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# H-Diplo

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Introduction by Edwin Martini

**David Zierler. *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think about the Environment.*** Athens and London: The University of Georgia Press, 2011. xii + 245 pp. ISBN 978-0-8203-3827-9 (paper, \$24.95); 978-0-8203-3826-2 (cloth, \$59.95).

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Introduction by Edwin Martini, Western Michigan University

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From 1961 to 1971, the United States and its South Vietnamese allies sprayed nearly seventy-three million liters (over nineteen million gallons) of chemical herbicides over two and a half million acres of southern and central Vietnam to defoliate the landscape and limit the access of the National Liberation Front to local food supplies. Of that seventy-three million liters, about sixty-two percent—over forty-five million liters—of the chemicals deployed consisted of Agent Orange, a 1:1 mixture of the herbicides 2,4-D, and 2,4,5-T that by the late 1960s was known to contain often dangerous levels of dioxin, specifically 2,3,7,8-tetrachlorodibenzo-p-dioxin, one of the most deadly toxins ever created. Since the world became aware in the late 1960s of Agent Orange and the other “rainbow herbicides” used by the United States and its South Vietnamese allies during the war, veterans and civilians from around the world have sought to understand the implications of Agent Orange and its associated dioxin. But Agent Orange has consistently provided far more questions than answers. Despite decades of study, questions of exposure, causality, compensation, and justice remain at the forefront of scientific, legal, political, and diplomatic debates over Agent Orange. To this day, the short-term and long-term effects of these chemicals remain a great source of controversy in many nations, communities, and academic fields.

And yet, despite what many observers (including many historians) believe, Agent Orange remains remarkably understudied by historians and others in the humanities and social sciences. Histories of Agent Orange remain rather polarized by, on the one hand, more traditional military histories that often fail to critique critically official sources and narratives, and, on the other hand, works of political advocacy that seek to reclaim the voices of Agent Orange victims, but often at the expense of historical context.<sup>1</sup>

The result of this schism has been that Agent Orange has remained one of the most recognizable and yet least understood aspects of the Second Indochina War. David Zierler’s important and innovative *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think About the Environment* marks an important turning point in Agent Orange scholarship, combining approaches from diplomatic and

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<sup>1</sup> For the traditional military approach, see William Buckingham, *Operation Ranch Hand: The Air Force and Herbicides in Southeast Asia, 1961-1971* (Washington, D.C.: Office of Air Force History, 1982); and Paul Cecil, *Herbicide Warfare: The Ranch Hand Project in Vietnam* (New York: Praeger, 1986). For the advocacy approach, see Fred A. Wilcox, *Waiting for an Army to Die* (Cabin John, MD: Seven Locks Press, 1989); and Jock McCulloch, *The Politics of Agent Orange* (Richmond, Australia: Heinemann Books, 1984). More recently Wilbur Scott’s *Vietnam Veterans Since the War: The Politics of PTSD, Agent Orange, and the National Memorial* (Norman, OK: University of Oklahoma Press, 2004) has taken this school in a much more constructive direction, illuminating the issues of veterans through historical sociology. Finally, any discussion of Agent Orange scholarship would be remiss if it failed to include the path-breaking work of Diane Fox, one of the reviewers for this roundtable. Fox’s anthropology dissertation, “One Significant Ghost: Agent Orange, Narratives of Trauma, Survival, and Responsibility,” (Ph.D. Dissertation, University of Washington, 2007), is very much a work of advocacy as well as scholarship, but it is also an incredibly important step in recovering the voices of Vietnamese believed to be affected by Agent Orange and its associated dioxin, particularly Vietnamese women.

environmental history in ways that illuminate not only the history of Agent Orange, but the scientists who helped to help bring the chemical war to an end. Unlike most previous works on the subject, Zierler illuminates the politics of Agent Orange without falling prey to them.

The reviewers all agree that Zierler's book has much to offer and is a welcome addition both to the literature on Agent Orange and to the rapidly growing body of work that explores the intersections of modern diplomatic, environmental, and technological history. They are particularly impressed with Zierler's ability to fashion an accessible and informative narrative around what David Biggs calls "a politically, scientifically, and ecologically complicated subject." The primary concerns of the reviewers are that they wish the book were longer and dealt with more of the complexities that surround Agent Orange. Most agree that this is simply a desire to have more of Zierler's considerable talents brought to bear on this topic, but there are a few issues in particular that they think should have been addressed in this book.

1. While praising Zierler's efforts to illuminate the role of scientists in shaping policy at the highest levels, several reviewers wish that the author had done a bit more to examine the implications of this argument. Diane Fox asks whether Zierler might be too "celebratory" in his descriptions of the scientists who helped end the herbicidal warfare program in Vietnam, and wonders instead what the long-term policy implications are for a government that continues to be beset by claims for programs and policies it has since renounced. Similarly, Larry Berman wishes that Zierler had paid more attention to "the legal and the policy issues emanating from ecocide," including issues such as government knowledge about the dangers of dioxin and the implications for veterans who believe their health conditions are caused by exposure to Agent Orange.

2. David Biggs suggests that Zierler might have further explored the Kennedy administration's concerns about charges of chemical warfare, particularly whether the president himself was actually worried about the implications of the herbicides for the land and people of Vietnam.

3. Keri Lewis raises the most direct concerns about Zierler's work, particularly whether Zierler could have done more to illuminate the ecological legacies of Agent Orange, particularly for those living in Vietnam. Along the same lines, Lewis argues that Zierler does not sufficiently draw connections between the scientists and "the larger modern environmental movement," especially when it came to gaining the attention of policymakers in Congress and elsewhere in Washington.

In his reply, Zierler addresses these concerns, agreeing with many reviewers that the history of Agent Orange is indeed constantly unfolding, in Vietnam and elsewhere. Future studies of the topic will have more data and more sources to deal with, to be sure, but they will also have a new starting point for secondary literature, thanks to *The Invention of Ecocide*.

**List of Participants:**

**David Zierler** is a Historian at the U.S. Department of State, where his research focuses on the Soviet invasion of Afghanistan. He is currently at work on a book on foreign policy journalism and national security crises from World War I to the Gulf War. He lives in Washington, DC with his wife and daughter.

**Edwin Martini** is Associate Chair and Associate Professor of History at Western Michigan University. He received his Ph.D. in American Studies from the University of Maryland in 2004. He is the author of *Invisible Enemies: The American War on Vietnam, 1975-2000* (University of Massachusetts, 2007), and *Agent Orange: History, Science, and the Politics of Uncertainty* (University of Massachusetts, forthcoming, 2012). He is currently working on a global history of napalm.

**Larry Berman** is Professor Emeritus at the University of California, Davis, and, from January 2012, the founding dean of the Honors College at Georgia State University. His forthcoming book, *Big Z: The Life and Times of Admiral Elmo Russell Zumwalt, Jr.* will be published by HarperCollins in 2013.

**David Biggs** is an Associate Professor of History at the University of California at Riverside. His recent book is *Quagmire: Nation Building and Nature in the Mekong Delta* (Washington, 2011).

