
Introduction

Toxicity, Uncertainty, and Expertise

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Almost every year, students taking environmental justice at Pitzer College go on a toxics tour of their backyards in the Inland Empire of Southern California. This trip usually includes a visit to the Stringfellow Acid Pits, California's first site to be designated as a Superfund in 1983.¹ Millions of gallons of chemical waste were dumped there from the mid-1950s to the early 1970s, and authorities estimate it will take at least four hundred years to clean up this contamination. Having learned about the history of this site in class (see chapter 5 of this volume), students anxiously anticipate seeing for themselves what this toxic disaster zone actually looks like. When they get to the site, however, most students are taken aback. It is not what they expected. There are no open pits of discolored or smoldering liquids; there is no acrid smell in the air. There are not even any noticeable signs alerting them to the contaminated landscape upon which they stand. Some students note that they have driven past Stringfellow on various occasions but would never have guessed that this barren canyon on the side of the highway has a history of contamination by chemical wastes. At the end of the day, one of the most impactful lessons for the class is that toxic environments are often invisible or appear innocuous, and that such spaces are more prevalent in our day-to-day lives than we either know or care to admit.

The questions that haunt students after a visit to the Stringfellow site are the questions that motivate this book. To what extent do we know about the processes resulting in contaminated places like Stringfellow, and do we, in fact, even recognize such spaces for what they are? How is it that toxic environments have become so pervasive while at the same time remaining invisible, overlooked, or ignored? Why do conditions of normalized toxicity fail to rouse mass outcry? Numerous scholars from a broad range of academic disciplines—from environmental history to public health, from sociology to geography, and from science and technology studies to environmental philosophy—have tackled such questions in their rich and diverse writings on toxic environments. This substantive and growing body of interdisciplinary scholarship, however, tends to be written by and for the consumption of other academics, who are themselves experts in their fields and who engage around toxicity through shared theoretical concepts.² The extension of Michel Foucault's concept of biopower, for example, asking us to pay attention to the ways in which states count and control populations, has generated much productive thinking and writing about toxicity at multiple scales.³ In science and technology studies, Sheila Jasanoff's seminal work on the coproduction of scientific knowledge and social norms has made room for scholars to more explicitly focus on the inextricable and complex ways in which scientific knowledge and public policy are shaped together, elucidating the proposition that how "we know and represent the world (both nature and society) are inseparable from the ways we chose to live in it."⁴ As academics ourselves, we use these kinds of intellectual frameworks in our own research and analysis.

Yet, as professors of the liberal arts, we are also keenly aware that there is a broader audience to be engaged. In tackling the emergence of toxic environments in multiple sites across the twentieth century and into the twenty-first, we have therefore purposely written this book for a nonexpert audience. For us, this has meant limiting academic jargon, clarifying terms when they are used, and imbuing theory implicitly into the very telling of our stories. We have often found compelling storytelling to be the most effective means of capturing our students' imaginations and sparking critical conversations. We hope that by conveying histories of toxicity in this intellectually rooted and evocative manner, a broader audience will be similarly engaged.

The stories in this volume draw attention to a diverse set of toxic spaces in the United States, Canada, and Japan, spaces filled with x-rays, nuclear radiation, industrial waste, pesticides, and other chemical contaminants.

Given the often-imperceptible nature of these agents, our first goal with this collection is simply one of illumination. Taken together, these chapters show us the ways in which exposure to toxicity has become routine, as toxic spaces have become increasingly interwoven into the economic structures and fabric of everyday life. Even more, these stories demonstrate that the burden of exposure continues to fall disproportionately on those already marginalized by class, race, and structures of colonization. Illuminating this reality, however, is just the first step. Our ultimate hope is that uncovering the histories of these spaces will make complacency impossible.

