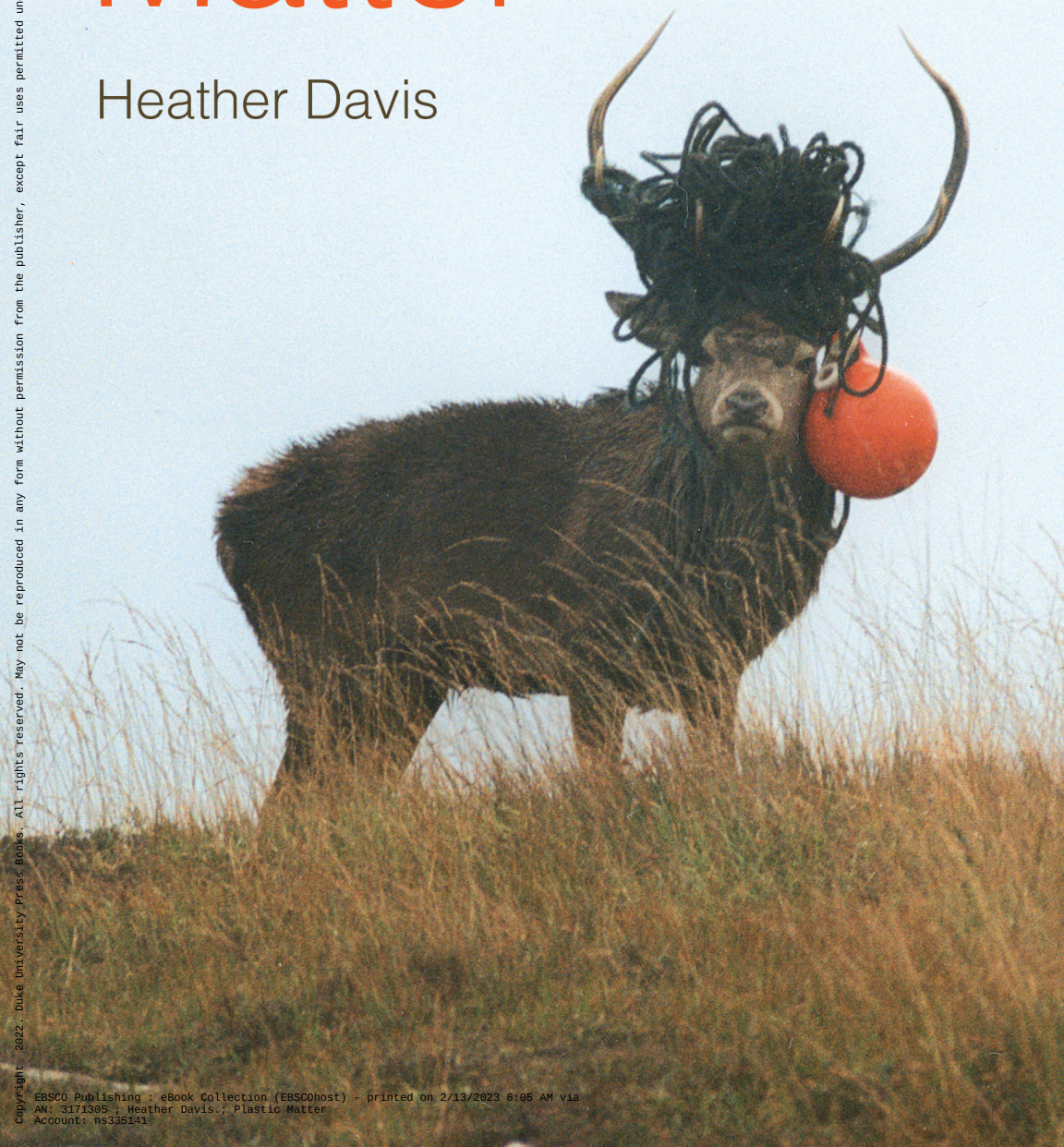
Plastic Matter

Heather Davis



Plastic Matter

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Plastic Matter

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HEATHER DAVIS

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COVER ART: Red deer stag with fishing line and buoy. Courtesy Ali Morris.

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Preface

Complicated Inheritances

Most families have a story that gets repeated again and again over dinners, to the annoyance and delight of everyone who's heard it a million times before. In my family it's the story of how my grandfather helped to develop the plastic milk bag. This sealed bladder of milk, a staple of my childhood, is common throughout Europe, South America, Israel, India, and Canada, where I grew up. Family gatherings were loud, chaotic affairs. Cousins ran everywhere while aunts and uncles talked over each other. It was difficult for anyone to get a word in, or finish a sentence. Anyone, that is, except my grandfather, Ken Irvine. He had all the gravitas and entitlement of a white man who grew up on a farm and had succeeded in the burgeoning chemical industry, fully believing in its promises of creating a better world. Ken was married to a beautiful, intelligent woman, Marg, and the father of seven children—a 1950s patriarch par excellence. When he spoke, we listened.

He would tell us the story of the milk bag, and he was clearly proud of his involvement. Later, looking through his documents, I found a speech on the same topic that he had given to a gathering of former employees. In 1964 he was tasked with finding new business opportunities for DuPont Canada. Founded in 1802 in Wilmington, Delaware, as a gunpowder mill, DuPont later turned to industrial chemical production, including the development of synthetic tex-

FIGURE P.1. Marg and Ken Irvine in Texas, 1952. Courtesy of the author.

tiles, paints, and polymers like nylon, Tyvek, and Teflon. One morning, while working on the problem of expanding DuPont's Canadian markets, my grandfather's colleague Jean Paul Trudel came into his office and asked: "What's the cheapest way to package a liquid?" "In a bag!" my grandfather replied, and so they began to work on how to package milk in bags. The story goes that when it came time to test the seal on the bag, Trudel marched into my grandfather's office and threw the bag across the room to prove that it wouldn't break. It didn't.

In the speech my grandfather gave at DuPont of this invention, there is no mention of my grandmother. But when he told his story around the dinner table, my grandmother would interject, reminding him that he brought home various milk bags for her to test. As the quintessential suburban housewife, my grandmother was the perfect focus group. The initial milk bag had no corresponding container, so my grandmother had to keep the bags in a bowl or transfer the milk to a pitcher. They would flop around and spill everywhere. "Oh, I really didn't like them," she would say, making a face. Eventually a corresponding plastic pitcher, made from a harder and more durable plastic, was developed to go along with the milk bags. And we would keep a blade, encased

FIGURE P.2. Marg Irvine, early 1950s. Courtesy of the author.

in another kind of plastic, attached by a magnet to the fridge, whose sole purpose was to open these bags.

