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Eternal Hunger: A Qualitative Analysis of Lawrence Livermore National Laboratory and its Role as a Driver of the New Nuclear Arms Race

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Abstract

The emergence of a new Cold War and the arms race it brings has captured the attention of the globe. To understand the drivers of the new global tension, the current discourse has overwhelmingly looked to great power politics for explanations. A dominant narrative has emerged that frames the United States as a superpower in decline and facing increasingly aggressive challenges from China. This thesis directly challenges that narrative by investigating the role of nuclear weapons laboratories as the possible key driver of this new era of nuclear arms racing and proliferation. Specifically, this thesis uses process tracing and organization theory to explain how Lawrence Livermore National Laboratories developed an organizational ethos that sought to master its resource dependence by pursuing influence over the policy that controls the distribution of the resources it seeks. This thesis argues that, in doing so, Lawrence Livermore acts as a driver of arms racing and the new Cold War.

1. Introduction

Today, the United States and China continue to participate in growing economic competition, political tensions, and evermore divergent international goals. Though still deeply interconnected through the international system, the two nations are constantly jostling for power through industry, technology, and the cultivation of new strategic partnerships and influence. Harking back to the shifting competition between the Soviet Union and the United States, this deterioration of relations and divergence of interests has repeatedly been characterized as a New Cold War. Following in the footsteps of its predecessor, this New Cold War includes a new era of nuclear arms racing. Though the actions of both states are undeniable contributors, the root cause of this New Cold War is being hotly debated in international relations.[1,2,3] This study investigates the role of United States nuclear labs in causing current global tensions. More specifically, this thesis asks: How does Lawrence Livermore National Laboratory function as a driver of arms racing, and, in turn, does it act as a causal force in the New Cold War?

[1] Keir A. Lieber and Daryl G. Press, "The Return of Nuclear Escalation." Foreign Affairs, October 24, 2023. https://www.foreignaffairs.com/united-states/return-nuclear-escalation. 1.On changing International rules see Shivshankar Menon, "Nobody Wants the Current World Order," Foreign Affairs, July 13, 2023, https://www.foreignaffairs.com/world/nobody-wants-current-world-order.

[2] For the return of nuclear escalation and arms racing see, Keir A. Lieber and Daryl G. Press, "The Return of Nuclear Escalation." Foreign Affairs, October 24, 2023. https://www.foreignaffairs.com/united-states/return-nuclear-escalation

[3] Rose Gottemoeller, "How to Stop a New Nuclear Arms Race," Foreign Affairs, February 27, 2024, https://www.foreignaffairs.com/articles/russia-fsu/2022-03-09/how-stop-new-nuclear-arms-race.

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To explain the shifting global order, most scholars have focused on the actions of China and Russia, arguing that the United States is responding to the actions of these nations.[4] These scholars view China as a new superpower challenging the existing hegemonic system, while Russia is an unsatisfied former superpower. The actions of both China and Russia have largely been interpreted as zero-sum threats to the United States.[5] This analysis has strengthened the United States' internalized identity as a superpower being challenged while losing influence abroad, thereby leading to a widespread acceptance of the need to re-arm, including abandoning arms control in order to pursue nuclear stockpile expansion in a major reversal from long-term strategic stability. Instead of continuing to mutually disarm nuclear weapons since the end of the Cold War, a new arms race is emerging.[6]

This study specifically focuses on one key actor, the Lawrence Livermore Laboratory. The basis for this thesis's focus on Livermore is threefold. The laboratory system has largely been stripped of agency and left out of the academic analysis of the military-industrial complex. Moreover, Livermore is often overshadowed by Los Alamos in popular media and academic analysis. Within the context of the present-day nuclear discourse, Livermore is unique as it was home to actors who influenced and continue to influence nuclear policy and nuclear myths. Lastly, in recognition of the nature and constraints of this thesis, focusing on a significant player in close proximity to where this research took place provided logistical benefits and relevancy.

This thesis will use organization theory, in particular resource dependency theory, and the framework of the Iron Triangle to explain the mission, identity, drive, and broader structures that developed the goals, power, and influence of Lawrence Livermore. This analysis will be done by first establishing a chronological history of the organization's mission development. This specific mission of manufacturing nuclear weapons is centered around resource dependency. The end of the Cold War threatened the organizational characteristics of Lawrence Livermore, forcing it to either change or to double down and strengthen its influence to continue gaining resources. Lawrence Livermore chose to become more aggressive in its collection of resources. Further, the broader theoretical framework is useful to analyze the case study of how the need for ratification of the last arms control treaty, the New START, forced a bargain that paradoxically continued to limit nuclear arms and began the process of rebuilding the full Cold War arsenal in a modernized way that has directly led to the New Cold War. New START offers one of the most clear and explicit demonstrations of how Livermore and the other laboratories politically maneuver and exude influence over policy. Process tracing New START will demonstrate how this bargain for full rearmament was spearheaded by Lawrence Livermore's resource dependency.

2. Methods and Theories

This thesis will utilize process tracing to analyze Lawrence Livermore and determine if its

[4] There are different approaches, theories and responsibilities; given and applied to the situation however these three nations have been framed as key actors. See, Hal Brands and John Lewis Gaddis, "The New Cold War." Foreign Affairs, October 19, 2021. 2024.https://www.foreignaffairs.com/china/axis-upheaval-russia-iran-north-korea-taylor-fontaine. 1. Tong Zhao, "The Real Motives for China's Nuclear Expansion," Foreign Affairs, May 3, 2024, https://www.foreignaffairs.com/china/real-motives-chinas-nuclear-expansion.

[5] The majority of focus has been on the growth and relationships of Iran, North Korea, China and Russia. The autocratic nature of all these nations and conflict with the United States is a major driver of the high threat evaluation. See Andrea Kendall-Taylor and Richard Fontaine, "The Axis of Upheaval." Foreign Affairs, April 23, 2024. https://www.foreignaffairs.com/china/axis-upheaval-russia-iran-north-korea-taylor-fontaine. Thomas G. Mahnken, "Could America Win a New World War?." Foreign Affairs, October 27, 2022. https://www.foreignaffairs.com/united-states/could-america-win-new-world-war.

[6] Waltz, K. N. (Kenneth N. (1979). Theory of international politics (1st ed.). Random House.

organizational ethos and mission play a causal role in influencing arms racing and the New Cold War. Process tracing is a qualitative method of analysis used to explain and test theories and explanations of causality. This process will be done by establishing a timeline of events hypothesized to show a causal role of Livermore's influence on creating the current arms racing. Process tracing as a method offers a structure and multiple tests that can be done to determine causality. For the purpose of this thesis, an adaptation of process tracing will be used. By identifying the creation of an organization ethos and tracing the development of an organizational mission and its adaptation through the end of the Cold War and privatization, this thesis uses process tracing to demonstrate means, motive, and opportunity. The more rigorous examination for causality will culminate with a casual graph and case study of Livermore and the other laboratories' role in the ratification of the New START. This thesis will use a modified version of process tracing in the organization and structure of the thesis and the analysis of the New START ratification process. The importance of including this modified process tracing stems from its ability to better frame and analyze competing explanations of events and actions. Due to the constraints and scope of this thesis, traditional process tracing and the tests for causality that accompany the process were not a realistic addition. The theories detailed in this section will be used to explain how and why the selected events shape Livermore's organizational mission and act as drivers of the New Cold War.

2.1. Organization Theory: How to Demonstrate Influence

The literature on measuring the effect of political influence is a subject that contains substantial contributions.[7] This work will rely on the distinction of political power and the general understanding of influence provided by Arts and Verschuren.[8] Here, power is understood as the resources and political capital that an organization possesses. While power can be used to promote influence, the use or lack of use of influence is not a requisite for power. Although materially tangled with power, influence is commonly understood as "…the modification of one actor's behavior by that of another."[9] In order to answer the question that this project poses, a more case-specific understanding is needed. The restrictions applied have to do with goals and outcomes. The influencer must have a goal, intervene with another actor to achieve that goal, and be successful in doing so. There are many other ways and counterfactuals that can be understood as successful and unsuccessful influences. However, for the purpose of this thesis, these requirements are the most useful.

2.2. Creation of an Organizational Mission: A Brief History

Lawrence Livermore National Laboratory officially opened on September 2, 1952, originally named the University of California Radiation Laboratory, Livermore branch. The creation of the lab and its history are well documented internally and externally; however, the available literature is overwhelmingly surface-level, focusing on a chronology of success and key moments of

[7] Parsons, Talcott. "On the Concept of Influence." The Public Opinion Quarterly 27, no. 1 (1963): 37–62. http://www.jstor.org/stable/2747290. Also Aplin, John C., and W. Harvey Hegarty. "Political Influence: Strategies Employed by Organizations to Impact Legislation in Business and Economic Matters." The Academy of Management Journal 23, no. 3 (1980): 438–50. https://doi.org/10.2307/255510.

[8] Arts, Bas, and Piet Verschuren. "Assessing Political Influence in Complex Decision-Making: An Instrument Based on Triangulation." International Political Science Review / Revue Internationale de Science Politique 20, no. 4 (1999): 411–24. http://www.jstor.org/stable/1601404.

[9] Ewing, A. F. "The Anatomy of Influence: Decision Making in International Organizations by Robert W. Cox, Harold K. Jacobson et al. New Haven and London, Yale University Press, 1973. Pp. Xiii+ 497. £6.50." The Journal of Modern African Studies 14, no. 2 (1976): 345–48. https://doi.org/10.1017/S0022278X00053349.

discovery.[10] Understanding the founding is necessary to fill the gap in the literature surrounding the inception and the existence of an organizational mission and to determine if it has a lasting impact on the organization and if that mission drives nuclear escalation today. One of the most important gaps in the literature that this thesis seeks to address is the recognition of Livermore and, more generally, the laboratory system as organizations that possess agency.

A brief history of the laboratory's founding will demonstrate that an the initial organizational imprint shapedwas shaped through a dependency on successful weapons development and scientific estrangement. Political maneuvering and outside support were a requisite for the laboratory's creation and success , and will additionally be shown to shape the organization.

2.3. Organizational Imprinting

Organizational imprinting is a popular theoretical framework for explaining the differences in directions and outcomes that organizations experience. This framework asserts that organizations are shaped by the constraints of the time of their inception. These constraints are an amalgamation of the political, economic, and societal realities of the time.[11] This framework is a coalition of two actions: the initial imprint of the constraints and actions of the founding actors and the process of imprinting that creates the persistence of the values that shaped the organization.[12]

2.4. Organization Theory and Resource Dependence Tied to the Manufacture of New Nuclear Weapons

Organization Theory is a multifaced discipline that seeks to understand how organizations form, grow, and respond to the outside environment and why they make certain decisions. Out of Organization Theory comes the idea of resource dependency. The focus of resource dependency lies in analyzing the effect that the acquisition of resources has on the behavior of an organization. Resources are fundamental to the survival and success of an organization; however, organizations do not always have control over the resources they need. When this occurs, they must implement strategies to maintain access to the resources needed for the organization's survival.[13] Throughout Livermore's history, the laboratory needed resources and found it could acquire the most resources through the production and modernization of nuclear weapons. The laboratory sees resources and weapons as inextricably tied. Consequently, when the production or modernization of nuclear weapons is threatened, it represents an existential threat to the resources the laboratory needs. Following this logic, the laboratory sees weapons development as survival and must devise methods to ensure their continued production.