Given the pervasive nature of toxic spaces and the urgent need for action, it might be surprising that most of the work in this book is historical rather than contemporary. Why examine x-ray rooms in the 1920s or pesticide use in the 1970s when we need to address water contamination from fracking right now? If we know the current state of contamination at the Stringfellow site, why delve into archives to pull out debates and decisions that are over half a century old? We suggest that this kind of historical analysis is powerful precisely because it disrupts the sense that our current predicament is inevitable. Understanding how it is that these spaces came into being can help us identify contemporary institutions as well as modes of thinking and acting that continue to allow environments of toxicity to persist. This seems especially urgent given the current political climate of deregulation in the United States, in which calls to “grow the economy” have become routine and are decoupled from any meaningful analysis of the ecologically unsustainable, socially exploitative, and violent processes through which capitalist relations operate. Careful historical analysis can illuminate these realities and inspire us to see how we can intervene to stem the tide of toxic spaces now and in the future.

In this introductory chapter, we first briefly outline the broader context in which environments of toxicity have been produced by modern imperatives of technological progress and economic growth. We then turn to consider the ways in which institutions of scientific expertise often work to hide—whether intentionally or not—the uncertain nature of knowledge about toxicity, excluding the experiences of those exposed to toxic agents. Despite deep and persistent uncertainties, scientific experts and other authority figures have often been called on to mitigate concerns about harmful substances, thus facilitating industrial and military expansion. We contend that this general pattern—articulated uniquely in different times and places—has resulted in conditions of environmental contamination

and, often, disproportionate harm to already marginalized groups. Finally, in our roadmap to this volume, we highlight some common themes across and between chapters, and reflect on the larger context of contestation and struggles for environmental justice in response to toxic environments.

SITUATING TOXICITY

Toxic environments are a characteristic of our political-economic system and, more broadly, represent what sociologist Anthony Giddens has termed “manufactured risks”: risks created by “the very progression of human development, especially by the progression of science and technology for which history provides us with very little previous experience.”⁵ Historian of science Michelle Murphy points to the emergence of “a chemical regime of living,” in which toxics pervade environments at multiple scales, from individual bodies to geographic terrains and processes of production and consumption. The fact that toxics traverse so many kinds of boundaries, Murphy argues, requires “us to tie the history of technoscience with political economy.”⁶ Scholarship in environmental history, in particular, has shown the ways in which attitudes of technological hubris and manipulations of scientific uncertainty have resulted in the creation of toxic landscapes.⁷ The case studies in this volume build upon this work and harness ways of thinking critically about toxicity at multiple scales, to more explicitly lay bare the political-economic foundations, modes of logic, and bases of knowledge upon which toxic spaces have been produced and obscured.

On the one hand, these cases could be read as proof of an increasing awareness of the toxic landscapes we inhabit, demonstrated by attempts to regulate and manage toxic substances, to study their circulation in the environment, and to create structures of safety to minimize exposure and keep bodies safe. Such actions are indicative of what sociologist Ulrich Beck has termed a “risk society,” in which we anticipate, organize around, and respond to manufactured risks.⁸ On the other hand, a closer look reveals just how inadequate and compromised these processes of regulation have been, almost from their very inception.⁹ As far back as the early twentieth century, toxic experiments were real-time practices: new toxic agents were released into human environments and fragile ecosystems, and not studied first in isolation to assess possible negative impacts. Scholars elsewhere and in this volume show how this trend has continued, evident in the development and

deployment of nuclear weapons and technologies during and after World War II, in the marketing of pesticides to consumers in newly concocted battles against insects and weeds, and in the decisions made about how best to dispose of these substances.¹⁰

In the case of nuclear technologies, their proliferation and the resulting environmental contamination has been uniquely hidden by a culture of Cold War secrecy. Scholars have only recently started to show us the widespread global impacts of this vast nuclear complex, uncovering, for instance, the ways in which scientists and politicians have made decisions about where to dump nuclear waste.¹¹ The experiences of individuals impacted by these decisions are increasingly coming into focus, including stories about growing up near secret weapons facilities, working in plutonium plants, and surviving nuclear disasters like Chernobyl.¹² The struggle for recognition and reparation is ongoing for multiple communities impacted by the nuclear industry globally.¹³