In the summers we visited my grandparents in Kingston at their sprawling midcentury home across the street from Lake Ontario. We swam at the beach and ate in their meticulously kept backyard. As a child I never paid attention to the "private, for residents only" sign on the fence guarding the beach, or the high-security men's penitentiary in the near distance. It wasn't until I was a teenager that I began to register the predominantly white, wealthy bodies on the beach, or the overrepresentation of Indigenous men populating the penitentiary, whose foreboding walls we could see as we swam out to frolic on a raft.

Around this time my high school history teacher, Mr. Cox, stopped during a lesson one day, stomping his foot for emphasis, as he sometimes did, to ask: "Why are we speaking English in the middle of the bush?" This question hit me hard. From that moment, I began to question my presence, my feeling of belonging, on that land, to no longer understand it as inevitable, and to see, slowly, its history of settler colonialism. I had always understood myself as the descendent of immigrants. I was taught to be proud of my English, Irish, and

Scottish heritage, filled with stories of hardship that naturalized my family's presence on the land, rendering it benign. That day in class, looking out into the forest, I began to wonder about the ways in which I do not belong. Why didn't I know the history, language, or culture of the Algonquin and Anishinabeg peoples whose land I occupied, even though a nearby park, one of the most iconic in Canada, was called Algonquin? It was the beginning of what I now understand as a lifelong process of recognizing and questioning how my body participates in forced displacement, genocide, and alienation: not only of Indigenous peoples but also of Black people as well as racialized settlers and immigrants.

I was praised for being the first grandchild to get a PhD despite no one understanding what I studied. My grandmother once introduced me to a friend not by my name but by my title. In other ways, however, I had clearly fallen short. I didn't get married or have kids. I don't own property. It wasn't until I was thirty-eight that I finally got a permanent job. I'm queer and have never brought any of my female or nonbinary partners to meet my extended family. When I was doing my master's degree and living in Toronto, I remember getting a thick envelope in the mail from my grandparents, the same day as massive protests against the start of the Iraq War. I was so excited to open it, thinking it might be a long letter or a present. Instead it was a portfolio explaining how my grandfather had invested $1,000 on behalf of each grandchild, much of this money in fossil fuels, to teach us about the stock market. My heart sank. I immediately thought of the war and the fact that that fossil fuels are also used as one of the primary means of Indigenous dispossession and environmental injustice. I never finished reading that letter. I also didn't pull the stocks out, fearing it would be insulting.

I tell this story to show how plastic has structured my life but also to open up broader questions of inheritance—namely, how whiteness has influenced the technological and material realities in which we live. As Kyle Powys Whyte has argued, our current ecocidal moment can be understood as living in my ancestor's utopia—that is, the utopia of European-descended settler colonizers.[1] This world is certainly the utopia of my grandfather. And as much as I would like to disavow it, it is mine as well. This book is my own attempt to grapple with this inheritance.

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This work is indebted to and enmeshed in countless conversations, workshops, and the generosity of friends, family, and colleagues. Some of my earliest theorizing of plastic happened through late-night talks with Pinar Yoldas. Although her artworks don't appear in these pages, her brilliant projects, particularly *Ecosystem of Excess* (2014), have been central to the ways I have come to understand and theorize plastic. Terike Haapoja, Jason Pine, Elaine Gan, Jeannine Tang, and David Berring-Porter all provided generous engagement as I neared the end of writing, looking over numerous versions and edits that were invaluable to the coherence of this book. Caitlin Berrigan sent me so many quirky articles on plastic that always blew my mind; she also provided rigorous editorial feedback. Thank you to Tejal Shah for their inspiring work and dedication to queer ecologies. Much gratitude goes to Courtney Desiree Morris for her intellectual and artistic practice and brilliant presence in the world. I am constantly amazed and humbled to have so many magnificent thinkers in my life that are also dear friends.

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the continued support of my teachers Monika Kin Gagnon, Peter Van Wyck, Brian Massumi, and Elizabeth Grosz. Generous collaborators and cothinkers, including Kirsty Robertson, Kelly Jazvac, Kelly Wood, Tegan Moore, and Jennifer Wagner-Lawlor have continued to inspire me and keep me on my toes. I have learned so much about work, generosity, and care from the Synthetic Collective. I am grateful to the participants of the Elements workshop, including the careful comments of Rafico Ruiz, Darin Barney, Yuriko Furuhata, Ayesha Vemuri, and Burc Kostem. I presented versions of this work at so many venues over the years—thank you to everyone who invited me and engaged these ideas. I also want to thank Michael Nardone, for his abiding love, and infectious love of language, through many years of writing. I have so much gratitude for Waqia Abdul-Kareem, their compassion, support, love, and piercing critical eye. Finally, the ongoing dedication of Stacy Alaimo and Nicole Starosielski to my work has been exceptional, buoying me through moments of difficulty, providing a beacon of feminist inquiry and generosity.

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Every day I am thankful for my parents, Diane and Phil, and sisters, Alison and Marcy, who always provide a ground of love, support, and intellectual rigor. This book is dedicated to them, for the complications, compromises, and beauty of being-with.

Plastic Matter

Plastic is now everywhere, and it seems to transmit its daily banality outward. What could possibly be said about such a terribly mundane material? How can it provoke thought beyond a shrug or exasperated scream at its unfathomable accumulation? As I will argue throughout this book, plastic's presence is an invitation to a broader reevaluation of matter and material relations. This book traces the relationship between plastic and plasticity, following the consequences of engineering matter. I argue that plastic reveals broader assumptions about relations to matter, and how matter is understood under technocapitalism. Plastic matter describes the assumptions that matter is there to be manipulated; it can and should be bent and made pliable; and its potential for manipulation is endless. *Plastic Matter* is a provocation to reexamine all matter in light of plastic's saturation. For plastic is not just any material but is emblematic of material relations in the twentieth and twenty-first centuries, showing how intimately oil has coated nearly every fabric of being, how the synthetic cannot be disentangled from the natural, and how a generalized toxicity is producing queer realities.

But what, exactly, is plastic?