**Diane Fox** is Visiting Assistance Professor of History and Anthropology, College of the Holy Cross, where she teaches classes on Viet Nam, peace, and the long term environmental and human health consequences of war. Her anthropology dissertation and several published articles recount the narratives of people designated by the Vietnamese Red Cross as "thought to be affected by Agent Orange."

**Keri Lewis** is an Independent Scholar and currently serves on the staff of the National Security Council.

Review by Larry Berman, University of California-Davis

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I'm grateful to Ed Martini for asking me to participate in this roundtable of David Zierler's *The Invention of Ecocide*. I had the pleasure of reading this twice, first as a completed dissertation and now in its revised form. The book is an intellectually innovative and substantively valuable interdisciplinary contribution; one that I believe advances understanding about the development and utilization of herbicides in Vietnam while telling the story of how a group of American scientists, on the right side of the evidence and, as it turns out, history, tried to prevent the tragic consequences which now envelop generations of Americans and Vietnamese in their daily lives.

I could not help but to see an analogy between these voices of reason by scientists beginning in 1963 who foresaw the long-term health and environmental consequences in the use of herbicides with the lonely dissent of George Ball in 1965 or Bernard Fall, to name just two, when warning of the consequences of Americanizing the war. In both instances, crossroads at which tragedy might have been averted, the logic of the dissenters could not prevail over the illogic of attrition, crossover points, order of battle, KIA. Entrenched and powerful interests prevailed over the power of argument and evidence. The spraying became a key component of policy until 1970. At the heart of the reasoning to use Agent Orange and other herbicides in Vietnam was the idea that by controlling the environment, the U.S. could win the war. Superior technology would prevail. This point lies at the very core of Zierler's epistemological approach in *Ecocide*.

Yet, from this ecological tragedy, Zierler surfaces a persuasive argument for a positive historical lesson. Here was a group of non-government actors advancing their vision of international security based on what herbicides did to humanity, to all people, not just to 'the enemy.' James Clary, an Air Force scientist in Vietnam, is often quoted for his point that "when we initiated the herbicide program in the 1960s, we were aware of the potential for damage due to dioxin contamination in herbicides. We were even aware that the 'military' formulation had a higher dioxin concentration due to the lower cost and speed of manufacture. However, because the material was to be used on the enemy, none of us were overly concerned."<sup>1</sup> While lawyers have focused most intently on the first part of Clary's statement, Zierler addresses the other component. Operation Ranch Hand would eventually be terminated and a set of international norms bearing on the use of herbicidal and chemical weapons had its roots in this early struggle by the scientific community.

I suspect that one's disciplinary background might determine the particular level of importance readers attach to Zierler's data, the argument, and conclusions. In my case, I came at the book as a political scientist completing a major biography of Admiral Elmo Zumwalt, who served as Commander of U.S. Navy forces in Vietnam from 1968-70. The general contours of that story are well-known to readers of H-Diplo. In order to reduce

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<sup>1</sup> Quoted in David Zierler, *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think about the Environment* (Athens and London: The University of Georgia Press, 2011), 8.

casualties to U.S. troops, the decision was made to defoliate the forest areas within which enemy forces hid. Over 19 million gallons of Agent Orange and related defoliants were sprayed over approximately 5 million acres in South Vietnam. The Pentagon assured field commanders that the ingredients in Agent Orange -- 2,3,4,5,-T and 2,4-D, were not harmful to humans. These are the synthetic chemical compounds developed to kill weeds in order to increase crop yield. In Vietnam, the military cooked at higher temperatures a 50-50 mixture of 2,4-D (2,4-dichlorophenoxyacetic acid) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) and named it Agent Orange. Dioxin is a highly toxic by-product of military-grade 2,4,5-T. As Zierler documents, cooking it at higher temperatures renders the dioxin even more deadly. I will return to this point shortly.

The navy had been taking casualties at the rate of six percent a month in Vietnam, which meant that the average young naval person had a 70 percent probability of getting killed or wounded in a year's tour. Snipers preyed on sailors from their hiding spots along riverbanks, perhaps 10 to 15 feet from their targets. When Zumwalt asked, he was told that Agent Orange defoliation offered the promise of moving those snipers back a thousand yards. He was assured that herbicide use was nontoxic and not dangerous to man or animal life. The jungle terrain was stripped bare. Zumwalt was unaware that the chemical companies producing these herbicides had evidence that the dioxin used in the manufacturing process was carcinogenic to humans. Zumwalt's son commanded swift boat PCF-35 in the Mekong from June 1969-July 1970. Elmo Zumwalt survived Vietnam, returning home in 1970 only to learn in 1983, like scores of other Vietnam veterans, that he had developed herbicide poisoning. Elmo Zumwalt fought his illness for five years, succumbing in 1988 at age 39. There was the cruel irony that his father had been responsible for ordering the spraying along the rivers and canals that his son and crew patrolled.\*

From Zierler's book I was able to ground my argument with details of the government's efforts to suppress information about the "teratogenicity (a cause of birth effects) of 2,4,5-T—the compound that comprised half of Agent Orange." I also learned that as early as 1966 Bionetics Research Laboratories, under government contract, informed the National Cancer Institute that female lab mice injected with even small doses of 2,4,5-T gave birth in "very high ratios" to offspring with birth defects. Also, in massive doses, 100% of female rats produced either stillborn or mutated babies. These results were sent to the Surgeon General, the National Institutes of Health (NIH), the National Academy of Sciences (NAS), and Dow Chemical. "Everyone involved agreed to sit on the report." (122-23) On August 9, 1990 the House Committee on Government Operations submitted "The Agent Orange Cover-Up: A Case of Flawed Science and Political Manipulation,"<sup>2</sup> constituting a devastating indictment of the government's interference with science. One of the main forces behind that study was retired Admiral Elmo Zumwalt, who in a deathbed pledge to his son promised to find out who had lied about the effects of Agent Orange.

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<sup>2</sup> <http://www.gulfwarvets.com/ao.html>, accessed 29 November 2011. [U.S. Congress, House of Representatives, Committee on Government Operations, Human Resources and Intergovernmental Relations Subcommittee. *The Agent Orange Cover-up: A Case of Flawed Science and Political Manipulation: twelfth report*. 101st Congress, 2d session. Washington, DC: U.S. G.P.O., 1990].

Returning to a point made earlier, during the 1980s, one of the greatest obstacles in trying to hold chemical companies liable for the effects of Agent Orange was the ‘contractor defense’ that holds that any private entity contracted by the federal government to produce military weaponry generally is not responsible for the effects of that weaponry’s use. The one caveat is that contractors must be producing items that are exactly to the specifications of the government. In the case of Agent Orange, this would mean that the government knew dioxins were present in AO, and authorized their production and inclusion in the final product. This is the stance that Agent Orange manufacturers such as Dow, Monsanto, and Diamond Shamrock held from the onset of torts resulting from litigation. I raise this point because if there is one area I wish Zierler had more fully addressed it is the relationship between the legal and policy issues emanating from *Ecocide*. “In Vietnam, the forest was the weed,” (p.2)he writes. (And true, the scientists eventually prevailed. But what about those on the ground who were so heavily exposed—the sailors who bathed and cooked in the sprayed rivers and the innocent Vietnamese villages which received the aerial spraying? The effects on them and their children have been devastating, but most especially in Vietnam where ‘hot spots’ are still uninhabitable. David Zierler’s book about herbicide use and how a small group of scientists slowly changed the way we think about the environment got me thinking about the battles still being waged on behalf of those who bore the brunt of the spraying program—the brave warriors sent to fight a war based on false premises and the Vietnamese who must live everyday with its aftermath. Zierler did not set out to write that book; so I can only hope it’s his next one.

