but a fuller understanding requires recognizing both higher education and the research trends within it as distributed phenomena.

Third, the motives we ascribe to industrial actors are often shaped by expectations fired in the kiln of neoliberalism. *What is the quid pro quo?* is a question that naturally springs to historians' minds when we see industry investing in university research. But this instinct can lead us to overlook collaborations built upon a commitment to shared ideals—in this case the belief that a portion of basic research activity in the United States needed to be protected from government control, that universities were best equipped to conduct it, and that industry had an obligation to support it as a business expense. The case of the Phoenix Project illustrates that responses to commercial incentives are not hard-wired into the circuity of corporations—as they sometimes

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[81] "An Overview of Fundraising at the University of Michigan from 1817 to 1980," n.d., VPDR, Box 16, Folder, Historical: Histories—Development Program and Specific Appeals, 1952–1977.

[82] On the revision of the Atomic Energy Act of 1946, see Richard G. Hewlett and Jack M. Holl, *Atoms for Peace and War: Eisenhower and the Atomic Energy Commission* (Berkeley: University of California Press, 1989), ch. 5.

[83] Martin, "Simple and Courageous Course" (ref. 65), discusses how an ethos similar to Michigan's shaped postwar nuclear research at the University of Chicago.

appear to be from the standpoint of our neoliberal moment—and that the specifics of cultural context also constrain corporate behavior.

Adams cribbed the phrase "invincible surmise" from George Santayana, who rhapsodized of Christopher Columbus: "To trust the soul's invincible surmise / Was all his science and his only art."[84] Although he might have misjudged us future historians, Adams did capture one aspect of the late 1940s and early 1950s, namely, the feeling of moving maplessly into unfamiliar waters and the sense of possibility that came with it. Understanding this mindset is critical to understanding the scientific and technical institutions that emerged and grew in the early Cold War.

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[84] The Santayana sonnet was quoted in the Michigan alumni magazine in Autumn 1950, which likely explains why it was on Adams's mind. William Frankena, "Twentieth-Century Philosophy Seen from the Middle," *Michigan Alumnus* 52, no. 10 (1950): 13–20, on 16.