Plastic, for the purposes of this book, can be defined as "any one of a large and varied group of materials consisting wholly or in part of combinations of carbon with oxygen, hydrogen, nitrogen and other organic and inorganic elements which, while solid in the finished state, at some stage in its manufacture is made liquid, and thus capable of being formed into various shapes, most usually through the application, either singly or together, of heat and pressure."[1] This broad definition covers the range of plastics that have been manufactured, most of which are dependent on coal, oil, or natural gas for their molecular carbon. There are many different types of synthetic polymers that we call plastic. They are mostly known through their recycling symbols, found on the bottoms of containers that give a false impression of the range of plastics. There are, contrary to those seven recycling symbols, thousands of different kinds of polymers, each with its own characteristics. To these basic molecular compositions, up to eighty thousand additional chemicals might be added to give plastic the qualities that a producer might desire, for example, to make it pink, or heat resistant, or pliable. Some plastics are made from materials such as polylactic acid, which comes from corn, or cellulosics, derived from cotton. These sets of polymers are conventionally known as bioplastics or biodegradable plastic.[2] A range of naturally occurring materials with similar molecular chains (polymers), such as rubber, are sometimes also referred to as plastic. However, these two latter categories of plastics, those that occur outside chemical laboratories, and those manufactured from nonpetroleum bases, fall outside this book's focus. Rather, I am rather interested in the ways in which fossil fuels have infiltrated almost every aspect of our daily lives, most intimately through plastic, and what this tells us about Western assumptions regarding matter and materiality.

The Indian artist Tejal Shah's installation *Between the Waves* (2012) depicts many of the central problematics of this book. The artwork creates a world that blurs the boundaries between ancient systems and contemporary form, where humans and our artifacts—plastic chief among them—are thoroughly enmeshed with nonhumans. Occupying a temporal register that is at once past, present, and future, the piece offers a mythic exploration of queer ecologies and a particularly poignant portrayal of a world saturated in plastic. Shah invites their viewers, placed in this mythic world, to see plastic as agential and lively but also as defying easy categorization.[3] Much like our own world, there is no escaping plastic in *Between the Waves*. In one scene, it appears that the characters are being birthed from the ocean. Images of them, bruised and bloodied, are juxtaposed with footage of sea turtles coming on land to lay their

FIGURE 1.1. Video still from Channel One, "A Circular Fable," *Between the Waves*, 2012, by Tejal Shah. Courtesy of Project 88 and Tejal Shah.

eggs. There is something deeply primal about the scene. The characters lie in the sand, with waves passing over them, entangled with all kinds of debris, including Styrofoam and plastic-coated wires. As they rise and help each other wash off, we see that they are clothed in more plastic—bags and film refashioned as tunics.[4] On one of them, the dress they wear is adorned with numerous CDs, which catch the light. This saturation of plastic, and its creative reuse, mimics the realities that are now present virtually everywhere. There is nowhere you can go to escape plastic. It is in the Arctic, the Mariana Trench—the deepest place on earth, over ten thousand meters beneath the surface of the Pacific Ocean—and on remote mountaintops in the high altitudes of the Pyrenees. It is in the air we breathe and the water we drink. Plastic microparticles circulate through our bodies; nanoplastics penetrate our cell walls.[5] Its chemical by-products have been found in everyone who has been tested. The world *is* now plastic.

This inability to filter out plastic, to maintain a neat division between the synthetic and natural worlds, is shown in two other scenes in Shah's piece. In one, set in a mangrove forest, the characters wade around in the water, picking up plastic trash from the roots of the trees with a scythe. They neatly collect the plastic debris into another plastic bag in order to remove it. Yet, even as this

FIGURE 1.2. Video still from Channel One, "A Circular Fable," *Between the Waves*, 2012, by Tejal Shah. Courtesy of Project 88 and Tejal Shah.

channel plays quiet and generous acts of care and disentanglement, the viewer is conscious of another channel, which depicts a large landfill, where this plastic, neatly removed from the forest, will end up. It is a poignant reminder that plastic does not go away; it is only put somewhere else. In the other scene, the characters swim underwater with a constructed coral colony, all composed of plastic waste and e-waste. Plastic jellyfish float by. These scenes are intercut with footage of marine life, but the juxtaposition does not pit "artificial" reality with a pure, untainted nature but rather shows the ways that *plastic is now nature*. For despite the fact that plastic was designed as a protective barrier from the earth and other creatures, plastic cannot help but become part of the earth, it is still a material of the earth, even if in a purposefully oblique and engineered fashion.

Between the Waves tells the story of waste colonialism, with countries such as the United States, Canada, and Western Europe using Southeast Asia as a dumping ground.[6] Although much of India's waste is generated internally, the artwork reflects the consequences of the aggressive marketing of plastic and plastic products in so-called developing nations, which often lack adequate waste disposal systems to deal with all this plastic.[7] (But what country really does have the proper infrastructure for the mountains of plastic produced ev-

FIGURE 1.3. Video still from Channel One, "A Circular Fable," *Between the Waves*, 2012, by Tejal Shah. Courtesy of Project 88 and Tejal Shah.

ery year?) Plastic pollution, as the science and technology studies scholar Max Liboiron has argued, can be understood as a form of colonization.[8] It is not incidental, in this context, that the first landfill in India was created by the British during their occupation of the subcontinent.[9] Plastic is transferred to peoples and places that do not consent to all the consequences of plastic and its waste, even if and when these items are produced and used locally. Regardless of where plastic comes from, it has the effect of transmitting a sense of universality; plastic is designed to be divorced from a specific location, appearing as if from nowhere and coating particular places in this sense of globalized unlocality. Here it is possible to see how plastic is imprinted with the colonial logics of dissociation, dislocation, denial, and universality, reproducing itself without regard for local cultures or ecologies. This is what I call synthetic universality, which I take up at length in chapter 2. Synthetic universality refers to the imprinting of plastic with a particular semiotic designed to be universal, placeless, and to deny its surroundings. Synthetic universality describes how plastic is a deliberately alienated material, which enacts its violence through the dislocation from the earth, as part of what Kathryn Yusoff calls "White Geology."[10]

In cases where plastic appears through logics associated with waste colonialism, as in India, I describe this as transmission. Differentiated from inheri-

tance, where plastic becomes the problem of those who invented and benefit from it, transmission describes the imposition of plastic: its legacies on multiple peoples, largely racialized and poor, who deal with the intergenerational effects of plastic but are not responsible for its emergence or proliferation.[11] Transmission considers not just waste but the potentially harmful aspects of plastic that include its production. *Transmission*, as I develop it, especially in chapter 3, refers to the ways in which plastic permeates every and all aspects of life on earth, often without the consent of those people and other beings who are most affected by it. Transmission of plastic describes one aspect of the dispossession and the undermining of health and well-being of communities through synthetic universality.