[\*] Elmo’s son Russell, Bud Zumwalt’s grandson, was born with severe learning disabilities attributed to his father’s exposure. In his memory, the U.S. Navy would later authorize the creation of a bronze frieze at the U.S. Naval Memorial in Washington, depicting his swift boat PCF-35 engaging the enemy on a river in the Mekong Delta. Part of the inscription, inserted with his father’s urging, reads: “At the age of 39, the younger Zumwalt died of cancer believed to have been caused by Agent Orange, a defoliant used by the U. S. Armed Forces in Vietnam.”

This book's aim is to bridge two subfields, diplomatic history and "ecological issues" (4), by examining how environmental changes and diplomatic events have become interrelated, especially in the twentieth century. Zierler acknowledges the pioneering work of such authors as Edmund Russell (on pesticides and chemical warfare) and Thomas Dunlap (on DDT); and he has very skillfully crafted a finely nuanced, engaging history of another chemical, Agent Orange, that in the 1960s and 1970s also shaped American policy. In this instance, however, the dioxin-containing chemical compounds had their largest impact not in domestic environmental politics but in American diplomatic policy, international law, and, on a continuing level, in U.S.-Vietnam relations. The book's nine chapters survey an intertwined history of scientific work on the chemicals, American military and diplomatic discourse over their deployment in Vietnam, scientist-led reactions in the media, and subsequent diplomatic debates about the use of chemicals in war that do not specifically target people.

Before engaging this narrative in more detail, as an environmental historian who has spent most of his academic life studying Vietnamese ecosystems and environments, I would like to address an early claim in the book that Agent Orange is little studied and that there is a dearth of works examining relationships between diplomatic and military policy and environmental changes associated with Agent Orange. The reasons for this continuing absence in environmental studies today, I would argue, are the same that plagued scientific missions such as Harvard Biologist Matthew Meselson's American Association for the Advancement of Science team in 1970 (131): there is simply not enough available 'data' to form solid conclusions. With the exception of historical and ecological materials generated by a few, high-profile bilateral initiatives (such as the recent U.S.-funded effort to clean up several Agent Orange hotspots), most of the air photos and other documents that could support more detailed studies have yet to be declassified. Researchers today encounter the same problem as Meselson's team forty-five years ago: the doors to data remain closed.

On the Vietnamese side of things, studying historical ecological events associated with dioxin are also highly complicated. There are differences between the aims of provincial or local authorities and national ones over the still-sensitive issue of Agent Orange. Mention of the word 'dioxin' in one's research almost automatically requires the intervention of national-level dioxin specialists from the Defense Ministry and the attention that comes with it. As with American communities' policies on hazardous waste in the U.S., Vietnamese communities likewise are engaged in delicate negotiations with national entities, private landowners, and their constituencies about researching pollution or cleaning it up. The few environmental historians who work in Vietnam are largely prevented from writing about Agent Orange's 'ecological issues' for these reasons. It is a long-term, thorny issue that may require many more years to untangle.

Chapters Two, "An Etymology of Ecocide," and Three, "Agent Orange Before Vietnam," represent for the most part, skillful syntheses of two relatively well-covered stories. I think Zierler offers a particularly valuable service for students of diplomatic history by



drawing in a wide spectrum of seemingly unrelated works such as Gunnar Myrdal's 1944 book *An American Dilemma: The Negro Problem* (24) and Stanley Kubrick's 1964 film *Dr. Strangelove* (30-31). The result is a first-rate intellectual history that examines underlying ideas and cultural influences on such central actors as the Yale botanist, Arthur Galston, who allegedly coined the term "ecocide" in 1970 (15). Zierler takes us through key works that accompanied the anti-war and environmentalist movements shaping the debate on ecocide.

In Chapter Three, the author begins discussion of the science of herbicides with a well-known, narrative arc beginning with Charles Darwin's research published in *The Power of Movement in Plants* (1880). In keeping with the previous chapter's emphasis on *zeitgeist*, I was surprised here not to see a more thorough discussion of the multi-sited "discovery" of hormone herbicides. Botanist James Troyer's 2001 essay in *Weed Science* (35) highlights not just Darwin's work but that of two other scientists credited with the discovery. Likewise in the 1940s, discoveries of key chemical compounds (35) occurred in Germany, the UK and the U.S. simultaneously. What I think is most interesting, given the continuing secrecy that limits historical research on Agent Orange, is the secrecy that shrouded its initial discovery during World War II. One might conclude that part of the problem with ecocide from its mid-century beginning is the closed scientific environment in which experiments were conducted and results disseminated.

Chapters Four and Five respectively address the American proclivity for replacing infantrymen with technology to fight Vietnamese communist guerillas and for choosing herbicides as one of those labor-saving "gadgets" (48). As an historian of the Vietnam War and of Vietnam, I have never bought into Americanist arguments that this conflict was different from all others on the basis of the United States military's heavy reliance on technology. Reading interviews with former Vietnamese guerillas and many after action reports, I was constantly reminded that guerillas employed many counter-technologies and everyday technologies, too, thus making technology a key part of their military strategy as well.

Zierler, however, does pick apart certain elements of the American discourse on technology in war with respect to herbicides, and for this I am grateful. He describes President John F. Kennedy's decision to first use Agent Orange as an antiplant (not an antipersonnel) chemical:

The distinction between antipersonnel and antiplant weapons ultimately explains why Kennedy authorized herbicide operations. Yet at the same time, the distinction obscures the fact that the president knew from the beginning that Operation Ranch Hand would mark the first time a major power introduced chemicals in war since World War I. The president never bought into the widely espoused line that chemical warfare represented a more 'humane' way to wage war. Hence the president drew the line at herbicides among the weapons he deemed suitable for use in South Vietnam. (68)

Kennedy's dilemma here points to the larger, central issue in the book - how an ecosystem-killing strategy might be construed as a war crime in the same league as genocide.

While Kennedy may have had his reservations about Operation Ranch Hand, I do wonder whether he had reservations about the wider spectrum of chemicals delivered by the United States to Vietnam, whether as weapons in war or in the struggle for modernization. A very big difference between World War I and Vietnam was that many thousands of new chemicals had become commonplace in developed countries. Besides Agent Orange, the U.S. contracted firms to produce such chemicals for Vietnam as napalm, Paris Green (copper acetoarsenite), and DDT, all to 'wage war' in various senses of the term. Napalm was first delivered via foreign military aid to the French in their war against Vietnamese communists starting in 1950. DDT and Paris Green were shipped by the ton to foster nation-building strategies and agricultural modernization in Vietnam and much of the world in the 1960s. Napalm was distinctly antipersonnel while DDT and Paris Green had lingering health effects in humans more difficult to tie directly to one-time or multiple exposures. Finally, U.S. troops used tons of a highly concentrated form of tear gas (CS) as copiously if not more so than Agent Orange in their efforts to rid forests of insurgents. Destroying a forest typically involved repeat drops of napalm, AO, and occasionally CS gas, to keep the land clear of humans. While President Kennedy may have not bought into Operation Ranch Hand, I wonder whether he had reservations about wartime use of chemicals generally.