In all of these cases, individuals in positions of authority—among them scientists, military officials, and politicians—have been willing to take risks with new toxic technologies for the sake of growth and progress, waiting to deal with the consequences later. In writing about toxic substance regulation in the United States, Sheila Jasanoff once asserted that the issue “is not whether expertise detracts from political processes, but how it is harnessed and steered to serve some political interests over others.”¹⁴ The majority of stories in this volume attend to this question. Chapters highlight the inherently political ways in which scientific expertise has been wielded in contexts of uncertainty to facilitate dominant economic and military interests, often at the expense of environmental and human health.

EXPERT KNOWLEDGE AND UNCERTAINTY

Understanding the ways in which toxic landscapes have become unremarkable and ubiquitous requires an examination of the development of modern institutions of scientific and technical expertise. Most of us know very little about the chemical and physical properties of particular toxic agents, their physiological impacts, or the ways in which they circulate in different ecological systems. But we feel confident that chemists, physicists, toxicologists, epidemiologists, and safety engineers have that knowledge and have worked with legislators to put adequate regulations in place to keep

bodies and spaces safe. This division of labor and deference to the special knowledge of experts, then, is a crucial component of societal complacency. Yet, institutions of expertise and patterns of science communication tend to mask the uncertain, tentative, or disputed nature of expert knowledge claims, while excluding the voices of those most impacted by toxicity.

Uncertainty is a central and disconcerting feature of histories of toxicity,¹⁵ wielded differently depending on the interests of government and industry. Recent historical work has shown, for instance, that appeals to the uncertainty of experts have been extremely successful in nurturing social inaction, even in the face of the increasingly evident links between smoking and cancer, and carbon emissions and global warming.¹⁶ Those stories reveal the conscious efforts of a small group of influential scientists to “manufacture doubt.” Our stories, however, are rarely ones of deliberate deception. Many of the cases in this collection focus on the judgments of scientists, doctors, and engineers who have been called on to decide whether a health impact exists or whether a given space is safe. In the course of passing judgment, developing protocols, and shaping regulations, these experts often unintentionally obscured all that was still unknown about a particular toxic agent. Such actions led to an appearance of safety, certainty, and consensus even when none existed. In this way, many of the chapters in our collection study the production of ignorance as much as the production of knowledge, contributing to the project outlined in Robert Proctor and Londa Schiebinger’s *Agnotology*.¹⁷ The imperceptibility and also proliferation of different kinds of toxic substances, the difficulty of untangling causes and clusters of symptoms, and the inevitable messiness of scientific measurement outside of a lab have worked together to make simple statements about the impact of toxic exposure rare.¹⁸

Stabilizing any scientific phenomenon and creating scientific consensus is always messy, but knowledge about toxicity is particularly incoherent. In part, this has to do with structures of national and industrial secrecy that have restricted the free communication of information about new chemicals, radioactive isotopes, and industrial waste products. The nuclear weapons development of the Manhattan Project during World War II ushered in a new era of classified military research and regimes of secrecy that have continued to structure contemporary institutions, hampering the circulation of knowledge about toxicity, and nuclear technologies in particular.¹⁹

While classified knowledge and military-industrial secrecy are inherently exclusive, broader patterns of science education and communication have also worked to prevent most people from participating in the production of

scientific knowledge. Over the course of the nineteenth century, science, medicine, and engineering became professionalized and increasingly specialized with new societies, journals, and university programs. At the same time, multiple forms of popular science emerged that erected new barriers between members of the public and their meaningful participation in science.²⁰ In England, in the late nineteenth century, for instance, popular science writing was often imbued with a natural theology that understood science as a moral and religious project. This was increasingly at odds with the deliberate secularism of professional science.²¹ Over the course of the twentieth century, themes of natural theology faded but books, radio programs, and television shows continued to draw sharp boundaries around the world of professional science. These vehicles for popular science often cast audiences as passive consumers of science entertainment, rather than active participants in the creation of scientific knowledge.²²