It would be easy to read the ecological ruin in *Between the Waves* as simply dystopian: the amount of waste depicted is overwhelming. But the work also conveys a capacious queer desire—a desire that cannot undo the effects of plastic's synthetic universality or its participation in waste colonialism but nonetheless offers potential avenues for living with plastic. The artwork is permeated with a queer ecological sensibility that does not turn away from the horrors of our times, or transmit a nostalgia for a pristine past, but instead offers a curiosity about what is present, what is possible here and now.[12] *Queer ecologies* is a term that was developed to contest the heterosexist assumptions built into biopolitical accounts of nature and to reimagine evolutionary processes, ecological interactions, and environmental politics in light of queer theory.[13] As it is employed in *Between the Waves* and throughout this book, queer ecologies seeks to question the purity narratives that are built around understandings of "nature," and to open up eroticism, kinship, and care to more-than-human relations. Erotic gestures and acts of care between the characters and all the materials and beings they come into contact with transmit a feeling of connection in *Between the Waves*, even when this connection is built through networks of toxicity. For example, the characters use black plastic gloves to have safer sex with each other and to caress the mangroves, yet these gloves will ultimately end up in the landfill. As I detail in chapter 4, queer ecological care, and the creation of kin through all the novel microorganisms that plastic is birthing, offer ways of living that are more implicated, enmeshed, and earthly, working against some of the universalizing logics that helped create plastic in the first place. This is not an escape from toxicity but rather a reckoning with its permeation.

Almost everything that appears on screen in *Between the Waves* is infused with vitality. This orientation finds resonance with Jane Bennett's provocative formulation of vibrant matter, and the turn toward understanding the agency of matter. *Vibrant Matter* does much necessary work to deconstruct the lineage

of Western thought that insists that matter is inert and inactive, drawing on the minor literatures of Western philosophy to argue for matter's agential being.[14] Bennett draws attention to the animacies of trash and plastic gloves (although these are not as erotically charged as in Shah's world). Bennett's intervention fits within the broader field of what has come to be known as feminist new materialism. Scholars working in this field have insisted on the importance of not privileging discourse over an engagement with materiality.[15] Feminist new materialism emerged in reaction to an overemphasis on the productive capacities of culture, instead "want[ing] to know how we can define the 'real' in science and how we can describe nonhuman agency in a scientific context."[16] Within this realm of thought nature is understood to be "an active, signifying force; an agent in its own terms; a realm of multiple, inter- and intra-active cultures."[17] These recent turns in contemporary feminist theory are deeply influenced by Karen Barad, who significantly challenged Western understandings of matter and semiotics through her insights in quantum physics. Barad conceptualizes matter and meaning as mutually implicated and co-constitutive, and from this I draw the relationship between plastic and plasticity. Barad's work on the inherent queerness of matter—meaning that matter itself is always queer, always surprising and fundamentally entangled—is echoed in the ways that plastic appears in *Between the Waves* and throughout this book.[18] I presume plastic to have a queer agency, that it is an active, signifying force in the world.

However, it is important to keep in mind that animacy itself is not anathema to waste colonialism. Matter's agential power is not antithetical to contemporary capitalism. Rather, as the art historian Amanda Boetzkes's work has shown, plastic and oil are fundamental to the animating power of capitalism. Boetzkes astutely observes that waste management has become its own form of maintaining economic growth and she and Andrew Pendakis note that plasticity is embedded in all forms of capitalist logic.[19] Boetzkes's work builds off Gay Hawkins's topological reading of plastic. She argues that the economic and cultural value of plastic is enacted rather than produced. Hawkins is particularly interested in tracing the agential qualities of plastic rather than thinking of it as a "passive object of economic forces."[20] In particular, she argues that plastic is valuable *because* it is meant to be wasted. Hawkins's work asks after the relations that plastic invites and produces, through detailed examinations of water bottles, plastic bags, and other single-use plastic items. She is also particularly concerned with the different ways that people interact with plastic and its associated waste, with particular attention to varying cultural contexts throughout Asia.[21]

Plastic has become one of the sites at which anxieties over technology and environmental futures merge. Since its invention, and escalating in the 1960s,

people have been deeply ambivalent about plastic and its many promises, seeing it as increasingly cheap, fake, and later, toxic.[22] We fear being smothered in plastic, in its sticky, sleek surfaces, our bodies invaded by this foreign, alien material. Yet, we are also attracted to it, and especially to its promises of a clean, sanitary, sterilized life. Despite the fear and revulsion that many now feel toward plastic, we cannot easily give it up.[23] Plastic is used in ever-larger quantities, with an exponential increase over the last sixty years. It is produced in astronomical amounts—about 380 million tonnes (or about 419 millions tons) globally per year—with about 9 percent recycled worldwide. The remainder of this plastic waste (91 percent) is put into landfills, incinerated, or used for durable goods, such as the plastics found in building materials. But much of this incredible tonnage ends up in the wider environment, where it circulates in the currents of air and water. If rates of plastic production continue with contemporary waste management practices, it is predicted that by 2050 twelve billion tonnes of plastic will be in landfills and throughout the wider environment.[24] It is hard to fathom such a large number, and we have very little understanding of what this may mean to ecosystems and to human health.

As plastics have entered into the environment, permeating almost everywhere on earth, there has been a large, growing body of literature from across the sciences on the health effects of plastic pollution, plasticizers, and their associated chemicals on all manner of beings. One paper called for plastic to be considered toxic waste owing to the proven and probable negative health and environmental effects on many populations, including humans.[25] The authors highlight the fact that if plastic were considered hazardous waste, there would be more incentive to produce less hazardous polymer materials, and existing materials would be handled more carefully.[26] They base their conclusions on a number of adverse health effects associated with plastics, including the fact that more than half of the chemical ingredients in plastics are hazardous and can be found to accumulate chemicals in the blood through, among other mechanisms of transfer, medical supplies.[27] This study shows that even in cases where plastics are used to improve human health, there can be unforeseen negative consequences, such as when microplastics get into tissues and cells because a person's joints have been replaced with plastic, disrupting cellular processes and degrading tissues.[28] There is additional, growing concern over the effect of associated additives, called plasticizers, on health, especially those shown to be endocrine disrupting;[29] there is also concern over the capacity of plastics to adsorb other toxic compounds including DDT, pesticides, and polychlorinated biphenyls in waterways, accumulating and dispersing these harmful chemicals.[30] We need to take these effects on the bodies of all beings seri-

ously, with critical attention to the ways that plastic differentially harms people along lines of race, class, geography, gender, and ability. When it comes to plastic and its long-term effects in the environment, despite the growing body of scientific literature, there are many more questions than answers.[31] What we do know is that plastics are inescapable. They are reconfiguring the atmosphere, biosphere, and hydrosphere, so it seems imperative to think with this material. Plastic has radically reshaped the world and our relations to it, even as the question of how plastics may be modifying the world speaks to the aporia of inheritance: we cannot know because the questions we ask, and the environments we are in, are already determined by plastic's presence.