As in Chapters Two and Three, one of Zierler's gifts in the middle chapters on herbicide is his ability to draw disparate, prolific voices of the era into a carefully constructed, historical mosaic. His account of herbicidal warfare in Chapter Five follows the Ranch Hand campaigns to their peak in 1969 while tying them to the broader cultural and political zeitgeist of the times. For example, he links Ranch Hand's countryside-clearing effects to Samuel Huntington's famous counter-insurgency thesis, defoliation helping achieve Huntington's idealized goals of "forced-draft urbanization and modernization" (87).

This brief history of military operations then leads into the final three chapters that offer a view into the world of the scientist activists who were central to debates on ecocide. Here, Zierler's interviews and his study of their private papers produces a nuanced history of this little-studied moment in American science. In comparing their involvement in the ecocide debate, Zierler very skillfully shows how political views and personal connections played into subsequent research initiatives. His discussion of Harvard molecular biologist Matthew Meselson, for example, illustrates the pivotal role that this well-connected scientist played in pushing forward the very sensitive effort to study Agent Orange's ecological effects in Vietnam. A graduate student in Meselson's department conveyed a classified FDA (Food and Drug Administration) report on Agent Orange possibly causing severe birth deformities. Meselson, on good terms with Harvard colleagues Henry Kissinger and McGeorge Bundy, used his access to the highest levels of the Nixon administration to plan a research trip to Vietnam in 1970 (123). Such highly-connected scientists tended to adopt more apolitical or centrist views on Agent Orange in the name of keeping the eventual research mission scientifically valid. Disputes among them from this

time, especially on choices of public action, likewise characterized their individual trajectories in the decades after the ecocide debate subsided.

The book reaches its dramatic policy climax in the attempts of the Nixon Administration to push for ratification of the 1925 Geneva Protocol to the Senate Committee on Foreign Relations (SCFR) in March 1971. Nixon's interpretation, however, included a clause that excluded the use of chemical herbicides or tear gas (CS) from the list of chemical and biological weapons banned by the Protocol (p. 150-51). This move ultimately delayed ratification of the Protocol until 1975, when the SCFR submitted a Protocol to President Gerald Ford for signing that only permitted the use of herbicides around military bases.

In sum, *The Invention of Ecocide* is an eloquently crafted narrative of a politically, scientifically and ecologically complicated subject. Zierler successfully culls different historical strands from archives of scientists, political activists, popular media, and American officials to produce a compelling story. It should make a welcome addition to courses on science policy, bioethics, and American diplomacy broadly defined. Zierler introduces to a new generation of students, possibly future scientists, a cast of characters whose wartime and professional experience intersected with defining moments in American diplomatic history.

Finally, to return to the book's larger aim to bridge interests in diplomatic and environmental history, this book's strength is its demonstration of the power of scientific and environmental thought to shape political and military decisions at the highest levels of government. In considering the other direction of this analysis and why little attention has been paid to the historical *ecological* legacies of Agent Orange, I think *The Invention of Ecocide* has at least one important observation to offer. The struggles of scientists such as Meselson, Galston and others to understand "ecocide" in ecological rather than political terms were for the most part stymied by a culture of secrecy around Agent Orange that has persisted since 1975 with limited openings, often resulting from mass actions taken by U.S. veterans lobbying Senators and Representatives. While the reluctance of the U.S. government to fully disclose all of its historical 'data' is understandable from a policy angle, it is problematic, to say the least, on humanitarian and environmental grounds. Of course there are also problems accessing Vietnamese archives and sites, especially alleged hot spots. Thus the wait continues, here in the environmental history camp, for more documents such that the long-term environmental legacies and historical meanings of Agent Orange can be more thoroughly understood in ecological terms.

What is Agent Orange? For some it is the nickname of a specific defoliant used during the war in Viet Nam. For others it is a generic term for all the chemicals used in that war, or a synonym for TCCD (2,3,7,8-tetrachlorodibenzo-p-dioxin). For still others it is an experience of the long-lasting consequences of war. For David Zierler it is a window to one of the major political transformations of our times. Zierler situates *The Invention of Ecocide: Agent Orange, Viet Nam, and the Scientists Who Changed the Way We Think About the Environment* as a case study of a much broader, and largely unexamined, historical question: “What is the relationship between ecological issues and international relations?” (4) How did we move from the bi-polar world view of the Cold War to today’s imperative “to sustain global ecological health or risk world-wide catastrophe”? (5) Specific to Agent Orange, how did the United States move from accepting the use of chemical herbicides in war in 1961, to renouncing their first use as weapons of war by 1975? Zierler argues that the scientists who opposed the U.S. use of chemicals during the war played a key role in that shift, and in the process, as he asserts in the subtitle of his book “changed the way we think about the environment.”

Exploring the “unique achievement” of these scientists, Zierler argues that

...the scientific campaign against Agent Orange succeeded because it fell squarely at the intersection of two major political transformations in the United States during the late 1960’s and early 1970’s: (1) the demise of interventionist anti-communism as the dominant expression of U.S. foreign policy; and (2) rising concerns that humankind’s environmental impact was global in scope, and a threat to international peace and even human survival (4).

The importance of the scientists’ work, Zierler asserts, was that it *connected* these two transformations in a way that expanded and reframed the meaning of international security. This they did, Zierler tells us, by standing at some distance from both politics and the environmental movement and raising a scientific question, to be answered in scientific terms: “What do we know about the long-term consequences to the environment and human health of the chemicals we are using in Viet Nam, given these elevated concentrations and doses, over such an expanse of territory?” By the end of the war, fifty percent of some provinces had been defoliated; overall, ten percent of the forests of what is today southern Viet Nam had been destroyed.

The nine chapters of this short book sketch a complicated history that brings together perspectives from science, international relations, politics, and military strategy. A brief outline cannot do justice to the book’s complexity, but may serve to introduce at least some of the major themes. After the first chapter lays out his argument and provides a brief overview of the history, science and politics of the issue, the second chapter sketches the development of the term “ecocide” through attempts to enshrine it in law as a crime parallel to that of genocide, as “the Auschwitz for environmental values,” in the words of Richard Falk, professor of international law at Princeton put it (25). In the third chapter,

Zierler takes a 'history of science' approach as he traces the development of the chemicals that compose Agent Orange from Darwin's studies of the mechanisms that affect plant growth, through the wartime alliance of herbicidal science and defense during World War II, to the development of herbicides as a boon to the chemical industry during the post-war years.