2.5. Iron Triangle Model

The Iron Triangle refers to the connection and influence web that ties government institutions, special interest groups, and Congress. The Iron Triangle framework has historically been most

[10] Lawrence Livermore National Laboratory, "Our History," LLNL, accessed May 12, 2024, https://www.llnl.gov/purpose/history. Also, American Institute of Physics, "Physics History Network," Lawrence Livermore Laboratory, accessed May 12, 2024, https://history.aip.org/phn/21612012.html. Tarter, C. B. (2018). The American Lab An Insider's History of the Lawrence Livermore National Laboratory (1st ed.). Johns Hopkins University Press.

[11] Simsek, Z., Fox, B. C., & Heavey, C. (2015). What's Past Is Prologue: A Framework, Review, and Future Directions for Organizational Research on Imprinting. Journal of Management, 41(1), 288–317. https://doi.org/10.1177/0149206314553276

[12] Johnson, V. (2007). What is organizational imprinting? Cultural entrepreneurship in the founding of the Paris Opera. The American Journal of Sociology, 113(1), 97–127. https://doi.org/10.1086/517899

[13] Pfeffer, J., & Salancik, G. R. (1978). The external control of organizations : a resource dependence perspective. Harper & Row.

effective as a form of analysis for the United States military-industrial complex.[14] Despite being deeply intertwined with the traditional private benefactors of the Iron Triangle, the U.S. nuclear industrial complex has largely escaped the scrutiny that the conventional military-industrial complex receives. The laboratories have historically existed in a gray area within the Iron Triangle, camouflaged by the academic image that terms such as "research" and "development" conjure. The new model under privatization of being government-owned but privately contracted further blurred the lines surrounding the laboratories' position in the Iron Triangle. Sandia National Laboratories is a useful and possibly more familiar example of the problematic and abstruse nature of the nuclear weapons complex. The federally funded research and development center was operated by Sandia Corporation from 1993 to 2017; Sandia corporation was a wholly owned subsidiary of Lockheed Martin Corporation. In 2017, Sandia was taken over by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International. Livermore is currently operated by its own consortium of private interests and has a unique position in the Iron Triangle. The use of the Sandia example was an attempt to provide context to the scale and pervasiveness of competing private interests in the United States nuclear weapons complex.

In the Livermore case, it is important to recognize how the structural model of the Iron Triangle interacts and is reinforced by traditional resource dependency and privatization. The nuclear laboratory complex and the military-industrial complex both engage in monopolistic behaviors with the United States government as the only customer.[15] The structure of the U.S. government, with multiple ways to lobby for resources, allows many opportunities for laboratories like Lawrence Livermore to pursue and acquire resources.

3. Founding of Lawrence Livermore

Although founded in 1952, the groundwork laid for Livermore was years in the making. To properly identify and analyze the creation of an organizational mission and ethos, it is necessary to fully review and comprehend the organization's earliest influences and the rationale for its creation. The organizational imprinting process begins with the constraints, motivations, and actions of the founders. The founders of Livermore were a part of the atomic community before it became an organization. Therefore, their disagreements, qualms, and individual ideologies within that community must be recognized as possible forces of organizational imprinting. Prior to the creation of Livermore, the Los Alamos National Laboratory, opened in 1943, designed all of the United States' nuclear weapons. The end of World War II brought uncertainty and division to the atomic community. As relations cooled between the United States and the Soviet Union, those who had opposed the use of nuclear weapons in the war along, with many of those who saw the destruction they caused, began to aggressively lobby for arms control. After the detonation of the U.S.S.R's first atomic bomb in 1949, the arms control camp had lost the lobbying war, and the Truman administration decided to pursue a hydrogen bomb.[16]

Edward Teller had been campaigning for a second laboratory and preaching the promise of

[14] Franklin C Spinney, "National Security Iron Triangle," Tipping Point North South, March 17, 2014, https://tippingpointnorthsouth.org/2014/03/17/national-security-iron-triangle/. Iron Triangle diagram.

[15] Tinoco, Janet K. "Organizational power and dependence: contradictions and implications for industry control." International Journal of Management and Innovation, vol. 2, no. 2, July 2010, pp. 54+. Gale Academic OneFile, link.gale.com/apps/doc/A270375485/AONE?u=oregon_oweb&sid=googleScholar&xid=120bd221. Accessed 19 May 2024.

[16] Notable names in the arms control camp were Oppenheimer and Einstein. 1. "Einstein and the Nuclear Arms Race: AMNH," American Museum of Natural History, accessed May 13, 2024, https://www.amnh.org/exhibitions/einstein/peace-and-war/nuclear-arms-race.

the hydrogen bomb since his first days on the Manhattan Project: the United States' development of the first atomic bomb. A fervent anti-communist and scientific romantic, Teller was, and remains to this day, the subject of division in the atomic community and beyond.[17] As Teller's relationships within the atomic community deteriorated due to his hawkish anti-arms control positions as well as his desire to pursue a hydrogen bomb, these same positions and desires would create new similarly hawkish allies outside of the atomic community. Teller garnered the support of Air Force officers, members of the Joint Committee on Atomic Energy, and David Griggs, one of the founders of the RAND Corporation, a research and development institute, policy think tank, and consulting firm. These parties had already turned their focus to the coming Cold War and saw a second laboratory focused on developing a hydrogen bomb as a necessity. With the support of those outside of the academic atomic community, the debate was already moving in Teller's favor for the creation of a second laboratory when Ernest Lawrence offered to run the new lab out of his existing radiation laboratory at UC Berkeley. Lawrence, a veteran of the first atomic bomb project, had already acquired the retired Livermore Air Force base as a site for a model accelerator project that could produce plutonium. Instead, Lawrence had gone to a subsidiary of Standard Oil to purchase and fund the site under the name Livermore Laboratories (Figure 1). Lawrence's support strengthened the bid for a new laboratory. After the first successful test of a hydrogen bomb that came out of Teller's work at the Livermore Labs, the Atomic Energy Commission (AEC) and the regents of the University of California decided that the Livermore site would become the second laboratory. Although it was agreed that Lawrence would stay at Berkeley, his influence was memorialized through the new lab's name. Herbert York, a student and friend of Lawrence, was the first director of the lab. Although Teller and Lawrence shared many of the same ideals, they had competing ideas of what the new laboratory would look like. Teller wanted a large lab devoted to weapons production and the hydrogen bomb—one with all the resources available. Lawrence, on the other hand, envisioned a smaller, more diverse laboratory. At one point, seeing that the AEC charter did not include work on the hydrogen bomb, Teller threatened to pull his support. Although both were crucial in the creation of the laboratory and its success, Teller's media, political, and military clout would consistently prove to be one of the most effective ways to garner resources for the laboratory and a trump card in personal disputes.

Figure 1. Map of Livermore and Site 300.

With a first-year budget of only $600,000, Livermore Laboratory was initially destined to play a secondary support role for Los Alamos. However, that would soon change. In the first years, Livermore Lab conducted a series of unsuccessful weapons tests. Despite these failures, a high-explosive testing center was opened in 1955, and that same year, Livermore garnered its first weapons design project. Site 300 was acquired in June of 1955 by the AEC for Livermore Laboratories.[18] The 11 square miles of

[17] Gusterson, H. (1996). Nuclear rites: a weapons laboratory at the end of the Cold War. University of California Press.

[18] Site 100 being Berkely and Site 200 Livermore itself. Livermore Laboratories being the name at that time

Site 300 would be key in Livermore's growth. It is home to the world's largest indoor testing facility, the Contained Firing Facility (CFF). Many of the half dozen annual CFF tests and 40 to 50 explosive detonations that are done at Site 300 are created and assembled there.[19]

One of the first large projects Livermore undertook was to design a warhead for the Regulus II missile. Although the Navy eventually pulled the plug on the Regulus II missile, the warhead designed for the Regulus II that came out of Livermore was successful. The warhead would eventually be used and built upon for other missiles. From 1958 to 1961, the Soviet Union and the United States agreed to a moratorium on nuclear testing. This came at a time when Livermore Labs was working on the Polaris warhead for the Navy, a nuclear-armed, submarine-launched ballistic missile (SLBM).

Seemingly unaffected by the moratorium, the US Navy successfully deployed the first batch of Polaris warheads in 1960. The success and momentum of this project would give Livermore a near monopoly on all strategic Intercontinental Ballistic Missile (ICBM) warheads from the 1960s until the mid-1970s. During this moratorium, Livermore branched out into supercomputer modeling. While the lab had been using computers since 1953 to design thermonuclear weapons, the moratorium forced Livermore to focus its efforts on modeling nuclear reactions with the use of supercomputers. This computer modeling would expand to Site 300 and become key in non-nuclear warhead research. In 1971, following community and university backlash, the university and the lab split. Although still under management by the University of California Regents, the lab was no longer a part of UC Berkeley.

3.1. Polaris

The events that led up to Polaris and its eventual success were definitive moments of organizational imprinting. The success of Polaris demonstrates how the resources reaped from Teller's off-the-cuff promises, the impact of policy connections, and isolation acted as the catalyst for the lab's approach to resource dependence as well as the lab's political influence today.

The process of imprinting involves the integration of the imprinting pressures into the organizational structure. The literature on the actual imprinting process is plagued with inconsistencies and mechanisms specific to each case. There is, however, consensus regarding the factors that create the proper environment for the imprinting process to take hold. Entry into new markets, as well as during or succeeding periods of poor performance or crisis, are known as sensitive periods.[20] During these times, organizations can internalize the environmental constraints and reflect them in the structure, norms, and mission.

Livermore began its history with three unsuccessful weapons tests, resulting in calls from across the government and the atomic community for the closure of the young lab.[21] In 1956, the Navy

[19] Map of Livermore's sites- Lawrence Livermore National Laboratory, United States Department of Energy Office of the Assistant Secretary for Defense Programs, United States Department of Energy Office of Scientific and Technical Information, Woodward, R K, Lamarre, A L, Green-Horner, L, Madrid, V M, Oberderdorfer, J A, and Taffett, M J. Natural Attenuation of Tritium in Vadose Zone Moisture and Groundwater at a Lawrence Livermore Site in Northern California, USA. Washington, D.C, Oak Ridge, Tenn.: United States. Dept. of Energy. Office of the Assistant Secretary for Defense Programs ; Distributed by the Office of Scientific and Technical Information, U.S. Dept. of Energy, 1999. http://www.osti.gov/servlets/purl/8839-KHgvjZ/.