Plastic Matter

Plastic matter, as I develop it, theorizes plastic as a material that embodies and challenges many of the received assumptions about matter coming from Western thought. It is a provocation to reexamine all matter in light of plastic's saturation. Referring to the ways that matter is understood to be plastic, in both the metaphorical and material senses, plastic matter describes the kinds of philosophical assumptions that fostered the conditions for plastic to emerge in the world in the first place. This concept speaks to how the materiality of plastic has been imposed on to our expectations of matter more broadly, how matter itself has come to be produced as inherently pliable, disposable, and consumable. The amorphous, shape-shifting qualities of fossil fuel–derived materials are refracted through the iridescent surfaces and deflective capacities of oil in plastic's plasticity. If we wish to understand material relations in the twentieth and twenty-first centuries, a comprehensive material investigation of plastic is needed. For, as I argue, how we, the inheritors of Western modernity, think about and interact with plastic is indicative of material relations more broadly. And plastic, paradoxically, carries within it many earthly lessons that might be useful in navigating through the current ecological crisis.

Plastic was one of the first materials to be chemically engineered, through the manipulation of molecules, representing the first instance of producing form and matter simultaneously. Unlike a pregiven material, such as clay or metal, which can be molded but must conform to its material constraints, plastic can be produced to have any particular material quality. The terms of materiality within the post-Enlightenment Western project are impressed into plastic, where matter is subservient and dichotomous to the wills and whims of the human mind. Plastic matter highlights how capitalist and colonial systems are dependent on the vitality of objects, the transformational capacities of the nat-

ural world, the endless transmutation of matter, and the creative responsiveness of evolutionary processes. As plastic shapeshifts, it takes on the exuberant energy of long-dead organisms to appear in virtually any form. The fact that plastic can seemingly become anything has consolidated an understanding of matter itself as infinitely pliable. Plastic matter is a descriptive concept, but it is also aspirational in the sense that it describes utopian ideals of technological progress associated with modernity. For plastic, and plastic matter, also relate the deep and profound lesson about earthly life: try as we might to remove ourselves, to maintain a solid division between nature and culture, or the natural and synthetic, everything emerges from and is ultimately folded back into the earth in a fundamentally intra-active process.

Plastic condenses and illustrates the goals of techno-utopian thinking, while simultaneously pointing to their undoing. Plastic matter speaks to this paradoxical relation: the ways in which plastics are impressed with an attempt to violently cleave the world in two, while also exposing how nature and culture can never be separated. Bruno Latour's assertion that modernity proceeds by way of purifying practices could be a way to describe the material relations of plastic.[32] Operating as a purifying material, plastic is often understood to be solely in the realm of the human, but it clearly has so many implications for the more-than-human world. The project of imagining nature and culture as two separate realms rests on an underlying assumption, perpetuated within mainstream environmentalist discourses, that the more-than-human world exists ahistorically, without its own capacities to respond and attune. Culture is the assumed place of transformation. Plastic's rapid incursion into the environment intrudes on our notions of the separation of nature from culture. The desire for, and belief that, nature and culture can and should be separated is in, among other things, the idea of wilderness, as manifested in national parks.[33] The opposite and complementary existence of the dump makes obvious an underlying belief that we can and should separate the human from the rest of the world through regimes of management.[34] Plastic, because of its transportability and ubiquity, disrupts these constructed boundaries. It is "matter out of place" as it is found blowing in the wind,[35] caught in trees, or being eaten by turtles in those same protected parks. It refuses to stay in landfills. This complication and disruption of boundaries happens at more fundamental levels than simply plastic's dispersion, as evidenced in novel geologic formations such as plastiglomerate, a mixture of plastic, sand, and other debris, which I take up in chapter 2. Despite the fact that plastic is the arch-synthetic material, it remains thoroughly of the earth. Everything is ultimately enfolded back into the geologic layer, including plastic. As it fuses with the wider ecology, plastic is turned back

into its basic composition as rock and oil, just as it becomes a new food source for bacteria and fungi.

Emerging from technoscience and technoculture, plastic matter shares a particular dissatisfaction with the world as it is, or in being in the present, attuned to its multiple nuances and contradictions. As Donna Haraway elaborates, "Twenty-first century technoscience and technoculture are nothing if not frontier practices, always announcing new worlds, proposing the novel as the solution to the old, figuring creation as radical invention and replacement, rushing toward a future that wobbles between ultimate salvation and destruction but has little truck with thick pasts or presents."[36] The rush toward a future is, in many ways, a desire to remove responsibility, to displace it onto peoples and generations at a remove from the current moment and location, to move so quickly as to evade repercussions. It is a desire for an existence that is less messy, less enmeshed with earthly life. The link here between the goals of technocultures and Western, colonial mentalities is not accidental or incidental. These ideologies are animated by a will to forget and disavow the violence of extraction and of technological transformations of everyday life: an impulse and belief that if we simply run fast enough, or move far enough, we can escape past violences, the haunting legacies of extraction and colonialism that have brought us to this place. The millions of years that go into the creation of a plastic item, and the indefinitely long time it will take for that plastic item to decompose, are seemingly obliterated by the fact that we often use plastic packaging for, at most, a few months, compressing deep time into what seems like an eternal, and eternally replicating, present. This time is not one that sits with the present to fully account for it; rather, plastic encourages a fleeting present that eats time.