Chapter four turns from technology to policy, as Zierler skillfully sketches the fraught political situation of 1960-61, the period in which the decision was made to use chemicals in the war in Viet Nam. In the context of U.S. setbacks in Berlin and Cuba, and Soviet support for wars of national liberation, Viet Nam became a symbol of U.S. resolve to fight communism. In the south of Viet Nam, where the National Liberation Front was feared to be ready to topple the U.S. ally Ngo Dinh Diem, Agent Orange became a new weapon for JFK's "flexible response" approach to fighting counter-insurgency. The next chapter illuminates the policy debates that led to the start of herbicidal warfare: Would the military benefits outweigh the political liabilities? Was it legal under the Geneva Protocol against chemical weapons, since the targets were plants, not humans? Zierler presents the sometimes ambiguous results of initial tests, and the expansion of the program into what he calls "one of the greatest chemical warfare operations in history" (88).

Drawing heavily on interviews with key scientists who opposed the use of Agent Orange, as well as on extensive archival documents from the time, chapters six and seven take us to the heart of these scientists' opposition to the wartime use of chemicals. Chapter six places the scientists in the lineage of their contemporaries like Rachel Carson and Barry Commoner, who were raising ethical questions about scientific inventions that placed short term gain above long term environmental consequences: Carson, with her work on pesticides, and Commoner, with his studies on nuclear fallout. Zierler traces the impact of a handful of determined individuals – Bert (E. W.) Pfeifer, Arthur Galston, Matthew Meselson, Arthur Westing, and John Constable – in mobilizing their scientific associations to ask for study of the consequences of the use of these chemicals, and chronicles government responses, reviews of literature, and laboratory studies. Chapter seven narrates the findings and frustrations of war-time field studies in Viet Nam.

Chapter eight illuminates the tensions and connections between science, anti-war politics, international pressure, the White House, the military, and the Congress, using the prism of President Nixon's failed attempt to get Congress to ratify the 1925 Geneva Protocol (Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare). To counter charges of use of chemical warfare by the United States, Nixon was trying to have established that herbicidal chemicals were outside the provisions of the original Protocol, despite a 1969 United Nations resolution that included anti-plant chemicals as weapons of war, and in face of the mix of scientific evidence and politics that underlay the Senate Foreign Relations Committee's refusal to accept Nixon's interpretation. Once President Ford renounced first use of the banned chemicals, in January of 1975, Congress ratified the treaty.

The final chapter focuses on the legacies of these debates, including the creation of the United Nations Environmental Programme as the embodiment of this shift in policy

towards global environmental concerns. In conclusion, Zierler notes that his study has demonstrated how “a group of nongovernmental actors were able to advance a vision of international security based on interdependence and environmental threats common to all people,” a vision that was “radical in 1965, cutting-edge in 1972, and arguably normative today” (168).

Much like the scientists he studies, Zierler contributes to our understanding of the legacy of Agent Orange by helping to expand the terms of the discussion. The book’s great strengths are the breadth and complexity of its scope, along with the rich detail of historical documentation, telling personal interviews, and extensive bibliographies, which should be a great resource for those who are interested in the issues he engages. Particularly successful, from the perspective of a person whose attention does not center on Washington, are the chapters which explore the hammering out of the contested decisions to implement, expand, and finally abandon the use of the chemicals, and those chapters which chronicle the growth of scientists’ opposition to the use of herbicides.

It is possible, I reluctantly concede, to critique this breadth by asking for more depth on certain points. Given the accomplishments and originality of the book, however, breadth seems to me a problem only if this book is taken as the last word, rather than a path-breaking foray into a history that deserves far more study, a fertile seedbed for future studies.<sup>1</sup> One reviewer, for instance, criticized the book for failing to include in-depth personal interviews with Vietnamese who lived through the spraying of chemicals.<sup>2</sup> Such stories have recently appeared in fiction, and some are available in edited volumes.<sup>3</sup> While more would indeed be welcome, this book has a different task: to engage reason and critical thinking in ways such stories sometimes short-circuit.

I hope others in this round table will be able to assess more knowledgeably the narrative Zierler constructs of the decision-making processes, and that future historians may engage the issues thus raised, as well as collect more expanded oral histories from the generation that was directly involved, and is passing; these stories need to be recorded now, before it is too late. I hope that historians of science and science studies scholars will engage the medical disputes that Zierler appropriately sidesteps here, and trace the development of

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<sup>1</sup> Another solid new contribution to this nascent field of study will be Edwin Martini’s *Agent Orange: History, Science, and the Politics of Uncertainty*, to be released in 2012 by the University of Massachusetts Press.

<sup>2</sup> Nick Turse, “Seeing the Forest for the Leaves,” *Asia Times Online*, 16 April 2011.

<sup>3</sup> For fiction, see Charles Waugh and Huy Lien, eds., *Family of Fallen Leaves: Stories of Agent Orange by Vietnamese Writers* (Athens, GA: University of Georgia Press, 2010). For ethnography, I have published three stories in English: “Chemical Politics and the Hazards of Modern Warfare,” in *Chemical Politics and the Hazards of Modern Life*, Monica Casper, ed. (New York: Routledge, 2003); “Speaking With Vietnamese Women about the Consequences of War: Writing Against Silence and Forgetting,” in *Le Vietnam au Féminin*, Gisele Bousquet and Nora Taylor, eds. (Paris: Les Indes Savantes, 2005); and “Agent Orange, Vietnam, and the United States: Blurring the Boundaries,” in *Vietnam and the West: New Approaches*, Wynn Wilcox, ed. (Ithaca: Cornell University Press, 2010).

our knowledge from the mid 1970's to today. I suspect they would find more agreement on medical outcomes than Zierler indicates, and more resolution of old disputes, despite certain remaining questions. In the '70's, veterans who spoke of being affected by Agent Orange were sent to the Veterans Administration hospitals' psychiatric wards; today, they are compensated for a still-expanding list of 17 diseases, on the basis of twenty years of extensive 'studies of studies' by the Institutes of Medicine.

Skeptics might challenge Zierler's celebration of the results of the scientists' opposition to the use of Agent Orange, noting that while herbicidal warfare may indeed have more or less ended, the environmental costs of war remain very high.

Finally, a minor but perhaps useful point: I would have found a detailed timeline helpful for keeping some of the complexities straight, especially as the narrative at times moved back and forth in time.

From the point of view of someone more focused on the issue of Agent Orange than on transformations in international relations, this book comes as a welcome change of perspective. Much of what has been published in English to date on Agent Orange focuses on the experience of American veterans,<sup>4</sup> on the court cases they pursued,<sup>5</sup> and on the nearly half a century of scientific studies and debate over the environmental and human health consequences of the chemicals.<sup>6</sup> As he side-steps these approaches and their embedded controversies, Zierler's work shifts us from fixating on what is *not* known towards thinking more clearly about the implications of what *is* known: that from 1961 to 1971 the United States used chemicals in war that it renounced four years later. What then should be the policy of a responsible government for past actions it has renounced? This is a question Zierler does not ask, but one that is well worth pondering.