[20] Simsek, Z., Fox, B. C., & Heavey, C. (2015). What's Past Is Prologue: A Framework, Review, and Future Directions for Organizational Research on Imprinting. Journal of Management, 41(1), 288–317. https://doi.org/10.1177/0149206314553276

[21] Jeff Garberson, "Study Recounts Early, Difficult Years of Lawrence Livermore National Lab," The Independent, August 23, 2013, https://www.independentnews.com/news/study-recounts-early-difficult-years-of-lawrence-livermore-national-lab/article_44e876e2-0aad-11e3-a35f-001a4bcf887a.html. Also Goodwin, Bruce T. "Spotlight on National Labs: Lawrence Livermore National Lab." American Nuclear Society Young Members Group Webinar. Lecture presented at the American Nuclear Society Young Members Group Webinar, July 16, 2020.

invited staff from Los Alamos and Livermore to discuss an anti-submarine warfare study called Nobska. The focus of the study was to put nuclear warheads on submarines. Teller promised he could make a 30-fold improvement in weight to yield of the nuclear warhead. More damage in a smaller delivery system was extremely enticing to the Navy. His proposition for a small one megaton warhead captured the attention of the Navy and Livermore received funding for the project. There was much skepticism that his project could be completed. In response to an Air Force request for a factual and unbiased opinion of Polaris, the RAND Corporation released a 1958 memorandum expressing its necessary role in the United States' deterrent force.[22] At this time, the Air Force was in an organizational battle for resources with the Navy and Army. Each wanted a deterrence strategy with their own organization at the center. This played a huge factor in the Navy's choice to pursue Polaris and the Air Force's opposition.[23]

Despite the fact that only one element of the system had been tested before the 1958 testing moratorium took effect, Livermore's budget and staff grew, and the first batch of Polaris warheads were successfully deployed in 1960. The success of this project would give Livermore a near monopoly on all strategic Intercontinental Ballistic Missile (ICBM) warheads until the mid-1970s.

3.2. RAND Corporation: Livermore's Introduction to the Power of Policy

Due to the nature of how these organizations interact, it is impossible to quantify the effect that the RAND Corporation's 1958 memorandum had on the implementation of Polaris. However, the effect of the reciprocal influence between the RAND Corporation and Livermore is well documented. As previously noted, Teller's bid for a second laboratory was supported by David Griggs, one of the architects of RAND. Adding to the connection, Griggs had met Lawrence at the MIT radiation laboratory after the end of World War II.

RAND began as a Research and Development arm of the Douglas Aircraft Company, an aerospace and defense company based out of Southern California. In 1958, the Air Force approved a split between Douglas and Project RAND, leading to the creation of the RAND Corporation as a non-profit. RAND is often considered the first think tank and has played a major role in researching and promoting policy during the Cold War. RAND is responsible for much of early game theory, the growth of War Games, and different deterrence strategies, and it played a prominent role in the conflicts in both Vietnam and Korea.

Prior to Polaris and shortly after Livermore's founding, then Director of Physics for the RAND project David Griggs directed his political analysts to engross themselves in the work taking place at the new lab. Tom Ramos, author of *From Berkeley to Berlin: How the Rad Lab Helped Avert Nuclear War* and member of the Livermore team behind Reagan's Strategic Defense Initiative, wrote about the analysts who went to Livermore, many of whom would become major influencers in the field of nuclear policy. Included in the group were names like Bernard Boddie, William Kaufmann, Andy Marshall, Albert Wohlstetter, and Herman Kahn. Ramos hints at the intimacy of this relationship by describing how Kahn spent so much time at the laboratory that he had his own office.[24]

The analysts who immersed themselves at Livermore saw the weight and size of the current

[22] E.P. Oliver, Polaris Weapon System, 28 October 1958, RAND Memorandum RM-2311, Secret, excised copy

[23] John T Correll, "The Ups and Downs of Counterforce," Air & Space Forces Magazine, May 15, 2024, https://www.airandspaceforces.com/article/1005counterforce/#:~:text=McNamara%2C%20was%20 likewise%20 repelled%20by,targeting%20 doctrine%20in%20 February%201961

[24] Tom Ramos, "The Importance of Professional Nuclear Policy Analysis," Nipp, October 3, 2022, https://nipp.org/information_series/tom-ramos-the-importance-of-professional-nuclear-policy-analysis-no-535-october-3-2022/.

warheads as a vulnerability. Heavier warheads called for stronger delivery systems, limiting options available for a possible second strike. Ramos tracks how that information was conveyed to the staff at Livermore. Livermore's focus was directed at creating smaller weapons; after the initial failures, they had successfully designed and tested the smallest hydrogen bomb yet.[25] It was this allegiance between RAND and Livermore that enabled the lab to pursue Polaris and for RAND to endorse it. This partnership made the theory of counterforce and limited nuclear war that Herman Kahn and others at RAND had been pushing a possible reality.[26] When discussing the success of Polaris and the relationship between RAND and Livermore, Ramos writes, "This wasn't an accident, and it doesn't mean that Los Alamos was incapable of achieving a similar feat. It does show, however, how potent it is to have nuclear policy analysts as integral contributors to the design process."[27]

Coming from an employee of the laboratory for over 40 years, Ramos's thesis is unsurprising: key actors at Livermore like Lawrence and Teller, in tandem with RAND analysts, saved the United States from nuclear war by creating weapons that lead to an effective deterrence strategy. Although Ramos saw the fusion of policies and research and development as a great achievement and his writing reflects that bias, his work offers evidence of historical connections between Livermore and policy creation implementation. Before his book was published in 2022, he was tasked with the creation of an internal classified chronology of Livermore's early weapons development in order to give lectures to the directorate. Much of this history remains classified.[28] The publishing of his book that contains the non-classified history offers new information and sources that might be unavailable to a laboratory outsider.

Ramos's work shows the formation of a laboratory that is intimately connected with the creation and implementation of the policy concerning weapons they are creating. The chronicles of Livermore's organizational relationship with RAND and other political organizations illustrates a sensitive period where organizational imprinting could take place, as well as the formation of Livermore's position in the Iron Triangle of government institutions, special interest groups, and Congress.[29]

Ramos goes further than just framing this relationship in a favorable light. In a 2022 article, he uses his research to critique an article from the nonprofit journal Bulletin of the Atomic Scientists. The article by Alan Kaptanoglu and Stewart Prager was itself a critique of the fact that most of the framing and discourse around deterrence and nuclear weapons is being done by actors who have vested interests in the proliferation of nuclear arms.[30] Once again, the heart of this issue is agency. Ramos wants to only ascribe positive agency to Livermore. Ramos openly stated that Livermore benefited from and shared influence with policy-making organizations. However, at the same time, he rejected the possibility that this unregulated interconnectivity could lead to self-interested decision making. Kaptanoglu and Prager's message was a call to democratize the discourse and honestly discuss the risks of

[25] Tom Ramos, From Berkeley to Berlin: How the Rad Lab Helped Avert Nuclear War (Naval Institute Press, 2022).

[26] William A Stewart, publication, Counterforce, Damage-Limiting, and Deterrence (The RAND Corporation, 1967).

[27] Tom Ramos, "The Importance of Professional Nuclear Policy Analysis," Nipp, October 3, 2022, https://nipp.org/information_series/tom-ramos-the-importance-of-professional-nuclear-policy-analysis-no-535-october-3-2022/.

[28] Jeff Garberson, "Study Recounts Early, Difficult Years of Lawrence Livermore National Lab," The Independent, August 23, 2013, https://www.independentnews.com/news/study-recounts-early-difficult-years-of-lawrence-livermore-national-lab/article_44e876e2-0aad-11e3-a35f-001a4bcf887a.html.

[29] Franklin C Spinney, "National Security Iron Triangle," Tipping Point North South, March 17, 2014, https://tippingpointnorthsouth.org/2014/03/17/national-security-iron-triangle/.

[30] Susan D'Agostino, "US Defense to Its Workforce: Nuclear War Can Be Won," Bulletin of the Atomic Scientists, February 2, 2022, https://thebulletin.org/2022/02/us-defense-to-its-workforce-nuclear-war-can-be-won/.

escalation. In response, actors from the defense silos and inside the nuclear industrial complex that were the subject of the article replied with varying levels of combativeness. One political scientist at the Army Management Staff College, Adam Lowther, editor of the guide that the article critiqued, responded by calling the authors "arm-chair generals" and reminded them that the work they were critiquing was created by "real generals."[31] Ramos joined this conversation with an article titled "The Importance of Professional Nuclear Policy Analysis." Instead of addressing the thesis of the article that focused on the democratization of the discussion and recognition and connection of vested influence on policy, he focused on arguing that this monopoly on the discourse was necessary.

Ramos concluded his essay by asking,

> ....could "amateur" nuclear policy analysts have come out of their silos to provide Kennedy with a nuclear policy strategy as good as the RAND analysts' Counterforce Strategy turned out to be? I doubt it. That nuclear strategy took years of study to develop, and it needed intense collaboration with other members of the defense establishment, including the physicists of Livermore. Their achievement strikes one as being the product of professionals.[32]

Livermore identifies as a force of global peace and beneficial scientific development: an organization that can use federal funds to attract "talented staff," work with private contractors, and simultaneously remain independent.[33] What is Livermore independent from? Much of the lab's early history was not shaped by independence but rather by isolation.

3.3. Livermore versus Los Alamos

The rivalry between Livermore and Los Alamos that began even before Livermore's official opening has been well documented.[34] A major argument for the lab's inception was to spur creation through competition.[35] When Teller and Lawrence were traveling the country campaigning for its formation and collecting allies in the government, military, and private sector, the prospective lab was already attracting opposition. Alongside Oppenheimer and the Atomic Energy Council, they also faced resistance from Norris Bradbury, the director of Los Alamos at the time, who saw the creation of the laboratory as a potential threat to the resources under his control. When Livermore came into being, it had fewer resources and lacked connections with the Air Force, the chief recipient of nuclear weapons. Whoever had a good relationship with the Air Force would receive more and better contracts and support. The rivalry was contentious from the start.[36] Livermore's first test, Ruth, was so

[31] François Diaz-Maurin, "Rebuttal: Current Nuclear Weapons Policy Not Safe or Sane," Bulletin of the Atomic Scientists, May 24, 2022, https://thebulletin.org/2022/05/rebuttal-current-nuclear-weapons-policy-not-safe-or-sane/.

[32] Tom Ramos, "The Importance of Professional Nuclear Policy Analysis," Nipp, October 3, 2022, https://nipp.org/information_series/tom-ramos-the-importance-of-professional-nuclear-policy-analysis-no-535-october-3-2022/.

[33] "Our Mission Our Vision Our Commitments Our Values," Lawrence Livermore National Laboratory , accessed May 17, 2024, https://www.llnl.gov/sites/www/files/2022-09/Mission-Poster_V04.pdf. Also 1. "Management and Sponsors," LLNL, accessed May 16, 2024, https://www.llnl.gov/purpose/management-sponsors.

[34] Staff, "A Nuclear Family Rivalry," Slate Magazine, July 13, 2005, https://www.slate.com/articles/life/welltraveled/features/2005/a_nuclear_family_vacation/a_nuclear_family_rivalry.html. Also, Walter Pincus, "2 Labs Battle to Be No. 1 - The Washington Post," The Washington Post, December 11, 1978, https://www.washingtonpost.com/archive/politics/1978/12/12/2-labs-battle-to-be-no-1/20a1a894-4867-4f9d-97d0-183c6c6d844e/.

[35] JAKE BARTMAN, "Lawrence Livermore National Laboratory: Discover Los Alamos National Laboratory," Los Alamos National Laboratory, April 27, 2023, https://discover.lanl.gov/publications/national-security-science/2023-spring/lawrence-livermore-national-laboratory/#:~:text=%2C%20though%2C%20the%20arts%20race%20between,physics%20and%20design%20at%20Livermore.

[36] Jeff Garberson, "Study Recounts Early, Difficult Years of Lawrence Livermore National Lab," The Independent, August

unsuccessful that it failed to even bring down the 300-foot tower that it was placed on. A picture of the still-standing tower (Figure 2) was framed and sent to Livermore with a note that asked the laboratory to leave the towers for subsequent tests fully intact so that Los Alamos could reuse them in the future.[37]

Figure 1. Photograph of the Ruth tower.