Synthesis of Petrocultures

Contemporary petrocultures that are read through plastic stress their intimacies and molecular saturations rather than their infrastructures, such as pipelines or oil wells. Petrocultures inquire into the material, social, and political imaginaries brought into being through fossil fuels. Oil has structured not only our energy systems but our understanding of democracy, freedom, and liberal political philosophy.[37] Similarly, plastic creates the contemporary world. It is not just on everything, *it is everything*, and it makes the realities and imaginaries that we have come to take for granted possible. It is necessary to think plastic in relation to petrocultures as plastic production is increasingly responsible for fossil fuel emissions and is bound to fossil fuel production.[38] The supposed fric-

tionlessness of global consumer supply and circulation is enabled through the sleek, slippery surfaces of plastic, while they also divorce us from the metabolic rhythms of the earth.[39] Plastic is emblematic of the relations of *petrocapitalism*, a term originally developed to describe the political and economic structures of nation-states to oil production but here employed in a wider sense to think through the particular formation of advanced capitalism that depends on and is enabled by widespread access to fossil fuels.[40]

Although oil precedes plastic, both as a source material and also, obviously, by tens of thousands of years, there is a circular logic between oil and plastic that Amanda Boetzkes and Andrew Pendakis highlight: "Oil generates a plastic operation. Every aspect of the oil industry relies on techniques of transposability that we can associate with plastics as circulating commodities and with plasticity as a myth of eternal and limitless transformation."[41] Here, Boetzkes and Pendakis draw attention to the ways in which plastic operates as the medium of our oil economy, but they also show that the metaphorical associations of plastic, as infinitely malleable, influence how that economy expands. Plastic, produced from oil, reproduces and multiplies its logics through plastic matter.

Materialized as a sealant, barrier, or container, plastic matter embodies the Western desire to rid ourselves of our obligations, relations, and connections to the land. The ability of plastic to seal an object or person off from the broader environment lends the material to an imaginary where technology can shield us from harm. From hazmat suits to Tupperware's ability to "vigilantly protect vulnerable leftover food from all external threat,"[42] plastic becomes the imagined barrier to protect from other forms of injury. Synthetic textiles, or what the art historian Kirsty Robertson calls "petrotextiles," are paradoxically used to keep oil workers safe as they work on rigs or in potentially explosive situations on fracking sites.[43] Petrotextiles are industry standard, despite the fact that these materials are themselves highly flammable, therefore requiring huge amounts of flame-retardant chemicals to make them safe. Landfills are also lined with plastic, in order to seal in plastic and other waste, to prevent leachate from entering groundwater.[44] Oil products are used to protect us from oil products. These examples illustrate the circular operations of plastic matter.

Although science and technology studies (STS) and related fields are more clearly established in their relationship to biology and physics, there is a growing body of work that is interested in examining the social, political, ethical, and cultural dimensions of chemistry.[45] It is significant that most of this work addresses questions of environmental justice in relation to the effects of the chemical industry, and in particular to petrochemicals.[46] These literatures help develop an understanding of the body as transcorporeal,[47] or as viscously po-

rous.[48] In other words, they are interested in molecular movements, recognizing that the openness of our bodies, the ways that our bodies are constituted by the outside, means that we are vulnerable to the chemicals found there. These literatures help to orient the insights of the nonsovereign body toward a politics of environmental justice.

Plastic is deeply embedded in what the environmental historian Michelle Murphy has called "chemical regimes of living."[49] These regimes extend the biopolitics of life to the molecularization of life,[50] and they speak to the ways that our worlds and bodies are increasingly saturated with the novel molecules of chemical engineering. Despite the lively and interesting effects of such a transformation to our environmental and bodily being, "synthetic molecular relations, fostering a chemical regime of living in which it is commonplace and legally acceptable for such molecular relations to escape state regulation or the spotlight of research,"[51] mean that the harms associated with synthetic chemicals are often disproportionately transmitted to oppressed communities without their consent. Therefore, it is necessary to think through plastic not just as an interesting material, for to do so would be to replicate the harms of Western-style thinking, but as one that enacts particular forms of harm carried by way of a set of principles that impress its materiality.[52]

Methodology

Thinking with and through plastic has not been an easy task. It is something so present, so ubiquitous, that it risks becoming invisible. It is also a material that could be described, in Timothy Morton's language, as a "hyperobject"—that is, an object massively distributed in time and space to the extent that it cannot be realized in any particular local manifestation.[53] Clearly, plastic has many local manifestations, but plastic matter involves this massive distribution. This is in part because of the alienated quality of plastic, its dislocation from time and space through the production process, as Robin Wall Kimmerer identifies. Her argument is worth quoting at length:

> Looking over the objects on my desk—the basket, the candle, the paper—I delight in following their origins back to the ground. I twirl a pencil—a magic wand lathed from incense cedar—between my fingers. The willow bark in the aspirin. Even the metal of my lamp asks me to consider its roots in the strata of the earth. But I notice that my eyes and my thoughts pass quickly over the plastic on my desk. I hardly give the computer a second glance. I can muster no reflective moment for plastic. It is so far

removed from the natural world. I wonder if that's a place where the disconnection began, the loss of respect, when we could no longer easily see the life within the object.[54]

Plastic Matter asks: How did we get to this place of disconnection, and why has it become so normalized? What effects have the assumptions about matter that informed the creation of plastic had on the world? And what happens if we do attempt to see the life within the object as potential queer kin? One of the premises of many strands of critical thought is that there is a recursive relationship between materiality and ideas. Thought manifests materially. *Plastic Matter* traces this recursive relationship between ideas and materiality to do the difficult task of thinking with, rather than passing over, plastic.

Just as plastic is not bound by a particular location, neither is this book bound by a particular discipline. *Plastic Matter*'s primary impetus is to follow plastic where it leads, attending to the ways in which it is both reshaping our material surroundings and inviting a critical reappraisal of how matter is understood within Western thought. This means that I trace the scales of plastic, showing how the molecular is intimately connected to the molar. Despite the ungainliness of these jumps, they are necessary to understand how we have arrived at a world so saturated with plastic. Plastic here is treated as an element. As the media studies scholar Anne Pasek writes, this poses particular challenges, as "elements are everywhere, within and composing everything."[55] Thinking plastic elementally, as I do, requires an expansive overview, which clearly has its methodological pitfalls. The scale of this book's ambitions, and its brevity, risk reproducing some of the universalizing logics I argue are impressed into plastic itself. But I hope that this approach affords a new way to think about plastic as a spur to reconsider the semiotic impressions of matter, and what such impressions tell us about our relations to the more-than-human world. If I have shown, via plastic, the recursive relations of the West's conceptions of matter and the conditions of its production, my goal is to invite an altogether different form of material relations.