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<sup>4</sup> See, for example, Paul Frederic Cecil, *Herbicide Warfare: the Ranch Hand Project in Vietnam* (New York: Praeger, 1986); and Admiral Elmo Zumwalt Jr and Lieutenant Elmo Zumwalt III, with John Pekkanen, *My Father, My Son* (New York: MacMillan, 1986). Cecil was an airman in the Ranch Hand project; the elder Zumwalt was an admiral in the navy who ordered the spraying along the rivers where his son served; his son, who later died of two forms of cancer, fathered a child born with deformities.

<sup>5</sup> See especially Peter Schuck's *Agent Orange on Trial: Mass Toxic Disasters in the Courts* (Cambridge, MA: Harvard University Press, 1987).

<sup>6</sup> A good place to start is the comprehensive "study of studies" that is updated every two years by the Institute of Medicine of the National Academies, Committee to Review the Health Effects in Vietnam Veterans of Exposure to Agent Orange. *Veterans and Agent Orange* (Washington, D.C.: National Academies Press, Periodic updates).

The role of the environment now has a place in U.S. national security strategy. While it may not be at the front and center of every discussion that takes place in the war rooms at the Pentagon or in the White House Situation Room, the influence of U.S. action on regional ecosystems is an inextricable part of the dialogue—shaping modern methods of warfare, diplomacy, international trade agreements, Congressional budget allocations, national security threat assessments, etc. A fundamental reason why the environment has such a critical role in 2011 is due in large part to those scientists who, in the 60s, 70s, 80s, and 90s, armed themselves with the evidence of the larger consequences of environmental degradation, and joined together with the emerging modern environmental movement to protest government actions and bring about a series of critical changes in U.S. policy.

A small group of these scientists are the topic of David Zierler's book, *The Invention of Ecocide*, which traces the use of herbicides in the Vietnam conflict. During the post World War II suburbanization boom, chemical companies in the United States invested millions in the creation of herbicides and pesticides designed to decrease pesky insect populations while promoting healthier, more bountiful crops, and, perhaps most importantly, greener, weed-free lawns. Over the course of the 1950s and 60s, chemical companies in conjunction with local and state governments dumped tons of those chemicals on suburbs across the nation, believing they were improving Americans overall quality of life. As the Vietnam conflict began, President John F. Kennedy used those chemicals sparingly to target areas used by the Viet Cong.

The arc from moderated to unchecked use of herbicides in Vietnam was simultaneously matched by a similar arc of cautious concerns developing into outspoken protests against it by the U.S. scientific community. Scientists, such as Rachel Carson, who first questioned the long-term consequences of domestic herbicide usage and then firmly inserted that concern into mainstream American society (92–93); E. W. Pfeiffer, who encouraged the NAS (National Academy of Sciences) to petition the federal government and to push for some scientific evaluation of the consequences of Agent Orange in Vietnam (125–126); and Arthur Galston, one of the first and most outspoken opponents of the use of Agent Orange (16–17), used their positions as “objective” scientists (as opposed to radical environmentalists) to protest what Galston termed “ecocide” in Vietnam.

Demonstrating a savvy understanding of etymological nuance, Zierler explores the evolution of this most versatile term (14–32), noting that it was, in part, the assignation of the term ecocide itself, particularly by the scientific community, to the systematic defoliation of Vietnam that inextricably linked the systematic destruction of the environment to that other horrific “cide”, genocide (32), and forced the issue to the forefront of the political and military discussion. This term painted a frightening picture of the future of warfare, connecting the unforeseen consequences of ecocide with the systematic destruction of humans, more specifically the ways in which ecocide could be used against Americans, a connection utilized by Zierler's scientists. With a small



consensus, these scientists petitioned the U.S. Government for access to sprayed regions of Vietnam to test the assertions that Agent Orange would have no long-term effects on either the ecology of the region or those living there. What they found was quite the opposite.

These scientists were granted limited access to study the sprayed regions of Vietnam and, although the degree of damage reported differed, the consensus was, as Zierler puts it “a catastrophe” (p. 112). Reports of stillbirths, fetal malformations, and dead and dying livestock flew directly in the face of those reports issued by the Pentagon that there were no adverse effects experienced by humans, thereby administering an extraordinary blow to the credibility of those politicians extolling the virtues of herbicidal use (112–130). Following these surveys, these scientists enlisted their respective academic institutions and scientific organizations to protest the use of herbicides in the conflict as counterproductive to American policy, destructive to the Vietnamese people, and positively harmful to the U.S. image in the world. Simultaneously, the election of President Richard M. Nixon brought an odd ally to the executive branch as he initiated significant changes in U.S. national security strategy that scientists were able to use to promote the ban of herbicides from warfare for all time (138). Their actions, not without personal or professional consequences, accomplished the goal of exposing the ‘credibility gap’ between government assurances of no long-term consequences and the reality of large scale herbicidal dumping and ultimately ended this destructive practice.

The strengths of this book are many. It tackles a difficult topic, the juxtaposition of warfare and the environment—a topic typically relegated to the sidelines of the historiographical discussion—with the science circling its center, and does so in a concise, well-written manner, using a solid array of impressive sources. The interviews, in particular, offer an illuminating perspective on this complex topic. Zierler touches on myriad important factors that influenced the politics, the science, the military execution of, and the international and domestic backlash against the use of herbicides, and does an admirable job of examining the disconnect between the scientists, politicians, representatives for various chemical companies, and those military and civilian officials.

But in trying to show so much, Zierler fails to push his analysis of the critical reasons far enough. Take, for example, the scientists. The book focuses on those few responsible for really pushing for the end of the use of herbicides—Arthur Galston, E. W. Pfeiffer, and Barry Commoner were the three scientists who stand out in this narrative—only referencing tangentially those arguing for the use of herbicides, and those voices typically came from the military sector. Were there no additional voices of dissent within the context of the larger scientific community? How were these perspectives received by their respective associations and, what, if any internal disagreement took place within them? Particularly in a world in which individual national policies regarding critical issues—such as global warming, shrinking polar caps, rising water levels, and the all too important issue of how to handle those displaced by these changes—can be offset by the inappropriate release of a few work-product emails expressing discrepancies in the solidarity of the scientific community, this opportunity to fully grapple with the ways in which the larger scientific community has addressed its disagreements and its disparate opinions, specifically on such

a topic in which politics and patriotism also converged so powerfully, should have been explored with more depth.

A second topic that deserved more substantive analysis is the connection between Zierler's scientists and the larger modern environmental movement. By the mid-to-late 1960s, the environmental movement had firmly established itself in mainstream society. Politically savvy activists, with the solid support and assistance of scientists, secured the passage of major pieces of national legislation including the Wilderness Act (1965), Clean Air Act (1967), the creation of the Environmental Protection Agency (1970), the Clean Water Act (1972), and the Endangered Species Act (1973), to name just a few.<sup>1</sup> Activists, scientists, and increasingly emotionally-charged radicals converged in nongovernmental organizations like the Sierra Club to bring about broad based social awareness to the dangers of unregulated pollution, and forced those issues onto the national political agenda. It wasn't until the mid 1970s that conflicting ideologies fractured organizations into myriad groups, each focused on different levels of acceptable means of protest. These organizations boasted a considerable number of highly accredited scientists who identified themselves as environmentalists and who used their positions to bring attention to the large-scale environmental consequences of human action. Moreover, the sheer amount of publicity generated by the actions of this emerging movement would surely have influenced the amount of face time politicians devoted to Zierler's scientists. The movement that developed in tandem with these scientists' discoveries utilized the cool logic and calm rationality of scientists, lawyers, politicians, and educators right along with the highly emotional and radicalized approach of the disaffected youth to spur change. Even if those scientists opposing ecocide wanted to distance themselves from those labeled "environmentalists", there can be no doubt that the larger movement as a whole advanced their overall agenda (18).