In order to fully participate in science and be recognized as an expert, then, one must pursue years of higher education, gain membership in particular professional societies, and participate in conversations with highly specialized jargon, at conferences and in journals. But barriers of income and education raise concerns that institutions of expertise simply continue to reproduce existing structures of social and racial inequity. The continued underrepresentation of women and minorities in STEM fields—disciplines that are integral to the regulation of toxic substances—gives at least one clear indication of how exclusionary these structures continue to be.²³ The numerous qualifications needed to become an expert also have direct consequences for those most impacted by toxic environments. As scholars of environmental justice elsewhere and in this volume show, low income and minority communities most often bear the brunt of toxic spaces.²⁴ Yet, these groups typically do not have the means to join expert ranks, and outside experts tend to discount these communities' lived experiences of toxicity.²⁵

As a result, community activists fighting toxics in various “sacrifice zones”²⁶ must try to educate themselves about current regulations and research in toxicology, trying to become, in sociologist Steven Lerner's words, “amateur toxicologists and epidemiologists, as well as fluent in regulatory jargon.”²⁷ But learning to read specialized literature is only one step in gaining expertise. As scholars Harry Collins and Robert Evans have argued, a crucial component of expertise consists of gaining a kind of tacit knowledge through experience, which in many cases is only possible through admission to an exclusive disciplinary community.²⁸ Community members

reading published literature on toxicology, for example, will not be able to contribute to this body of knowledge without spending time in laboratories learning from practicing scientists.

Taken together, this paints a decidedly grim picture about the exclusionary nature of expertise, its use in contexts of uncertainty to create a veneer of safety, and challenges faced by communities exposed to toxic spaces. Given this structurally uneven terrain, should those contesting expertise and fighting toxic environments simply give up? No, they should not. As various scholars have argued, there is room to expand our understanding of expertise and recognize knowledge gained outside of these formal institutions.²⁹ Even the model offered by Collins and Evans acknowledges that individuals without access to the formal institutions of science may still have important experiential understanding of an environment, place, or illness. In some environments of toxic exposure, community members have successfully gathered their own health data through surveys, partnered with allied scientists, and gained recognition of illness, engaging in what sociologist Phil Brown has called “popular epidemiology.”³⁰ Research on environmental justice organizing has further shown that collaborations between scientists and activists are not only possible but have also produced new ethical frameworks for collecting and reporting data on toxicity.³¹

Clearly, communities on the ground will continue to contest toxic spaces and, sometimes, change structures of expertise in the process. While the majority of stories in our collection demonstrate how seldom this kind of experiential expertise has been acknowledged historically, either by scientific experts or government bodies, more contemporary mobilizations against toxicity indicate that this situation may be gradually changing. By revealing how our current condition of pervasive toxicity has come to be, the work in this volume, then, may be considered an important “prequel” to understanding our toxic present.

ROADMAP AND THEMES

While any substance causing an adverse health effect on humans can be considered toxic, in this collection we focus in particular on inorganic toxins: chemical substances and radiation produced in x-ray tubes or emitted during fission or by radioactive decay. In almost all of our cases, the toxicity remains invisible, with health effects sometimes manifesting immediate-

ly, and sometimes after long periods of chronic exposure. Many of these toxic agents are the by-products of industrial or military operations—for instance, radioactive fission products circulating through the environment after nuclear weapons testing and chemicals leaking into groundwater as a result of industrial waste disposal or fracking. But not all of the toxics studied here are waste products. In some cases, toxic agents such as x-rays or pesticides were deployed with a particular goal in mind, and with their toxicity not fully understood.