In addition to thinking plastic elementally, I am driven by a methodological approach that values and privileges intimacy. If, in much critical thinking, there is a distance that is presumed and required in order to see clearly, with plastic no such distance is possible. Instead of thinking about this as a methodological pitfall, I take it as an opportunity to ask what it might mean to get closer to difficult or problematic objects. What might it mean to take these enmeshments not as what we must distance ourselves from; instead, by getting closer to objects we may abjure, what lessons might be found? This is a

methodological intimacy that hopes to stage a process of care taking or making meaningful of objects and materials that are otherwise taken for granted, made invisible, or seemingly too big to think about, too abstract or alienated.

I think through the intimacies of plastic, in part, through my own direct inheritances of it, and how inheritance in general provides a framework for thinking through the task of making worlds that always lie before us. For the philosopher Jacques Derrida, inheritance is always in the making as it works through us. I use the word *inheritance* because it also refers to how structures of privilege and power are passed on. As a term, *inheritance* is still primarily used, both legally and informally, to speak of property relations. *Inheritance* is defined, in the *Oxford English Dictionary*, as the "succession to property, a title, office, etc."; "a coming into, or taking possession of something, as one's birthright; possession, ownership; right of possession."[56] Inheritance as right, possession, and property indicates how Western modernity conceives of intergenerational time. Here, we become with the world through our objects. Inheritance as property, rather than as skills or ways of being, assumes a naturalized relation to capital and to colonial extraction and is about the ways in which filial relations, patriarchy, and race unfold across generations, consolidating, rather than redistributing, privilege. As the American studies scholar George Lipsitz writes, this kind of inheritance works "especially through intergenerational transfers of inherited wealth that pass on the spoils of discrimination to succeeding generations."[57] I argue throughout this book that we can think plastic matter in similar terms. Plastic matter describes the intergenerational transfers of wealth, the differential accumulations of toxins, and the effects that these have on thinking about questions of power and privilege through the lenses of capitalism and settler colonialism. I take this up especially through the case study of southern Louisiana in chapter 3. Plastic matter also describes unexpected openings, if we are willing to sit with the conditions that we find ourselves within, offering queer reworkings of kinship that may help to see a way to worlds otherwise.

Although plastic can now be found everywhere, or anywhere, on earth, this book is grounded in the United States. There are two primary reasons for this geographic circumscription. First, I have lived in northern North America for my entire life; this land represents the limits of my own knowledge. Second, the primary centers for the birth of plastic were the United States and Germany. As I will argue throughout, this was not incidental but carries a particular orientation to philosophies of matter that originate in Western thought. The setting of the United States offers the further advantage of making the connections between settler colonialism and plastic clear.

Chapter Summaries

All studies of materiality are shaped by plastic matter. As a result, many of the categories that have anchored humanistic analysis—body, subjectivity, media, infrastructure—need to be reexamined in light of plastic matter. I do this through each of the chapters. Beginning, in chapter 1, with a historical overview of plastic and its infrastructures, I argue that the concept of plasticity predates the set of materials we have come to know as plastic but deeply informed how it was made. As an object of technoscience, plastic bears the traces of plasticity, where matter is understood as a field of limitless potential. This orientation has profound implications, not just for how plastic has shaped the world, but for all our material relations and infrastructures. Understanding plasticity's connection to matter makes clear the philosophical investments of technoutopianism in times of ecological crisis. For plastic matter is still very much with us, beyond plastic itself, as it also manifests in various climate engineering schemes, for example. Tracing plasticity through plastic makes these investments more obvious.

Chapter 2 focuses on a novel geological form, plastiglomerate. This new composite material invites an appraisal of how plastic matter penetrates into the geological layer, not simply to be read as a particular linear time map but to serve as an invitation to see the multiple unfoldings of matter across time. Plastic is frequently used as a marker of geological time in the framing of linear time. For example, plastic is one of the main stratigraphic markers within the geological literature of the Anthropocene. The Anthropocene has been widely critiqued as a concept by humanities scholars, primarily because of its lack of accuracy in attributing responsibility for contemporary ecocidal conditions, and its reinstantiation of a universal human. Kathryn Yusoff has also made clear that one of the other problems with the Anthropocene is the presumption that linear time can be read into the rocks of the earth.[58] Stratigraphy itself was built on an ordering of the materiality of time through sequential strata. Certainly, this is a useful way to be able to read the earth and its various phases, but it can also lead to gross simplifications. In the case of plastic, it is not enough to be able to show that it occupies a particular register in the stratigraphic layers, as plastic is composed of the compressed bodies of ancient plants and animals, themselves unearthed. In other words, plastic has to be read in at least two ways: through its contemporary placement and through its ancient origins, but this already begins to complicate the presumed linearity of materialized time that is the earth's strata, already suggesting that there are multivalent ways to read these layers of the earth that may in fact be more like the timescales of

Between the Waves, not easy to place in either the past, present, or future, not easily pinned down to only one time. I trace the geological relations of plastic through plastiglomerate, which not only incites these questions of earth's readability but also brings into focus the fact that the natural and synthetic world cannot be disentangled, only violently cleaved apart.

Chapter 3 examines the relationship of media and bodies in petro-time. Plastic bends and compresses time in such a way that it becomes a vector between the deep past, through oil, and the deep future, because of its persistence. Petro-time describes the plasticity of time itself, the way that petrochemicals haunt and saturate these multiple condensed presents. Petro-time forces the geological past into the present, transmitting the harms of unearthed matter. Thinking through the embodied consequences of so much plastic and its associated chemicals in the environment, I show how petro-time scrambles intergenerational time, as the effects of toxic exposure may skip generations. By taking photography as my main medium and southern Louisiana as my main site of analysis, I reexamine how plastic haunts people and places. Photography is a medium that is dependent upon petrochemicals, as it also conveys a sense of time's passing. I read the haunting potential of photography through the petrochemicals that it transmits. Similarly, the polyvinyl chloride (PVC) plants of southern Louisiana map a complicated relation to petro-time that dispossess primarily Black communities, where settler colonialism haunts the landscape. The companies of "cancer alley" are read as a form of anti-Black atmosphere that enacts an intergenerational violence through petro-time. Here, it is easy to see the colonialism of pollution directed toward the preservation of white supremacy, the ways that plastic's plasticity continues to be transmitted to specific bodies.