Simultaneously, the international community also began to acknowledge the importance of environmental protection during the 1960s, ultimately culminating in the creation of the UN Environmental Programme in 1972.<sup>2</sup> Serious concerns from scientists all over the

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<sup>1</sup> There are a multitude of works detailing the rise of the modern environmental movement and the ways in which scientists, lawyers, and politicians were a fundamental part of this movement. M. W. T. Harvey's *A Symbol of Wilderness: Echo Park and the American Conservation Movement* (Albuquerque: University of New Mexico Press, 1994) does an excellent job of examining the ways in which David Brower and Howard Zahniser used science and a few congressional legislators to stop the flooding of Dinosaur National Monument; Paul Sutter's *Driven Wild: How the Fight Against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press, 2004), Paul Charles Milazzo's *Unlikely Environmentalists: Congress And Clean Water, 1945-1972* (Seattle: University of Washington Press, 2000), and Karl Brooks', *Before Earth Day: The Origins of American Environmental Law, 1945-1970*. (Lawrence: University Press of Kansas, 2009), all examine the rise of the modern environmental movement and the role of scientists and politicians in bringing that movement both into mainstream American culture and to the highest levels of the U.S. Government.

<sup>2</sup> There is little in the way of historiography regarding international environmental organizations and/or agreements. There are several books written by political scientists that examine international agreements, perhaps one of the most thorough is Jan-Erik Lane's *Globalization and Politics: Promises and Dangers* (Aldershot; Burlington: Ashgate Publishing, 2006). Other works that include a history of the UNEP

globe of the effect of large scale environmental catastrophes—from oil spills and potential fallout from nuclear testing to the consequences of unregulated trade in endangered species—had been actively articulated in a multitude of national political discussions, spurring international exchanges regarding these concerns. These scientists fit into this larger context, and, indeed, seem to be the product of it. Some discussion of those voices in the larger Agent Orange debate seems warranted.

Finally, Zierler explores the impressive biodiversity of Vietnam (112–114), and the systematic ways in which the U.S. military targeted the different regions and notes that the long-term consequences of spraying are still hotly debated. But this needs additional examination. There is no substantive discussion about how spraying affected certain plant/animal species, crops, forests, and/or marine life more than just the time it took to regenerate (which begs the question, what constitutes regeneration?). Several scientific institutions such as the Center for Biodiversity and Conservation (CBC) have conducted a multitude of studies in Vietnam's three biogeographic regions of Vietnam between 1990 and 2010 to determine the range of biodiversity in this country and to determine those factors influencing the health of the regions.<sup>3</sup> Although the primary objective of, for example, the CBC's study was not to test the long-term consequences of the use of Agent Orange, it seems that critical data is available from those studies through which one could make substantive, long-term deductions regarding sprayed regions. Organizations and academic institutions—including the World Wildlife Fund and Yale University—have also promoted additional studies into those most pronounced threats to biodiversity in Vietnam.<sup>4</sup> This begs the question, how have these studies, or others, of the vegetation, the wildlife, the marine-life, and the soil in the sprayed regions supported or detracted from Zierler's scientists' findings? Do those results differ from region to region, given that the ecosystems are so different? How do human health statistics, published by organizations like the World Health Organization, confirm or dispel these scientists' conclusions? And, what, if any, effect did spraying (especially in regions covered in mangroves) have on fish? Additional scientific information would have bolstered the scientists' argument, even forty years after the fact, that herbicidal warfare is, indeed, one of the more hideous consequences of war and a chapter detailing this would have furthered Zierler's argument.

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include Stephen Andersen and K. Madhava Sarma's *Protecting the Ozone Layer: The United Nations History* (EarthScan, 2002), and Richard Leaky's *Wildlife Wars: My Battle to Save Kenya's Elephants* (MacMillan, 2001).

<sup>3</sup> Center for Biodiversity and Resesarch, Vietnam Research and Conservation, [http://cbc.amnh.org/vietnamresearch/viet\\_main.html](http://cbc.amnh.org/vietnamresearch/viet_main.html), accessed 29 November 2011.

<sup>4</sup> Eric Wikramanayake and Philip Rundel, eds. *Terrestrial Ecoregions of the Indo-Pacific: A Conservation Assessment* (World Wildlife Fund Ecoregion Assessments) (Washington, DC: Island Press, 2001), 90–92. Eleanor Jane Sterling, Director of the CBC, works closely with her former alum Yale University to promote studies of regions such as Vietnam. In conjunction with scholars, Martha Maud Hurley and Le Duc Minh, she has published several important works on the biodiversity in Vietnam through Yale University Press, including *Vietnam: A Natural History* (New Haven: Yale University Press, 2007).

Overall, this work adds an important chapter to the historiographical discussion of the Vietnam conflict. Examining warfare from an environmental angle, and the role of scientists in particular, is a crucial one and one that will undoubtedly encourage other scholars to approach other conflicts in a similar way.

**Author's Response by David Zierler, Office of the Historian, U.S. Department of State**

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*Note: The views presented here are my own and do not necessarily reflect those of the U.S. Department of State or the United States Government.*

**F**irst I want to express my thanks to Ed Martini for setting up this H-Diplo roundtable, and more generally, for traveling alongside me on the tricky paths of Agent Orange scholarship over the past six years. I have touted his work at conferences and I'll do it again here: Martini's forthcoming book on the history of Agent Orange could well become the standard study on the subject. If he were a senior scholar, I wouldn't hesitate to call it his magnum opus. Stay tuned for that.

I am gratified by the generally positive reviews in this roundtable, and it goes without saying that if this book ever gets a second edition, there is no doubt that I will grapple again with much of this cogent criticism. Taken as a whole, the basic critique from the reviewers calls for more discussion or explanation of this or that topic. I had anticipated such a reaction well in advance of this forum as well as other peer reviews over the years. As the book went off to press, I was all too aware of the discrepancy between the massive amount of documentation I had collected since 2006 and the relatively short book that I had produced. But in the end I had concluded that the discrepancy was large but not problematic, for I believe I stuck with my original twofold plan. The first objective was to create a narrative that answered this specific question: What explains the rise and fall of herbicidal warfare in Vietnam?