Without the market of the Air Force and influenced by RAND political analysis, the laboratory had no choice but to go small. The laboratories took sides in the battle between the Air Force and the Navy on who would shoulder the future of U.S. deterrence; the Polaris success crowned Livermore the victor and gave them a monopoly on ICBMs until the 1970s. Having gone through the humiliation of failures and playing second fiddle to Los Alamos, Livermore clung to the rewards of Polaris. Teller's method of promise first, develop later had paid off in a big way.

The rivalry between the two laboratories is best demonstrated through the words of those who experienced it: "Remember: The Soviets are the competition. Los Alamos is the enemy (Attributed to Livermore weapons designer)."[38]The relationship has consistently been characterized by heads of laboratories and members of defense communities as a healthy rivalry. However, even advocates of the competition model unintentionally touch on the negative elements that have been imprinted on the labs through this rivalry.

Sybil Francis, director of the policy research group Center for the Future of Arizona, wrote her dissertation at MIT on competition in weapons development and is now researching how the competition between Livermore and Los Alamos can be implemented elsewhere in the government to spur innovation. In discussing the results of the pressures that Livermore faced, she explained that the environment at Livermore "...led to a culture of entrepreneurialism at Livermore, a less conservative approach to weapons design and riskier endeavors."[39] Although she and others might see increased risk and entrepreneurship as positive characteristics of a Nuclear Weapons facility, scientists of the labs and outside observers have come to different conclusions regarding the value and success of the rivalry.

A 1978 Washington Post article focused on the growing intensity of the rivalry in the face of a possible test ban contained interviews with scientists from both labs and from those outside of the rivalry. One scientist who was familiar with both laboratories expressed concern that the rivalry was unhealthy and destructive to the needs of the country. The scientist explicitly stated that "the labs are trying to influence weapons decisions by 'overselling' the nuclear effects of their designs 'in the struggle to be No. 1.'"[40] A scientist from Los

23, 2013, https://www.independentnews.com/news/study-recounts-early-difficult-years-of-lawrence-livermore-national-lab/article_44e876e2-0aad-11e3-a35f-001a4bcf887a.html.

[37] Jeff Garberson, "Study Recounts Early, Difficult Years of Lawrence Livermore National Lab," The Independent, August 23, 2013, https://www.independentnews.com/news/study-recounts-early-difficult-years-of-lawrence-livermore-national-lab/article_44e876e2-0aad-11e3-a35f-001a4bcf887a.html. Photograph of the Ruth tower taken by Los Alamos Observer.

1. LLNL, "Our History - 1950s," LLNL, accessed May 16, 2024, https://www.llnl.gov/purpose/history/1950s#event-the-ruth-event.

[38] Jeffery Lewis, "RRW: Los Alamos vs. Livermore," Arms Control Wonk, September 29, 2005, https://www.armscontrolwonk.com/archive/200807/rrw-los-alamos-v-livermore/.

[39] John Markoff, "Laid-Back in the Lab, Maybe, but They Spurred the Weapons Race," The New York Times, July 4, 2011, https://www.nytimes.com/2011/07/05/science/05bomb.html.

[40] Walter Pincus, "2 Labs Battle to Be No. 1 - The Washington Post," washingtonpost.com, December 11, 1978, https://www.washingtonpost.com/archive/politics/1978/12/12/2-labs-battle-to-be-no-1/20a1a894-4867-4f9d-97d0-183c6c6d844e/.

Alamos shared that the commonly accepted difference between the labs was that while Los Alamos built weapons at the direction of the nations security interest, Livermore "believes it's God's work to build bigger and better warheads."[41]

The rivalry that began with Livermore in a position of little resources and no connections has continued to this day, shaping the organization. Proponents of the competition recognize the organizational effect that it had on the laboratory and see the risk-taking and ambition that resulted from it as a benefit. However, the scarcity of resources and political influences from RAND cornered Livermore, so they became dependent on the creation of smaller counterforce weapons. At first, it was just to survive and escape the humiliation of early failures. However, by building off this established period of imprinting, it will be demonstrated that risk-taking and the resource dependency that formed in the early years of the lab continue to shape the lab today in its role as a driver of arms racing.

3.4. Teller: Solitaire Separation and Star Wars

Teller, along with early Livermore supporter and resident RAND analyst Herman Kahn, was the inspiration for the fictional scientist in Stanley Kubrick's political satire film Dr. Strangelove.[42] The Hungarian-born United States physicist is consistently characterized as an overly ambitious man whose back-of-the-envelope calculations needed extensive review and grounding by his peers.[43] The creation of Livermore, his testimony against Oppenheimer, and his pursuit of missile defense deeply imprinted on Lawrence Livermore's organizational ethos. As a founder, Teller sent the laboratory on a path of risk-taking, isolation from the larger scientific community, and political maneuvering. Teller responded to the scientific isolation by embracing military support and influence, leading the laboratory to become more integrated into the early military-industrial complex and internalizing the hawkish organizational ethos of military organizations into Livermore's own ethos.

Teller, who had been preaching and exploring the idea of a hydrogen bomb since his time at the Manhattan Project, would finally find success in what would be known as the Teller-Ulam design. The importance of Stanisław Ulam, a Polish Jewish physicist, in the development of the hydrogen bomb has been debated. The controversy stems from Teller's self-promotion and historical campaigning for the hydrogen bomb. Today, it is widely accepted that Teller, "the father of the hydrogen bomb," would not have been successful without Ulam. Teller constantly dismissed and denied Ulam's impact; this self-aggrandizing would be the first step down a road of isolation from the scientific community.[44] Despite the controversy, the hydrogen bomb skyrocketed Teller's political capital and made him a hero of the nuclear age.

His propensity to fully immerse himself in an idea and leave the hard calculations for later was key to landing Polaris and greatly influenced Livermore organizational ethos. In reviewing Livermore insider and author Bruce Tarter's history of Livermore, Benjamin Sims writes,

> Livermore continued to display greater willingness than Los Alamos to engage in political and technical maneuvering to push new and risky projects, even where

[41] Walter Pincus, "2 Labs Battle to Be No. 1 - The Washington Post," washingtonpost.com, December 11, 1978, https://www.washingtonpost.com/archive/politics/1978/12/12/2-labs-battle-to-be-no-1/20a1a894-4867-4f9d-97d0-183c6c6d844e/.

[42] Peter Goodchild , "Meet the Real Dr Strangelove," The Guardian, April 1, 2004, https://www.theguardian.com/science/2004/apr/01/science.research1.

[43] Broad, W. J. (1992). Teller's war : the top-secret story behind the Star Wars deception. Simon & Schuster.

[44] Schweber, S. S. (Silvan S.). (2000). In the shadow of the bomb : Oppenheimer, Bethe, and the moral responsibility of the scientist (Core Textbook). Princeton University Press. https://doi.org/10.1515/9781400849499

> technical feasibility had not quite been established. Although this strategy enabled the laboratory to grow, in some cases it led to technical and administrative difficulties. It also contributed to the laboratory's reputation for actively pushing a militaristic, 'hardline, anticommunist point of view' that led to public criticism—particularly in relation to missile defense. [45]

It is well-documented that much of the scientific community opposed the creation of Lawrence Livermore. The formation of the laboratory, the military, and the RAND Corporation may have further isolated Teller and Lawrence, reflected in their leadership and staff choices. The staff consisted of young scientists who had grown under Lawrence and Teller and shared their anti-communist fervor.

Already cut off from the larger community and embroiled in an intense rivalry with Los Alamos, Teller and Livermore were further segregated from the scientific community after his testimony at the 1954 AEC hearing. Teller was the only scientist to testify that Oppenheimer should not receive security clearance. Notably, Ernest Lawrence did not attend the hearing due to battling colitis. However, Teller's equally hawkish Livermore Lab partner later said that Oppenheimer should never again be in the position to influence policy. [46] Despite his hardline anticommunist views, Teller's main concern during the trial was Oppenheimer's opposition to the H-bomb. Isidor Isaac Rabi, a Nobel prize-winning physicist, had been a critic of the militarization of science since the Manhattan Project. When asked about the outcome of Teller's testimony, he plainly stated that "The scientific community was thoroughly behind Oppenheimer. Teller disgraced himself, and he was more or less ostracized. But there was no rift." [47]

When Teller segregated himself from the scientific community, he found the lucrative embrace of the military and sought their support and political maneuvering to continue to pursue his passions.

3.5. Plowshare

The possibility of a test ban and the creation of the Plowshare program demonstrates how Livermore learned to respond to threats to its ability to acquire resources. By framing nuclear weapons as the key to untapped civilian benefits, Livermore learned to disguise its pursuit of resources through weapons development as purely scientific projects.

The possibility of a test ban represented a threat to Livermore's ability to acquire new resources. Fears of a nuclear winter were one of the major motivations for a test ban. In response, Teller used his image as the Father of the Hydrogen bomb and his new political connections to argue that Livermore was on the brink of creating a clean bomb that could be used for civilian use. He lobbied Congress and appeared on TV to oppose the test ban treaty, arguing that tests were needed for the creation of a clean bomb. Teller proposed that clean bombs could be used for mining, extraction of oil, and projects such as the Panama Canal. Simultaneously, he worked to prove that the test ban treaty would be ineffective: "Under Teller's direction, his colleagues at Livermore devised ever wilder schemes to prove that nuclear testing could be hidden and, therefore, a test ban was not possible. These included exploding weapons in deep caves,

[45] Sims, Benjamin. Review of *The American Lab: An Insider's History of the Lawrence Livermore National Laboratory*, by C. Bruce Tarter. *Technology and Culture* 61, no. 4 (2020): 1238-1240. https://doi.org/10.1353/tech.2020.0136.

[46] Staff, "Lawrence and the Cyclotron," Niels Bohr Library & Archives, accessed April 15, 2024, https://history.aip.org/exhibits/lawrence/lcw.htm#:~:text=A%20out%20of%20 colitis%20 prevented,convince%20the%20AEC%20to%20 withdraw.

[47] "War and Peace in the Nuclear Age; Weapon of Choice, The; Interview with Isidor Isaac Rabi, 1986," 03/13/1986, GBH Archives, accessed May 16, 2024, http://openvault.wgbh.org/catalog/V_7E62DED261394CEDBB3A79E9260DB791.

building a gargantuan shield to hide x-rays from earthbound observers, and planning nuclear tests on the far side of the moon."[48]

This effort to retain the resources collected from weapons testing eventually manifested itself as the Plowshare program, an exploration into safe civilian uses for nuclear bombs. President Eisenhower and his Atoms for Peace initiative were excited by the possibilities that the Plowshare program and a clean bomb advertised. With presidential support, Project Chariot was born: a project aimed at creating a deep seaport in Alaska with clean nukes. Following protests by the indigenous people of Alaska and many in the scientific community, Project Chariot was scrapped. Although the plowshare program survived the 1963 test moratorium and remained until 1977, boasting 27 nuclear tests during its life, no major breakthroughs in civilian use came from it.