Inevitably Toxic is divided into three parts. In Part One, “Radiation,” we explore particular U.S. encounters with toxic radiation in hospital x-ray rooms, at test sites for nuclear weapons, and in experimental nuclear reactors in the period prior to and shortly after World War II. Here, authors examine the process by which different experts have made decisions about safe radiation exposure in the context of many kinds of uncertainties, highlighting the consequences of those decisions for those exposed. Janet Farrell Brodie’s and William Palmer’s chapters investigate the impact of secrecy on nuclear research while also challenging our ability as historians to reconstruct this history. This section also drives home the willingness of those in positions of power and authority to take enormous risks with people’s health and safety, choosing to deal with the consequences of radiation exposure during or after the fact. Vivien Hamilton demonstrates in her piece, for example, how national safety standards for x-rays in the United States were developed even while doctors were already subjecting their own bodies and the bodies of their patients to radiation. Similarly, Lindsey Dillon explores the new biomedical problems that emerged from the U.S. Navy’s atomic experiments during Operation Crossroads in 1946, showing us that scientific attention turned to questions of radiological safety and best practices only after people and places had already suffered irreparable damage.

In Part Two, “Industrial Toxins,” authors examine how U.S. economic growth in the post–World War II era resulted in the creation of contaminated environments by many different kinds of industrial chemicals. These chapters explore contexts in which legal frameworks to regulate toxics were just emerging, revealing the shaky and compromised foundations of regulation itself. In so doing, these cases look closely at the ways in which public officials mobilized scientific expertise while drawing our attention to the entangled relationships of government agencies and private economic and military interests. Brinda Sarathy argues that expertise on water pollution control in Southern California was filtered through a lens that favored

economic growth, showing how interpretations of scientific data were never simply objective but, rather, inherently political-economic in nature. Similarly, Bhavna Shamasunder reveals how oil industry lobbyists in early twentieth-century Los Angeles ultimately quashed community organizing by forging political alliances with state and federal officials. Such alliances have shaped both the physical and regulatory landscape of toxicity. Part Two also elucidates how the drumbeat of “growth at all costs” was sustained by an attitude of technological hubris and scientific utopianism. Sarah Stanford McIntyre, for example, highlights a version of this unyielding faith in technological progress, as she chronicles how an entire region in Texas held fast to the promise of petrochemicals while also, almost willfully, denying the potentially deleterious consequences of these new industries to human health and ecology. Similarly, James G. Lewis and Char Miller’s chronicle of herbicide use by the U.S. Forest Service epitomizes both the technocratic confidence through which experts remade entire landscapes and their outright refusals to explore alternative means of pest control despite growing public concern and opposition.

In Part Three, “Community Contestation, Expanding Expertise,” community resistance and contaminated bodies become a central theme and unit of analysis. The chapters in this section foreground the experiences of individuals in contact with toxic environments and contaminants; the roles of race, gender, and class in spurring activism; and the growing significance of the local expertise of “ordinary citizens.” More specifically, these authors focus on groups that have often been depicted as victims rather than as agents of resistance in the wake of toxic contamination: Japanese American women who utilized folk traditions to treat radiation sickness following the bombings of Hiroshima and Nagasaki, and First Nations peoples in the Canadian North articulating alternate visions of community health and risk. This unit continues to highlight inconsistencies in the ways in which risk has been perceived and addressed for different kinds of bodies. Taken together, these chapters highlight both the structural forces that help keep in place the status quo but also point to possibilities of reconfigured ways of living that prioritize health and well-being.

Our afterword captures a conversation with historian of science Peter Galison, whose recent film with Robb Moss, *Containment* (2015), returns to the fraught problem of long-term nuclear waste storage. Galison’s work connects with many of the themes in this volume concerning regulation, complacency, and the assessment and communication of risk. Examining

sites of nuclear contamination and waste both in the United States and Japan, the film asks us to imagine how we might warn future generations of this pernicious danger.