A review of the extant literature left me convinced that this simple yet fundamental question remained basically unanswered. My decision to shape the narrative with this question in mind was bolstered by the way Agent Orange is understood and discussed in the wide ranging and free-wheeling contemporary "Agent Orange community," for lack of a better term. The legacy of herbicidal warfare in Vietnam remains a keen topic of interest for think tanks, diplomats, scientists, lawyers, activists, veterans' groups, and Vietnamese nationals. If there is one characteristic that connects these disparate groups, it is their basic understanding of Agent Orange as a current rather than a historical problem: it is acknowledged as something vague that happened in the past but demands a focus squarely on the myriad problems it poses now. This is perfectly understandable; the participants are not historians. And yet I am convinced that no matter what the specific interests of members in this community, all would benefit, or at least find interest in, some of the conclusions I have drawn.

My second objective was to complete a book that would be as accessible as possible (and therefore, appealing to) people who have been personally affected by the legacy of Agent Orange in one way or another. Early on in my research I learned that my friend's father had died of illnesses which he and his family blamed on his exposure to Agent Orange in Vietnam. I resolved then and there to keep the narrative as streamlined as possible for an audience that may or may not be inclined toward reading academic history. It's a tricky

line to toe; after all, I am an academic historian, keenly interested in producing work at the cutting edge of my field.

Now on to the reviews. I will begin with Keri Lewis, whose review stands out for its eagerness to critique the narrative for what it “fails” to accomplish. I can only disagree with Lewis’s assertion that I do not properly contextualize the role of the protesting scientists within the broader scientific community. I did not randomly pick the scientists out of a hat; part of what makes their work during the herbicide controversy so interesting is that most of their colleagues either did not care about herbicidal warfare in Vietnam or thought that academic scientists should confine their research pursuits closer to home and without the built-in controversy of criticizing U.S. government policy. These intramural debates are amply documented in the book. Lewis seems to suggest that I have suppressed other voices; I invite her to find them.

The second area where Lewis believes I could have done more is the relationship between the scientists and the broader environmental movement. I believe this criticism rests on a basic misreading of my argument. First, as I make clear, the scientists, particularly Arthur Galston, intentionally remained aloof from environmentalists and activists in general. In assuming that the scientists benefited from enhanced ‘face time’ with politicians because of growing societal interest in environmental issues, Lewis cites five pieces of environmental legislation, all of which are decidedly national (as opposed to global) in scope, with the last two arriving on the scene after the scientists helped to ensure the end of Operation Ranch Hand. Lewis’s ‘face time’ assumption has no basis in fact; the scientists were animated by the intersection of ecology and international policy, a combination which they articulated in an entirely new way. It was this intellectual innovation laid out by eminent and well-connected professors, in the context of antiwar sentiment on Capitol Hill, which accounts for their ability to elevate the herbicide issue to a matter to be grappled with by Washington’s foreign policy establishment. The White House paid attention to Matthew Meselson because he was a major figure on arms control issues in the Kennedy administration and because he was a Harvard colleague of Henry Kissinger. The Sierra Club had nothing to do with it.

Finally, I would like to address Lewis’s claim that I paid scant attention to the actual environmental impact of herbicidal warfare in Vietnam. What counts for a ‘substantive discussion’ on this topic is somewhat subjective. But it is simply untrue if Lewis means to say that I ignored the issue. Readers will find in this book a summary of what the scientists found based on their field work in Vietnam in 1969 and 1970, as well as an overview of current ecological investigations of the ongoing impact of Agent Orange in Vietnam. I was much more interested in the theoretical component of the scientists’ concerns, which connected unchecked modern warfare with the specter of global ecological calamity. Lewis’s own summation of current environmental studies on herbicidal warfare encapsulates nicely my decision not to delve into this topic further: this work is available elsewhere, and in my view, the legacy is far less neat than Lewis seems to believe. The landscapes affected by Agent Orange have not been frozen in time since 1975, ripe for deductive study to yield precise answers on the true ecological impact of herbicidal

warfare. It is a dynamic situation, and one that interested readers can read more about, especially if they start with my bibliography.

I eagerly await Larry Berman's forthcoming book on Admiral Elmo Zumwalt, whose tragic experience with Agent Orange will add a singular perspective to this controversy and will undoubtedly convey the paradoxes and frustrations of those who experienced herbicidal warfare first hand. As Berman expertly details in his short review, Agent Orange cannot be understood solely as lifesaver or killer – it was both. In the polarized world of Agent Orange, this is a perspective that is sorely lacking. Even in his brief review, Berman conveys the fact that military proponents of herbicidal warfare were not simply blowing smoke or making their case based on faulty data. If I were a Navy patrolman on the Mekong in 1968 I wouldn't give a second's thought to ecocide or international policy. This ambivalence was not lost on the scientists; for example, Arthur Galston flatly told me that he would have supported defoliation in support of the Allied invasion of France in 1944. What startled me at the time only makes more and more sense. Pardon the altered cliché, but it seems that where one stands on Agent Orange depends on where one crouches.

Both Diane Fox and David Biggs provide excellent narrative summaries of the book which take up the bulk of their respective reviews. I will respond only to particular questions and points they make which beg elaboration. I suspect that Fox means to challenge me more directly in alluding to unnamed "skeptics" who would question my "celebration" of what the scientists achieved. It is a sideways, although still quite powerful, critique. While it is true that my celebration of the scientists' achievement probably gets a little closer than the normal amount of distance a historian should maintain from his or her subject, I believe that I carefully laid out the rather narrow parameters in which I judged the scientists' success. If I did not adequately emphasize just how narrow the criteria are, I will do so here: 1) because of their work, I posit that herbicidal warfare remained a relic of the Vietnam War. It was precisely the ease and cheapness of conducting herbicidal warfare that so vexed the scientists, who envisioned ecocides anywhere forests and war intersected; and 2) the scientists articulated their fears in a way that was truly forward thinking (hence the subtitle of the book) – at least as much as what Rachel Carson accomplished earlier in the 1960s. The scientists effectively merged two discrete areas in such a way that today it is impossible to partake in environmental discourse in strictly nationalist terms. Depending on one's perspective, these achievements can be seen as relatively minor, and as Fox sagely reminds us, the environmental costs of war remain distressingly high. So allow me to hide behind a counterfactual: without the scientists' efforts – really the only successful protest movement in the entire Vietnam War era – these environmental costs would be even greater.

With regard to the question of whether or not it is possible to create dioxin-free 2,4,5-T, I do not know the answer to this. But I would say that the much more important issue is to understand the connection between U.S. government demand for 2,4,5-T at the height of the war and the incidence of dioxin contamination that invariably resulted when the chemical manufacturers attempted to meet this demand.

I greatly appreciate David Biggs's discussion regarding the study of ecological problems from a Vietnamese perspective. Biggs's command of Vietnamese history and contemporary politics is virtually unmatched, and his explanation of the ongoing "thorniness" inherent in understanding the legacy of Agent Orange is a much-needed addition in this discussion. I also think Biggs is entirely correct in his attempt to rebalance the notion that the technological component of the Vietnam War was strictly an American-led phenomenon. To the extent that my work only perpetuates this view, I am guilty as charged insofar as my focus is on American wartime technology. Lastly, Biggs's concluding sentences serve as a good point of departure for this response. As he understands, the history of Agent Orange is still very much unfolding, and as such, I hope that my work has answered some basic questions, raised others, and above all, helps perpetuate further debate and understanding of this confounding chemical compound.

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