Today, Livermore describes the creation of Plowshare as a response to Atoms for Peace, with the express goal of safe civilians; the reality is that Teller's promise of a clean bomb never existed and does not exist today. In his book *Edward Teller: The Real Dr. Strangelove,* long-time BBC television producer Peter Goodchild rejects that narrative, determining that Plowshare's goal in Alaska was not really civilian use. Goodchild writes, "Chariot was intended as a cover for military activities."[49]

Plowshare and Polaris demonstrate how Teller and Livermore have pursued resources through untested and nonexistent promises of technology. Nuclear weapons creation and testing were the goals of the laboratory; non-weapons projects were created as a means to ensure that the resources from testing and creation remained. The isolation of Livermore and the condemnation of Oppenheimer brought Teller and Livermore further into the arms of the military and political clout and maneuvering to acquire resources.

3.6. STAR WARS

When asked about the creation of the hydrogen bomb and Teller's tendency to pursue projects before having the science to support them, Isidor Isaac Rabi said, "…he pursued it very passionately, and at the time of this discussion, the General Advisory Committee, what he was advocating couldn't work…that reminds me very much of what we have now 36 years later with Edward Teller in the same position advocating something which would not work. Advocating it with enormous passion and eloquence. As I say, history doesn't repeat itself, but in this case, it does."50

In this quote, Rabbi refers to Reagan's STAR WARS program. The failures of The Strategic Defense Initiative and President Bush's Brilliant Pebbles Rabbi refer to missile defense and, more specifically, Reagan's STAR WARS program. The failures of The Strategic Defense Initiative and President Bush's Brilliant Pebbles missile defense systems are well documented. The science to create an effective shield was never there. The idea threatened numerous treaties, and the idea of mutually assured destruction opened the door for limited nuclear war. Because of the numerous and well-documented critiques of the Strategic Defense Initiative, this thesis offers only brief documentation of its foundation in relation to Teller and Livermore to further demonstrate the effectiveness of the resource-collecting methods Teller and Livermore have historically engaged in.

After a short stint as the director of Livermore, Teller's imagination and anti-communism drove him to find a new passion. Teller's 1962 book *The Legacy of Hiroshima* unveiled his new mission: missile defense. In his book,

[48] Lawrence Wittner, "Edward Teller: The Real Dr. Strangelove-A Book Review," Nuclear Age Peace Foundation, July 1, 2013, https://www.wagingpeace.org/edward-teller-the-real-dr-strangelove-a-book-review/.

[49] Goodchild, P. (2004). Edward Teller : the real Dr. Strangelove. Harvard University Press

[50] "War and Peace in the Nuclear Age; Weapon of Choice, The; Interview with Isidor Isaac Rabi, 1986," 03/13/1986, GBH Archives, accessed May 16, 2024, http://openvault.wgbh.org/catalog/V_7E62DED261394CEDBB3A79E9260DB791.

Teller argues missile defense is a way to defend America and break free from mutually assured destruction. Following the thinking of RAND analysts, he critiqued mutual deterrence and argued that X-ray-backed missile defense would enable the United States to engage in localized limited nuclear war in response to Soviet aggression.[51] Teller's new passion was hampered by the 1963 test ban. However, throughout the Plowshare program and underground testing, he continued to work on testing warheads for missile defense. Livermore would test larger and larger warheads underground in the name of missile defense, but that too came under threat with the 1974 Threshold Test Ban Treaty. With Nixon's resignation due to Watergate, Teller saw new President Ford and Vice President Rockefeller as a welcome opportunity to promote missile defense and lobby against test bans. Teller and Rockefeller had been friends since the 50s and the Vice President saw Teller as a one-of-a-kind genius. The scientific community at large found many issues in the feasibility of Teller's idea. Their skepticism and the Threshold Test Ban taking effect in 1976 caused the conversation around missile defense to die down.

The 1979 partial meltdown of a reactor that would come to be known as the disaster at Three Mile Island would invoke fear in the nation and continue to stifle support for Teller's ideas. Although missile defense was not on the public's mind, Teller continued to work and focus on his passion project. The election of Ronald Reagan gave Teller the opportunity he had been waiting for. Teller pitched the idea to Reagan at a tour of Livermore when he was first elected governor. Teller and Reagan were both staunch anti-communists and saw military might as the correct way to deal with the Soviet Union. Teller would become a frequent visitor to the White House, dazzling the president and his staff with his promises of missile defense and the progress in X-rays taking place. Teller would continue the tradition, stoking fears of a Soviet attack and making promises of soon-to-come breakthroughs, and Reagan bought all of it.

Reagan would sign NSDD 12, The Strategic Forces Modernization Program, funneling a massive number of resources into the weapons laboratories and specifically to Teller's work on missile defense. With Teller in attendance, Reagan would make the 1983 STAR WARs speech, calling on the scientists who brought the United States the hydrogen bomb to once again protect the nation. Much of Livermore's work in supercomputing and lasers was made possible by the resources given under President Reagan.

Teller would continue to lobby for missile defense, oppose treaties, and make new promises. He was the champion of Brilliant Pebbles under George H.W. Bush and was a champion of congressional Republicans under Clinton. In the last years of his life, his lifelong passion for missile defense would earn him a Presidential Medal of Freedom and help destroy the Anti-Ballistic Missile Treaty. For 30 years, the ABM Treaty supported deterrence and prevented arms racing between the United States and the Soviet Union.

Teller is still a hugely influential and polarizing character, celebrated for his scientific achievement and condemned for his hawkish ideas. His imprint is still evident in the laboratory he founded and United States Nuclear policy. Most important is his imprint on Livermore in regard to acquiring resources. Out of isolation, he welcomed military-political support and saw that being deeply influential in the creation and dissemination of policy was a way to ensure continual resources.

4. End of The Cold War

The end of the Cold War offered the possibility of real change for the weapons laboratories. The Department of Energy and Congress had plans for

[51] Broad, W. J. (1992). Teller's war : the top-secret story behind the Star Wars deception. Simon & Schuster.

centers of innovation and drivers of growth. The possibility of cleanup and accountability was tangible. However, as demonstrated by today's modernization, those lofty goals failed to materialize. Understanding how the laboratory and its mission survived the end of the Cold War is crucial to understanding its influence today. In 1991, only 36% of Livermore's budget was dedicated to research and development of nuclear weapons, while their 2024 budget request devotes 84.3% to nuclear weapons activities.[52] This happened because the organizational mission never really changed. By examining the creation of the National Ignition Facility and the creation of both the Center for Global Security Research and the International Security Research Facility, it will be made clear that although threatened, the organizational mission and imprinted processes of resource capture continued to drive the laboratory.

4.1. Possibility for Change

The signing of the INF and the first two START treaties was the culmination of successful arms control negotiations to end the arms race, shifting the focus from fighting nuclear war to enshrining mutual deterrence. This meant the U.S. would no longer need new high-tech nuclear weapons. The fall of the Berlin Wall and, shortly thereafter, the Soviet Union signaled the end of the Cold War and a bipolar world. Institutions like Livermore, which were designed for coordinated weapons research, development, and supremacy during the Cold War, suddenly found themselves without a mission, network, or the national support they had grown accustomed to.

Starting in 1989, Livermore's X-ray and laser faced budget cuts, leading to the complete closure of the X-ray laser division in 1990. Under President Bush, the last weapons system that Livermore had been commissioned to design, the SRAM II, was canceled. Across the defense industry, budgets were slashed and discussions about closing one of the research and design laboratories spread throughout the government. Many believed that Livermore should be closed or repurposed.

In 1995, the Stockpile Stewardship Program came into full effect, Livermore's focus was now the extremely inexpensive Stewardship and Life Extension Programs. It takes a small number of people to safely store and maintain the existing weapons. Life Extension Programs work by replacing pieces of a weapon system with an exact copy when necessary, which is understood as maintaining the stockpile and not modernizing. During this time Livermore was forced to branch out with developments in the human genome project and climate modeling. Supercomputing continued to serve as a way to monitor and test the stockpile safely and offered other areas for research. Despite the possibility for change, Livermore's historic organizational mission and ethos were still evident during the early post-war years.

4.2. The NIF

Livermore's creation of the National Ignition Facility was advertised as a way to ensure the safety and stewardship of the stockpile and explore fusion ignition in the name of science. The $3.5 billion facility was explicitly stated not to be used for modernization. However, on page 703 of the *Energy and Water Development Appropriations for fiscal year 1994*, three purposes for contained ignition facilities and the National Ignition facility are given. The first purpose was to play a crucial role in exploring physics regimes related to nuclear weapon design and to provide relevant data, especially concerning the design of secondary weapons.[53] The second purpose was to

[52] Marshall, Eliot. "Weapons labs: after the Cold War." Science 254, no. 5035 (1991): 1100+. Gale OneFile: Health and Medicine (accessed May 19, 2024). https://link.gale.com/apps/doc/A11630748/HRCA?u=oregon_oweb&sid=googleScholar&xid=0d566925.

[53] Energy and Water Development Appropriations for Fiscal Year 1994: Hearings Before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Third Congress, First Session, on H.R. 2445. United States: U.S. Government Printing Office, 1993.

offer a simulation capability for nuclear weapon effects on strategic, tactical, and space assets, including sensors and command and control.[54] The third and final reason was to generate ignition for civilian power

The NIF was paid for by funds from defense programs earmarked for nuclear weapons. Continuing the tradition perfected by Teller with projects like Plowshare, the NIF was greenwashed by Livermore and sold as research for civilian benefit, as well as a critical element to keeping the labs successful in their mission of stockpile stewardship. Through the development of the NIF, the cost continuously rose while progress slowed. In addressing these issues, Livermore continued to come up with a new rationale for the necessity of such a facility. One argument put forward was that without weapons work, the best and brightest scientists would leave.[55]

4.3. The September 11th Attacks

The attacks on 9/11 shook the United States to its core. In response, defense spending skyrocketed, doubling in the decade after the attacks. Since 9/11, around half of the $14 trillion spent on defense has gone to private contractors, making Washington, D.C. the largest regional economy from 2001 to 2011.[56] The laboratory gained funding for chemical weapons research, contracts for truck armor creation, and short-lived research into new tactical nuclear Bunker Busters. The laboratory pursued the Reliable Replacement Warhead program from 2004 to 2009. The program was a return to modernization disguised to look like Life Extension as usual.

4.4. Center for Global Security Research

Livermore founded the Center for Global Security Research in 1996, followed by the construction of the International Security Research Facility in 2002. Its mission is to bridge the scientific and policy communities. It has grown tremendously in influence since its creation and opened new avenues for Livermore to exert power. The center now attracts former government employees, private interests, academics, and the military. Its creation set the stage for the laboratory's influence today and was an important step in creating a future where the laboratory would not face the resource shortages and organizational threats it faced in the years following the end of the Cold War. The end of the Cold War posed existential threats to Livermore's organizational mission and offered a real opportunity for restructuring and change. The lab continued to use its historical forms of resource acquisition through projects such as the NIF. However, this thesis sees 9/11 as the deciding factor that enabled the laboratory to hold on to its organizational ethos. It was only 10 years between the end of the Cold War and the September 11th attacks. Both shocked the country and its defense industry in different ways. Under the George W. Bush administration, the laboratory would continue to escape the post-Cold War decade and begin its transformation into the laboratory of today.

[54] Energy and Water Development Appropriations for Fiscal Year 1994: Hearings Before a Subcommittee of the Committee on Appropriations, United States Senate, One Hundred Third Congress, First Session, on H.R. 2445. United States: U.S. Government Printing Office, 1993.