In closing, we should acknowledge that most chapters in this volume examine the production of toxic spaces in or by the United States. As such, readers should keep in mind that narratives of “progress” in the U.S. context—and for Western modernity more generally—cannot be disentangled from legacies of conquest and genocide of Native American populations, land theft, slavery, and institutions of white supremacy, colonialism, and structural racism.³² These formations have fundamentally shaped the creation of toxic environments in historically specific ways, both within the United States and beyond.³³

Many of the works in this book, for instance, reveal ways in which the production and management of toxic environments are linked to projects of nation building and related imperial ambitions. In writing about Japanese American atomic bomb survivors, Naoko Wake interrogates how imperial dynamics played out in the formation of the Atomic Bomb Casualty Commission and its gendered portrayals of “victors” and “victims” during the postbomb period. More generally, radiation contamination from nuclear weapons developed by the United States—as outlined at different historical moments by Janet Farrell Brodie, William Palmer, Lindsey Dillon, and Naoko Wake—all bear testament to a larger arsenal that continues to shore up American neo-imperialism globally. Chemical contamination has similarly served to further western ambitions. To this point, James G. Lewis and Char Miller detail the involvement of U.S. Forest Service personnel in torching vast swaths of Vietnam jungle in an overseas war, while Alexander Zahara chronicles the Canadian government’s militarized displays of defense to reinforce the belonging of northern territories within its larger national body. Such stories raise questions about how contaminated peoples and places are not merely incidental to western projects of nation building at home and abroad but instead are constitutive of the process itself.³⁴

Finally, for cases of toxicity in the United States, we urge readers to again be mindful of the broader relations of force that have created toxic places in the name of “progress.” Scholarship in environmental justice has been instrumental in showing how specific processes of white flight, racial segregation, political marginalization, and institutional racism have led to low-income communities of color in the United States being disproportionately impacted by toxic spaces. More recently, the high-profile cases of toxic

contamination in Vernon, California, and Flint, Michigan, have further laid bare the ways in which capitalism works through race and difference, and via the state, to quite literally poison devalued nonwhite peoples and places.³⁵ To this end, Bhavna Shamasunder's chapter on Los Angeles-area activists fighting the oil industry and Sarah Stanford-McIntyre's references to the disproportionate exposure of Black and Latinx residents to petrochemicals must be read against a larger historic tapestry of racial dispossession and racialized violence in the United States. While our stories thus collectively paint a picture of contaminated environments that have become pervasive over time and space, resulting in few "safe places"³⁶ for anyone, toxic environments still impact some bodies and places more than others. This reality itself should be a basis for action against our condition of normalized toxicity.

NOTES

1. "Superfund" relates to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, passed by the U.S. Congress in response to toxic waste disasters such as that in Love Canal, Niagara Falls, New York, in 1978.

2. See, for example, compiled volumes such as Mitman, Murphy, and Sellers, eds., *Landscapes of Exposure*, and Jorgensen, Jorgensen, and Pritchard, eds., *New Natures*.

3. Rose, *Politics of Life Itself*; Braun, "Biopolitics and the Molecularization of Life"; Mitman, Murphy, and Sellers, "Introduction"; Murphy, "Chemical Regimes of Living"; Petryna, *Life Exposed*; Nash, *Inescapable Ecologies*.

4. Jasanoff, ed., *States of Knowledge*, 2.

5. Giddens, "Risk and Responsibility," 4.

6. Murphy, "Chemical Regimes of Living," 697.

7. Langston, *Toxic Bodies*; Walker, *Toxic Archipelago*.

8. Beck, *Risk Society*.

9. The volume *Powerless Science?*, for example, shows various instances of how "the production of scientific knowledge and expertise on toxicants and their effects evolved alongside the modes of toxicant regulation." Boudia and Jas, *Powerless Science?*, 3.