[55] National Ignition Facility: Management and Oversight Failures Caused Major Cost Overruns and Schedule Delays: Report to the Committee on Science, House of Representatives. United States: General Accounting Office, 2000.

[56] Knickmeyer, Ellen. "Study Says Nearly Half of Defense Spending for 9/11 Wars Went to Private Contractors." PBS, September 13, 2021. https://www.pbs.org/newshour/politics/study-says-nearly-half-of-defense-spending-for-9-11-wars-went-to-private-contractors.

Knickmeyer, Ellen. "Study Says Nearly Half of Defense Spending for 9/11 Wars Went to Private Contractors." PBS, September 13, 2021. https://www.pbs.org/newshour/politics/study-says-nearly-half-of-defense-spending-for-9-11-wars-went-to-private-contractors.

MorningBrew. "For the Defense Industry, 9/11 Changed Everything." Morning Brew, September 5, 2021. https://www.morningbrew.com/daily/stories/2021/09/05/defense-industry-911-changed-everything.

5. Privatization

In 2003, after frustration with lab management and concerns about security, then-Secretary of Energy Spencer Abrams decided not to renew the Department of Energy (DOE) contract with the University of California, which had run the laboratory since its inception.[57] Citing security concerns at both Los Alamos and Lawrence Livermore, Abrams gave a public statement where he bluntly stated that the university "bears the responsibility for the systemic management failures that came to light in 2002."[58] The new path forward under the Bush administration would be one of privatization. The University of California's contract would run out in 2005, and the DOE began to accept bids for private contractors to run the laboratory.[59]

Privatization and the incentive structures it introduced marked another pivotal moment in Livermore's organizational history. Its traditional organizational mission was to acquire resources for the running of the laboratory. Former directors of the laboratory who were key drivers of arms racing and risk-taking, like Teller or York, sought out political influence and power to acquire resources for the laboratory and their passion projects. Privatization fundamentally changed Livermore's incentive structure, goals, and processes. The laboratory had attracted and developed its mission through ethos and ideological similarity. As demonstrated throughout this thesis, from its inception, Livermore developed a reputation as the younger, more hawkish, risk-taking laboratory in comparison to Los Alamos. This developed organizational selection processes and influenced how the laboratory was able to acquire resources. Historically, Livermore's largest successes in terms of resources came from periods when hawks were in power, and the laboratory was able to embed itself in the policy decisions of that time due to shared ideology. This was historically successful but also constrained by who was in office and their disposition towards the nuclear weapons complex. With privatization came a managing company driven by profit. This changed the historic structure of the laboratory but opened new doors for lobbying and political maneuvering that were not limited by prior constraints.

Only private companies were allowed to bid on managing the laboratory. The University of California joined Bechtel, BWXT, and Amentum to form Lawrence Livermore National Security LLC (LLNS). LLNS took control of the laboratory in October 2007. The year prior, the lab was operated by Los Alamos National Security LLC (LANS). LANS, which took over both Los Alamos and Lawrence Livermore in 2006, is an LLC made up of the University of California, Bechtel, Babcock & Wilcox.[60]

This marriage of private contractors and governmental departments has become a hallmark of the United States entrepreneurial state-defense model. Examples include the operations of the Defense Advanced Research Projects Agency (DARPA) and the Small Business Innovation Research (SBIR) pilot program passed under President Jimmy Carter. Proponents of this model argue that the partnership between the state and the private sector leads to more rapid and successful growth in areas that the private sector might not otherwise invest in. The state acts as the catalyst for development, and the private sector can then work more effectively with less red tape and oversight.[61]

[57] "The Wen Ho Lee Case," Science , December 22, 2000, https://www.science.org/doi/10.1126/science.290.5500.2224b.
[58] Walter Walter Pincus, "Los Alamos Contract Open for Bids," *The Washington Post*, April 30, 2003.
[59] Notably the Non Profit TRI Valley-Cares submitted a bid for management of the Lawrence Livermore laboratories. The bid was submitted under GREEN LLC, in part with Citizens Against a Radioactive Environment and Nuclear Watch of New Mexico. TRI Valley Cares alleges that their bid was rejected prematurely and without substantial review or basis.
[60] Alaina G Levine and Michael Lucibella, "It's a Bumpy Ride to Private Management for Los Alamos, Livermore," American Physical Society, June 2010, https://aps.org/publications/apsnews/201006/losalamos.cfm.
[61] Mariana Mazzucato, "The US Entrepreneurial State ," essay, in THE ENTREPRENEURIAL STATE (Penguin , n.d.).

The first major material changes that came from the new private management of the lab appeared in staffing and budget; however, some soon questioned if there was a less tangible yet more consequential transformation.

Under the University of California's sole management, the highest management cost in the lab's history was capped at $6.75 million in 2005. Just three years later, in 2008, LLNS recorded management costs of $30.9 million, followed by $47 million in 2009.[62] During the same period that the management budget ballooned, the lab experienced massive layoffs and buyouts affecting scientists, engineers, and workers. According to multiple sources, spending on management was prioritized overspending on staff.[63] The 2008 layoffs that the privatization of management ushered in resulted in lawsuits filed by 130 laid-off employees. The plaintiffs alleged breach of contract, age discrimination, and retaliation, among other individual claims. LLNS did everything in its power to drag the case out, using considerable resources to separate the cases, bifurcating plaintiffs' claims, and move them in and out of federal courts. In 2013, the case came to a close with a $37.25 million settlement made with federal funds. During the case, it was found that 40 new managerial positions were created at LLNS, many of which were staffed by employees of the Bechtel corporation. The court found that these positions significantly increased overhead; simultaneously, LLNS located and targeted the most senior and experienced employees for layoffs.[64]

5.1. Bechtel

Bechtel is well practiced in lobbying, controversy, and profiteering from conflict. Founded in 1898, Bechtel has a storied history deserving of further reading.[65] In order to understand the new organization brought by the controlling interest in the laboratory's management, it is important to examine key aspects of their structure and operations.

Bechtel is an organization with involvement in everything from the Hoover Dam to CIA-directed foreign policy. The privatization of water and nuclear infrastructure are two major industries for the organization. In 1997, the World Bank placed a condition on any further aid to Bolivia; the country would need to privatize water services in some of its largest urban centers. In 1999, as the sole bidder in the classified process, Bechtel won the contract. Within weeks, they raised the water prices by 50%. What followed became known as the Cochabamba Water Revolt.[66] In the aftermath, Bechtel sued Bolivia—not for their initial investment but for the loss of their expected profit.

Bechtel has built or designed half of the nuclear power plants in the United States. They have been charged with or responsible for numerous safety violations, hazards, and disasters. After the disaster at Three Mile Island

[62] Alaina G Levine and Michael Lucibella, "It's a Bumpy Ride to Private Management for Los Alamos, Livermore," American Physical Society, June 2010, https://aps.org/publications/apsnews/201006/losalamos.cfm.

[63] Roger Logan and Jeff Colvin, "Privatizing National Lab Management Misguided," SFGate, September 25, 2013, https://www.sfgate.com/opinion/openforum/article/Privatizing-national-lab-management-misguided-4843513.php. John Upton, "Employee Lawsuit Exacerbates Issues at Livermore Lab," The New York Times, September 11, 2011, https://www.nytimes.com/2011/09/11/us/11bclivermore.html?_r=1. "Lynda Seaver, a lab spokesperson, said spending on staff and operations had fallen because of a substantial increase in management fees." Robert Weissman, "Privatization Dogma Confronts Reality at Lawrence Livermore Lab," HuffPost, June 7, 2015, https://www.huffpost.com/entry/privatization-dogma-confr_b_7020702.

[64] "$37.25m Settlement in Lawsuit over 2008 Layoff at Lawrence Livermore Lab: Alameda-Contra Costa Trial Lawyers Association," Alameda-Contra Costa Trial Lawyers Association |, August 29, 2019, https://acctla.org/verdict/37-25m-settlement-in-lawsuit-over-2008-layoff-at-lawrence-livermore-lab/. - LLNS's Aim In All Of This Was Clear – Drag Things Out And Force The Plaintiffs To Settle Cheap. This Was A Particularly Cynical Strategy Given The Advanced Age Of The Plaintiffs.

[65] Denton, Sally. The Profiteers: Bechtel and the Men Who Built the World. United Kingdom: Simon & Schuster, 2016.

[66] "Bechtel vs Bolivia," THE DEMOCRACY CENTER, accessed May 19, 2024, https://www.democracyctr.org/bechtel-vs-bolivia#:~:text=In%20April%202000%2C%20following%20a,was%20force%20to%20leave%20 Bolivia.

(the 1979 partial meltdown of a reactor designed by another private interest that manages Livermore Babcock & Wilcox), Bechtel was contracted for cleanup. During the cleanup, investigators also confirmed that Bechtel employed various methods to bypass the necessary repair procedures and compromised safety checks to meet unrealistic deadlines.[67] Since 2000, Bechtel has paid $936,443,338 in penalties.[68] The company has perfected the revolving door, with historically deep ties to Republican Congress members, administrations, and the CIA. George Shultz served as the president of Bechtel, worked in the Nixon and Eisenhower administrations, and then returned to Bechtel to serve as its director until 2006. During this time, he helped President Bush develop the Bush Doctrine and helped Bechtel secure profits before and after the invasion of Iraq.[69] Along with Lockheed Martin and others, Bechtel receives millions of dollars to manage the Nevada Test Site. In 2023, eight out of nine Bechtel lobbyists had previously held positions in government.[70] That same year, their most lobbied bill was S.826: The International Energy Act of 2023.

5.2. Profiteers and Perils of Proliferation

In his article "The Perils of Proliferation," Scott Sagan uses organization theory to examine the contradiction between nuclear weapons and deterrence. He uses organization theory to critique the assumed rationality that those like Kenneth Waltz and others in the proliferation camp endorse. In his article, Sagan makes two key arguments. The first is that military organizations are drawn to systemic organizational behaviors that lead to deterrence failures and demonstrate a propensity for preventative strikes. This argument posits that military organizations, in their isolated dogma, will fail to place larger political and societal interests ahead of the rules and norms that govern military organizations. Secondly, he argues that strong civilian control and oversight can act as a counterbalance against the ingrained organizational features. Building off of this framework, this thesis has demonstrated that, like military organizations, Livermore has been shown to place its organizational dogma and norms ahead of societal interests in its pursuit of resources and mission success. The laboratory has shown norms that select and reward hawkish projects and ideologies that have been strengthened by the embrace of the military and segregation from the scientific community. To his second point, the laboratory's formative relationship with RAND, its early political maneuvering, and the creation of the CGSR all demonstrate efforts to control policy and curb oversight. The backlash in response to Kaptanoglu and Prager's call for the democratization of discourse in the Bulletin of the Atomic Scientists is evidence of the ethos of repudiation of laboratory outsiders' input.

The privatization of the laboratory had the inverse effect that Sagan's civilian oversight board would have. Although the initial transfer caused organizational confusion and mission stagnation, the means for acquiring resources remained the same and the methodologies to collect them expanded. The companies that now manage the laboratory system are well versed in the consolidation of power and profitably of weapons. The anti-communist zeal that drove the founders of the laboratory may not be relevant in a post-Cold War age, but today laboratories' motivations produce the same arms racing results, possibly more effectively.

[67] Philip, "Reactor Cleanup at 3 Mile Island in Found Improper," The New York Times, September 14, 1983, https://www.nytimes.com/1983/09/14/us/reactor-cleanup-at-3-mile-island-in-found-improper.html.