10. Carson, *Silent Spring*; Kuletz, *The Tainted Desert*; Steingraber, *Living Downstream*.

11. Hamblin, *Poison in the Well*.

12. Iversen, *Full Body Burden*; Brown, *Plutopia*; Petryna, *Life Exposed*.

13. Johnston, *Half-Lives and Half-Truths*.

14. Brickman, Jasanoff, and Ilgen, *Controlling Chemicals*, 174.

15. Mitman, Murphy, and Sellers, "Introduction."

16. Oreskes and Conway, *Merchants of Doubt*; Proctor, *Cancer Wars*.

17. Proctor and Schiebinger, *Agnology*.

18. Michelle Murphy has developed the idea of “regimes of perceptibility,” arguing that a particular effect can be made both perceptible and imperceptible by different practices of measurement and argument. Murphy, *Sick Building Syndrome*.

19. Galison, “Removing Knowledge”; Dennis, “Secrecy and Science Revisited”; Schwartz, *Atomic Audit*, chapter 8.

20. Any form of science communication pitched at a nonexpert audience, including books, newspaper articles, museum exhibits, science demonstrations, and lectures, can be considered a form of popular science. See Secord, *Victorian Sensation*; Lightman, *Victorian Popularizers of Science*; Bowler, *Science for All*; LaFollette, *Science on the Air*; Radar and Cain, *Life on Display*; Nelkin, *Selling Science*.

21. Lightman, “The Voices of Nature.”

22. While this dominant model has received criticism from scholars, such as Stephen Hilgartner, who have argued persuasively that it is impossible to clearly demarcate popular from “genuine” science, it is evident that modes of science communication often solidify boundaries between scientists and nonscientists. Felicity Mellor points out, for instance, that when popular physics books lay out an explicit goal of making their material accessible, they are implicitly constructing physics as inaccessible to most readers. Hilgartner, “The Dominant View of Popularization”; Mellor, “Between Fact and Fiction.”

23. National Science Foundation, *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*.

24. Bullard, *Unequal Protection*; Bullard et al., *Toxic Wastes and Race at Twenty 1987–2007*; Mohai, Pellow, and Roberts, “Environmental Justice”; Pulido, “Rethinking Environmental Racism”; Szasz, *Ecopopulism*.

25. Lerner, *Sacrifice Zones*, 3.

26. Sacrifice zones as redefined by sociologist Steven Lerner include a broader array of “fenceline communities or hot spots of chemical pollution where residents live immediately adjacent to heavily polluting industries or military bases.” Lerner, *Sacrifice Zones*, 3.

27. Lerner, *Sacrifice Zones*, 8.

28. Collins and Evans, *Rethinking Expertise*.

29. Wynne, “May the Sheep Safely Graze?”; Epstein, “The Construction of Lay Expertise”; Collins and Evans, *Rethinking Expertise*; Brown, *Toxic Exposures*; Chambers, *Whose Reality Counts?*

30. Brown, *Toxic Exposures*.

31. Ottinger and Cohen, eds., *Technoscience and Environmental Justice*.

32. Limerick, *The Legacy of Conquest*; Cronon, “The Trouble with Wilderness; or Getting Back to the Wrong Nature”; Merchant, “Shades of Darkness”; Almaguer, *Racial Fault Lines*; Gilmore, “Growth”; Gilmore, “Fatal Couplings of Power and Difference”; Smith, “Heteropatriarchy and the Three Pillars of White Supremacy.”

33. Pulido, “Rethinking Environmental Racism”; Dillon and Sze, “Police Powers and Particulate Matters”; Sze, *Noxious New York*; Pellow, “Environmental Inequality Formation”; Pellow, *Resisting Global Toxics*; Brown, *Toxic Exposures*; Lerner, *Sacrifice Zones*; Langston, *Toxic Bodies*.

34. For more, see Brown, *Plutopia*; Hecht, *Entangled Geographies*.

35. Pulido, "Geographies of Race and Ethnicity II"; Pulido, "Flint, Environmental Racism, and Racial Capitalism"; Pulido, Kohl, and Cotton, "State Regulation and Environmental Justice."

36. Brown and Mikkelsen, *No Safe Place*.

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