[68] "Bechtel: Violation Tracker," bechtel | Violation Tracker, accessed May 19, 2024, https://violationtracker.goodjobsfirst.org/parent/bechtel.

[69] CorpWatch, Global Exchange, and Public Citizen, "Bechtel: Profiting from Destruction," CorpWatch, June 5, 2003, https://www.corpwatch.org/article/bechtel-profiting-destruction.

[70] "Bechtel Group Profile: Summary." OpenSecrets. Accessed May 19, 2024. https://www.opensecrets.org/orgs/bechtel-group/summary?id=D000000237.

6. New START and the Interagency Charter

It has been established that from 1989–2005, the labs made a concerted effort to resist downsizing in the post-Cold War peace. During this time, the Secretary of Energy's advisory board proposed closing parts of the nuclear weapons complex. In the same year, 1995, a presidential panel declared that the lab system was excessively large and costly for its intended purpose.[71] This repeated itself in 2005 when a second Secretary of the Energy Advisory Board suggested that one of the design labs could close. However, this shrinkage of the nuclear industrial complex and the system of labs never materialized, and by 2007, the labs were privatized. Privatization changed the playbook for the laboratories. It opened new opportunities for lobbying and pursuing profit and placed the labs in positions to politically capture the nuclear policy of the United States. Channeling the ethos of Teller and Lawrence, these newly private institutions worked to ensure that they would never face the uncertainty that the end of the Cold War brought.

In 2013, a reporter using the pseudonym Dienekes released a report featured on the Los Alamos Study Group's website titled "Broken Promises: The White House, Special Interests, and New Start." It traces the ratification of the New START and the formation of an interagency charter to fund Livermore and other nuclear laboratories. The paper's thesis was that President Obama's administration engaged in a quid pro quo with the nuclear laboratories, trading new funding sources and long-term projects for the laboratories' support in ratifying the New START. By following the timeline provided and confirming with primary and secondary documents, a case study of the ratification process will demonstrate a continuation of the laboratories' organizational quest for resources, the integration of assets of privatization, and their influence in the Iron Triangle. Most importantly, it will be shown how, ironically, the ratification of New START laid the foundation for today's modernization. Only 12 days into Obama's presidency, he was nominated for the Nobel Peace Prize. With no significant foreign policy experience or achievements, there was considerable confusion and backlash in the United States and across the globe. The nomination given by the Norwegian Nobel Committee specifically mentioned the president's work on strengthening international institutions and his push toward a nuclear zero.[72] As Obama worked quickly and publicly to find success in the nuclear realm—and justification for the prize—he was already running into a wall.

Initially, the Obama administration brought new challenges for the laboratories. Recently nominated for a Nobel prize with little to show for it, Obama began to wage a massive arms control campaign. The labs now faced the possibility of losing billions in defense contracts, a halt on all new projects, and an administration pushing to downsize the existing arsenal.

In a brilliant political maneuver, the labs weaponized Obama's need for a major foreign policy win. Seeing the Republican wall in Congress that opposed the administration at every move and the possibility of arms control impacting their bottom line, the labs traded their endorsement of New START for a massive increase in funding and guaranteed long-term non-nuclear projects. After the labs secured Obama his victory, the administration's loudly proclaimed goal of nuclear zero disappeared. Finally, in a maneuver that would put David Blaine to shame, the labs transformed disarmament into modernization. By analyzing the events that precluded the New

[71] DIENEKES , "LASG," Los Alamos Study Group , February 5, 2013, http://www.lasg.org/Broken_Promises_Dienekes_5Feb2013.pdf.

[72] "Obama Wins 2009 Nobel Peace Prize," BBC News, October 9, 2009, http://news.bbc.co.uk/2/hi/europe/8298580.stm.

START, it's exceptionally difficult to ignore a clear quid pro quo.

In 2009, the Stimson Center, a foreign policy think tank, wrote a report titled "Leveraging Science for Security: A Strategy for the Nuclear Weapons Laboratories in the 21st Century."[73] This proposal suggested that other agencies, such as the Office of the Director of National Intelligence, the Department of Homeland Security, and the Department of Defense, should take responsibility for funding the labs outside of the Department of Energy. Only three months after the Stimson Center's report, the Department of Defense released a memo from John Fisher, the Pentagon's Director of Defense Laboratory Programs, that outlined the formation of an interagency group just like the one suggested by the Stimson Center.

In the same year that the formation of this interagency charter was being established, the heads of the nuclear labs visited the White House to lobby for more funding. In December 2009, the three heads of the national labs were asked by Republican representative Michael Turner, the senior member of the House Armed Services Committee, to comment on the JASON Study that had been released that year. [74] JASON is an independent advisory group of scientists who advise the United States government on important and sensitive areas of science. They were created as a response to the launch of Sputnik 1 in 1957. The JASON study, ordered by the National Nuclear Security Administration (NNSA), focused on the Lifetime Extension Program with the goal of better understanding its risks and complications. Released in 2009, the study found that the lifespan of current nuclear warheads could be prolonged for decades without any expected loss of reliability by using methods similar to those already applied in LEPs."[75] This showed that the inexpensive practice of stockpile stewardship and the LEP were working.

In response to Representative Turner's request, the heads of the three laboratories (Michael Anastasio of Los Alamos, George Miller of Lawrence Livermore, and Thomas Hunter of Sandia) all wrote letters containing their thoughts on the non-classified JASON report. The letters expressed concerns that the unclassified data used in the report did not allow the JASON team to fully understand the risks and complications that went into the LEP process. In response to JASON's confidence in the long-term viability of the stockpile, as outlined in the unclassified summary, Miller argued that without the more detailed analysis provided in the classified report, he believed the JASON findings underestimated the challenges and risks involved in maintaining a safe and reliable nuclear force.[76]

All three letters, though agreeing with some of JASON's findings, called into question the certainty of others. The uncertainty of what the future would hold and whether new problems would arise underpinned each letter. The New York Times called these letters a warning.[77] A warning about reliability and, more deeply, a warning to the Obama administration about its direction of nuclear policy. Specifically, the ratification of the Comprehensive Test Ban Treaty and SALT II, which would begin to be drafted in April of 2010, both of which faced opposition from Republicans. These letters added fuel to the debate that the JASON study could have helped put out.

When speaking about a meeting with the lab directors in December 2009 at the National

[73] Frances Fragos Townsend, Donald Kerrick, and Elizabeth Turpen, "Leveraging Science for Security," Stimson Center, March 2009, https://www.stimson.org/wp-content/files/file-attachments/Leveraging_Science_for_Security_FINAL_1.pdf.
[74] Meri Lugo , "Arms Control Today," Lab Chiefs Question JASON Study Summary | Arms Control Association, 2010, https://www.armscontrol.org/act/2010-05/lab-chiefs-question-jason-study-summary.
[75] JASON program office, "Lifetime Extension Program Executive Summary ," irp.fas.org, September 9, 2009, https://irp.fas.org/agency/dod/jason/lep.pdf.
[76] Meri Lugo, "Arms Control Today," Lab Chiefs Question JASON Study Summary | Arms Control Association, 2010, https://www.armscontrol.org/act/2010-05/lab-chiefs-question-jason-study-summary.
[77] William J. Broad, "Nuclear Labs Raise Doubts over Viability of Arsenals," The New York Times, March 26, 2010, https://www.nytimes.com/2010/03/27/us/27nuke.html.

Defense University, then-Vice President Biden spoke about the threat that underfunding these labs would have on the United States' security and growth. Biden went on to announce a massive budget increase, allocating $7 billion to maintaining the nuclear stockpile and modernizing nuclear infrastructure. He emphasized that this amount was $624 million more than Congress approved in the previous year, with an additional $5 billion planned over the next five years. Despite the challenging fiscal environment, he assured that the necessary resources for national security would still be committed.[78]

Biden argued that this budget increase is an essential part of Obama's new non-proliferation agenda and the then-president's publicly stated goal of a nuclear zero. During the same 2010 remarks, Biden argued that it was the neglect and underfunding that led to the massive layoffs at both Los Alamos and Lawrence Livermore. The tight budgets led to the loss of jobs for more than 2,000 employees at Los Alamos and Lawrence Livermore between 2006 and 2008, including skilled scientists and engineers.[79] However, this was not true since funding for the laboratories grew after their transition to being run privately. The capital went into management salaries and positions, and it was the laboratory workers who were neglected, not the budgets themselves.

Only two months after Biden's speech, the NEW START treaty was signed on April 8, 2010. In the same month, a Memorandum of Agreement was issued between the DOD and the DOE. In the memorandum, the Department of Defense agreed to work with the Office of Budget Management to transfer $5.7 billion of budget authority for the 2011-15 fiscal year to the NNSA.[80] In the introduction of the memorandum are the justifications. Aside from this transfer being within the recommendations of the 2010 Nuclear Posture Review, the stated goals were to ensure security, safety, continued research, and support the ratification of the New Strategic Arms Reduction Treaty and Comprehensive Test Ban Treaty.[81] It is difficult to read this as anything other than a quid pro quo between the administration and the labs; help us with this foreign policy victory and we will make sure you are taken care of.

On July 6, 2010, the interagency charter that originated from the 2009 Stimson Center report was signed. The charter was signed by the heads of the DOD, DOE, ODNI, and the deputy secretary of DHS.[82] On July 15, at a hearing before the Senate's Committee on Armed Services, all three heads of the labs testified their support for the New START. The Senate ratified the treaty in December.

Republicans in Congress were opposed to Obama every step of the way; the formation of the TEA party and the wave of successful Republican nominations in 2010 seemed to have stopped Obama's nuclear agenda in its tracks. Nevertheless, Obama got the New START. The labs and the defense corporations that run them locked down long-term contracts that would keep the money coming in even if nuclear projects slowed. They garnered a whole new funding system from the federal government that brought them closer to policy decisions and new projects.

The administration needed support from the CEO lab directors of Los Alamos, Lawrence Livermore, and Sandia to win ratification of New START. The public record shows the labs got $357 million in stimulus dollars. In addition, the White House hiked investment to a level, in constant

[78] https://obamawhitehouse.archives.gov/the-press-office/remarks-vice-president-biden-national-defense-university

[79] https://obamawhitehouse.archives.gov/the-press-office/remarks-vice-president-biden-national-defense-university

[80] Signed by then Defense secretary Robert Gates and then Energy secretary Steven Chu.

[81] Robert M Gates and Steven Chu, "FAS," Federation of American Scientists, April 2010, https://irp.fas.org/congress/2011_hr/nw-moa.pdf.

[82] "Read 'Managing for High-Quality Science and Engineering at the NNSA National Security Laboratories' at Nap.Edu," A, July 6, 2010, https://nap.nationalacademies.org/read/13367/chapter/8.

dollars, nearly 70% more than the Cold War average, and DoD agreed to kick in nearly $6 billion over a five-year period to modernize nuclear weapons infrastructure. The corporations (Bechtel, Babcock & Wilcox, URS, Battelle, and Lockheed Martin) that run the nuclear labs coveted *non-nuclear missions with binding long-term financial commitments from multiple federal agencies.* This was because they foresaw a smaller nuclear stockpile as a result of the administration's arms control initiatives, and without new projects to replace old warheads, this meant less workload, greater excess capacity, and higher overhead cost.[83]

Nuclear zero never came, and the labs walked home with what they came with and more. The laboratories had scored a seminal victory and demonstrated the breadth of their influence. They had reignited modernization and secured long-term, non-nuclear projects as a fail-safe. They also developed a deeper connection to the policy apparatus that controls their access to resources. Continuing their mission to exert more control over policy while maintaining their organizational image of independence is a key feature of the laboratory today.

7. Conclusion

7.1. Today's Profiteers of Proliferation

Possibly learning from their private managers or drawing from the lab's early success with the RAND Corporation, the Center for Global Security Research at Livermore is perfecting the method of the revolving door. Members of the defense industry and former cabinet members aid the center with policy briefs, publications, and lectures. The military academies and other institutions that share a similar ethos work together, pushing collective narratives of America as a superpower in decline and the urgent need for stockpile modernization to stave off the existential Chinese threat. The same talking points and supporters that enabled the creation of Lawrence Livermore and sold the government on Polaris and missile defense are once again being used by the laboratory to sell modernization. The spending on nuclear weapons continues to skyrocket at alarming rates. Today, the laboratory and the private contractors that operate it have honed the organization and its ability to acquire resources into its most effective form. With lobbying power, networks of private interests, and a rotating door of support for past and present government officials, controlling the narrative and shaping policy has emerged as the next step to bolster influence.

On June 2, 2023, in response to the heightened calls for modernization and expansion, National Security Advisor Jake Sullivan attempted to quiet the chorus of escalation. He emphasized that the United States does not need to surpass the combined nuclear forces of its adversaries to maintain effective deterrence.[84] The calls for modernization that Sullivan attempts to silence come from the very laboratories and managing interests that stand to benefit from expansion. Livermore, in collaboration with contributing experts with government experience, has been bombarding the informational commons and saturating the current literature with cases for expansion. In one of the many papers released in partnership with Livermore and the CGSR, Franklin Miller, former Special Assistant to President George W. Bush, argues for the expansion of the number of deployed warheads from around 1,500 today to around 3,000.[85]

[83] DIENEKES , "LASG," Los Alamos Study Group , February 5, 2013, http://www.lasg.org/Broken_Promises_Dienekes_5Feb2013.pdf.

[84] Jake Sullivan, "Remarks by National Security Advisor Jake Sullivan for the Arms Control Association (ACA) Annual Forum," The White House, June 2, 2023, https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/06/02/remarks-by-national-security-advisor-jake-sullivan-for-the-arms-control-association-aca-annual-forum/.

[85] Charles L. Glaser, James M. Acton and Steve Fetter, "The U.S. Nuclear Arsenal Can Deter Both China and Russia." Foreign

In October 2023, the Center for Global Security Research at Lawrence Livermore, in partnership with the Office of National Security and International Studies at Los Alamos laboratories, published a series of papers titled "The Inflection Point and the US Nuclear Security Enterprise." Colin Kahl's opening paper's thesis laid out the current challenge faced by the United States: despite efforts to reduce the prominence of nuclear arsenals worldwide, rival nations continue to prioritize nuclear weapons in their military strategies, and the threat of nuclear proliferation persists as a global concern.[86] The threats to the United States focused on the People's Republic of China's increase in ICBMs, silo-based, solid-fueled delivery systems, and the overarching expansion and modernization of its nuclear force.[87] Kahl's paper also outlined the risks that Russia and North Korea pose to the United States. The claims surrounding China's expansion, Russia's massive stockpile, implicit nuclear threats in Ukraine, and the rogue state of North Korea's continued work on ICBMs are all facts—facts that heighten proliferation and global tensions. However, the solutions and framing of this paper do not point towards a practice of de-escalation. Kahl summarizes what he sees as the National Defense Strategy and the Nuclear Posture Review's outlook on the future of nuclear weapons. Overall, the NDS and NPR closely examined how America's adversaries and competitors incorporate nuclear weapons into their strategies for success. Their key takeaway was that nuclear deterrence is essential and should be a central component of the United States' own strategic approach to victory.[88]

Victory is difficult to measure when a nation is not actively engaged in conflict with its adversaries, even more so when one of those adversaries is also its largest trading partner. The prescription offered for these threats is one of complete modernization. The NPR advocates for complete funding to modernize and update the nuclear triad. This effort goes beyond refurbishing existing systems; it aims to fully update all three components of the triad with new capabilities and technologies.[89] Kahl discusses how the modernization of the triad will be a complete overhaul. It involves not only new submarines, the end of LEP for the Minuteman III, and the development of the new Sentinel ICBM but also major investments in the maintenance of the B-2s and B-52s and the creation of the new B-2 raider from the Northrop Grumman group. There are also plans in place for major investment in LSROs, mapping a path of total modernization across all three legs of the United States nuclear triad.

This paper, published jointly by Lawrence Livermore and Los Alamos, argues that the United States' safety and position in the world must be supported by full Triad modernization and a modern deterrence strategy. This is framed not as a choice but a necessity for the United States. Along with modernization, Kahl sees a deeply integrated defense system throughout the Indo-China Sea with Australia and Japan as necessary for effective deterrence. The W87-1 and W87-0 warheads that will go on the Sentinel missile both come from Lawrence Livermore, the designated design agency lab.

Ironically, these modernization efforts are regressive in much of their strategy. A key feature of modernizing the Triad is the $100 billion modernization of 450 silos across five states. These silos were built prior to the Polaris project and rendered obsolete by the change in second strike

Affairs, October 5, 2023. https://www.foreignaffairs.com/united-states/us-nuclear-arsenal-can-deter-both-china-and-russia.

[86] Colin Kahl, "Nuclear Deterrence and National Security in a Decisive Decade," Lawrence Livermore Center for Global Security , October 2023, https://cgsr.llnl.gov/content/assets/docs/CGSR-Inflection-OP-FullBook-10-04-2023-v4-Web.pdf.

[87] Claims of China's expansion are backed up by many including the Federation of American Scientists. 1. HANS KRISTENSEN et al., "Chinese Nuclear Forces, 2024: A 'Significant Expansion," Federation of American Scientists, February 20, 2024, https://fas.org/publication/chinese-nuclear-forces-2024-a-significant-expansion/.

[88] See footnote 1

[89] See footnote 1

capacity by undetectable, constantly moving submarines provided. The Minuteman III, which is to be replaced by the Sentinel intercontinental ballistic missile system, is not the only relic of the Cold War. The land-based leg of the Triad is essentially a $100 billion nuclear sponge that puts millions at risk by providing a stationary and easy target in the event of an attack.[90]

The Pentagon has identified the streamlining and integration of all mechanisms and organizations that are deemed part of the deterrence mission as a top priority. In a memorandum issued in August 2023 by the Undersecretary of Defense for Acquisition and Sustainment and the Executive Chair of the Nuclear Weapons Council, William LaPlante emphasized the Council's central role in coordinating and unifying efforts related to nuclear deterrence. He described it as the primary body responsible for integrating activities to ensure a cohesive approach to the nuclear defense strategy.[91]

The Nuclear Weapons Council is exclusively made up of military elites and government defense experts and advised by the nuclear laboratories. The organization in charge of the formation and implementation of modernization contains all the organizational pitfalls that Sagan warns can lead to deterrence failures. Livermore and the other laboratories are making substantial progress in controlling the disbursement of the resources they have pursued since their inception. The organizational identity has evolved and responded to new environmental factors like the end of the Cold War and privatization. Yet, the ethos of a hawkish, politically savvy, ideological hardline organization that Teller and Lawrence created is alive and well. When the conflicts of interest or influence of the laboratories are rarely brought to attention, the explanation of these actions never changes. Articles such as "Deterrence is Not Rocket Science: It is More Difficult" and "The Importance of Professional Nuclear Policy Analysis" frame nuclear policy decisions as problems that only well-connected professionals in their field can have opinions on, excluding citizens whose lives are affected.[92] The laboratories and Livermore's Center for Global Security Research are dominating the pool of literature. The monopolization of discourse is the final destination for an organization bent on resource collection and propelled by private interests; it represents the enduring success of a hawkish organizational ethos that acts as a driving force for arms racing, feeding a never-ending hunger at the heart of the beast that is the nuclear weapons complex.

7.2. Moving Forward

This thesis clearly demonstrates the creation and evolution of an organizational ethos and mission at Lawrence Livermore, an identity shaped and driven by resource dependency, which has responded to that need by doing everything in its power to control the resources in question. This has resulted in the modernization and expansion of the arsenal, promoting arms racing and proliferation, and driving the new Cold War. One of the most unexpected and concerning findings of this study was made during the research phase. Modern literature is overwhelmingly dominated by laboratory-aligned media. All of the evidence used during this analysis to show that Livermore's organizational mission acts as a driver of arms racing is presented as positive laboratory system synergy. The response by vested interests to the

[90] The Editors, "The U.S.'s Plans to Modernize Nuclear Weapons Are Dangerous and Unnecessary," Scientific American, March 4, 2024, https://www.scientificamerican.com/article/the-u-s-s-plans-to-modernize-nuclear-weapons-are-dangerous-and-unnecessary/.

[91] Joseph Clark, "Pentagon Tackling Nuclear Modernization with Proactive, Integrated Approach," U.S. Department of Defense, August 25, 2023, https://www.defense.gov/News/News-Stories/Article/Article/3505989/pentagon-tackling-nuclear-modernization-with-proactive-integrated-approach/.

[92] Tom Ramos, "The Importance of Professional Nuclear Policy Analysis," Nipp, October 3, 2022, https://nipp.org/information_series/tom-ramos-the-importance-of-professional-nuclear-policy-analysis-no-535-october-3-2022/.

article in the Bulletin of Atomic Scientists calling to democratize the decision was an unexpected, crucial moment of understanding. Nuclear weapons are extremely dangerous by themselves, but their potential for damage grows exponentially when efforts to restrict discussion around them succeed. The goal of this thesis was not to offer a solution or inspire hope for a post-nuclear utopia. Regarding next steps, organizations like Tri-Valley Cares are doing incredibly important work and offer many opportunities to get involved and stay informed. They have fought important legal battles and lobbied tirelessly for the communities in and around the Livermore Laboratory. Their mission is stated in five interlocking goals:[93]

1. Convert Livermore Lab from nuclear weapons development and testing to socially beneficial, environmentally sound research.
2. End all nuclear weapons development and testing in the United States.
3. Abolish nuclear weapons worldwide and achieve an equitable, successful non-proliferation regime.
4. Promote forthright communication and democratic decision-making in public policy on nuclear weapons and related environmental issues locally, nationally, and globally.
5. Clean up the radioactive and toxic pollution emanating from the Livermore Lab and reduce the Lab's environmental and health hazards.

7.3. Important Note

A variety of factors led this thesis to exclude many important aspects, actors, and consequences of the laboratory system. Communities across the United States and the world have been decimated by the effects of the Nuclear Weapons Complex. Indigenous communities in New Mexico, Nevada, the Great Plains, and Alaska have been disproportionately affected by the theft of land, environmental degradation, and illness as a result of weapons testing and laboratory sites. Employees of these laboratories have faced unsafe working conditions and adverse health effects that are often denied or covered up. This thesis also overlooked the degradation of flora and fauna across the globe as a result of these weapons and their architects.

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[93] "Home," Tri Valley CAREs, February 26, 2024, https://trivalleycares.org/.