Chapter 4 expands the focus on intergenerational time, inheritance, and transmission to think about networks of queer kin that are inadvertently being birthed by the proliferation of plastic. The microorganisms that are appearing as a result of plastic's proliferation—the new bacteria that have evolved in order to eat plastic—invite a reconfiguring of categories of kin making, to extend beyond not only normative family units, or even the more-than-human world, but also these slightly abhorrent technobacterial becomings. This queer ecological imaginary does not condone the violence of petrochemical companies, but it also refuses a bucolic past, asking those of us who are the inheritors of plastic to become accountable to our bacterial children.

FIGURE 1.4. Video still from Channel Two, "Landfill Dance," *Between the Waves*, 2012, by Tejal Shah. Courtesy of Project 88 and Tejal Shah.

Conclusion

How do we begin to situate a feminist "response-ability," as Donna Haraway has called it, to these broad lines of connection from our ancestors to our queer descendants?[59] Landfill Dance, one of the channels of *Between the Waves*, depicts what the title would suggest: multiple femme performers dancing on top of a landfill in costumes equipped with improvised gas masks. The dancers' gestures come from ballet and contemporary dance but also convey an intimacy, and even aspects of care, with the garbage that they are dancing on and crawling over, just as their bodies are nearly swallowed up by this giant pile of trash. In one instance, a dancer picks up a tiny ceramic jug, examining it, demonstrating an attentive curiosity for this putrid environment. This video can be understood as an indictment of what we have made of the world, how it has been rendered toxic and uninhabitable. Importantly, though, it also asks us to move closer to this site of devastation, to move in, to become acquainted and to invite creativity and movement. This invitation to become more curious about plastic does not eschew the very real damage it is doing, but it does ask us to learn to become more accountable, more enmeshed.

Plastic shows us both the ways in which colonial technologies can have a profound effect on the world around us and how matter and bodies are defined

through their responsive capacity to change, evolve, adapt. Plastic asks us to become attuned to these divergent realities: to think through the consequences of technological development and the ways they distribute harm and possibility, while simultaneously understanding that the proliferation of any technology is beyond human control. For as much as it is tempting to believe that our technologies evidence mastery over the world, they merely show a particular rearrangement of the practices, forms of life, and life forms, often with unintended and unforeseen consequences.

Derrida advocated for and developed the concept of hauntology over the Marxist materialist emphasis on ontology. Hauntology emphasizes openness, transformation, and self-transformation. For Derrida this "means not simply accepting this heritage but relaunching [*relancer*] it otherwise and keeping it alive. Not choosing it (since what characterizes inheritance is first of all that one does not choose it; it is what violently elects us), but choosing to keep it alive."[60] Petrocapitalism chooses to keep plastic alive at the expense and sometimes to the benefit of humans and other beings. But the self-reflective capacity of choosing to keep it alive seems rote, a question of upholding infrastructures already in place, rather than a commitment to developing an ethical relationship with materiality and matter. How might we begin to shift this hauntological relation, instead of only being subject to the elected legacies of chemical violence? Might we also see in plastic new forms of queer kinship and responsibility? Might the proliferation of plastic be understood as an opportunity to reevaluate the terms of techno-utopias, the disposability and manipulability of matter, and the ever-accelerating present? These inheritances of some of our ancestors demand a working-through that shows the lively and deadly effects of plastic matter and desire for utopias that might morph and bend and refract, and violently rip apart the earth and its relations. But they also, inadvertently and unintentionally, point to new modes of relating, new forms of queer composition and kinship-making that invite new ways of thinking about and relating to matter.

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1

Plasticity

It is the spirit that dominates matter, is that not so? Was it not this that they had hammered into my head in the Fascist and Gentile liceo? I threw myself into the work with the same intensity that, at not so distant a period, we had attacked a rock wall; and the adversary was still the same, the not-I, the Button-Molder, the hyle: stupid matter, slothfully hostile as human stupidity is hostile, and like it strong because of its obtuse passivity. Our trade [industrial chemistry] is to conduct and win this interminable battle.—PRIMO LEVI, *The Periodic Table*

When plastics were first created, they were produced as a replacement material for shells and horns from animals that had been hunted to the brink of extinction. In 1867 elephants were in grave danger because of the ivory trade. At least one million pounds of ivory were consumed each year, sparking fears of an ivory shortage. It was a material that was used for many luxury items, including combs and piano keys, but one of the biggest uses was for billiard balls. Billiards had become all the rage within upper-class society, and so a reward was placed

for anyone who could come up with a substitute.[1] John Wesley Hyatt, who originally trained as a printer before becoming an inventor and industrialist, was lured by the $10,000 prize money. This resulted in one of the first plastics, celluloid. Although celluloid was never successfully used in the manufacture of billiard balls—the balls would spark due to their flammable nature and caused alarm[2]—further experiments did find that the material was suitable for making a wide range of consumer goods including everything from denture plates and combs to harness fittings and piano keys, and later celluloid became nearly synonymous with cinema.[3] All of a sudden, objects that were either precious or a marker of high-class status became available at a much reduced price, thus contributing to a burgeoning middle class defined by consumerism. Plastics were originally materials of mimesis, but as time passed, they came into their own, used not just to replace other materials but to invent new ones. They marked the democratization of the access to consumer goods that was, in many ways, a continuation and amplification of the extractivist ideologies that had threatened the elephants in the first place. In other words, even before plastic existed as a material, there was a belief in the plasticity of the world, as passive matter was understood to be available for near limitless consumption.

In the popular imaginary, plastic is often thought of in terms of plasticity, endlessly pliable, a material that can mimic or be molded into anything. Plastics are associated with plasticity because they are often produced through a process of molding or casting, where forms are created that conceive of and reproduce the world as liquid that can be hardened into a shape that echoes or inverts the original form. But they are also associated with plasticity because of their seeming weightlessness, the way that they appear as if from nowhere, yet can be found everywhere. They also seem to disappear just as mysteriously—at least for those of us who live in countries with large-scale waste management systems and who use other countries as dumping grounds. The myth of recycling reinforces this notion that plastic is full of plasticity. Yet, despite the fact that plastic is associated with plasticity at all these levels, it is a material that is incredibly recalcitrant and resistant in the face of change. This is a hard reality that is emerging as a pressing global problem. Plastic is recycled only with a lot of energy and effort. Additionally, the wide array of molecular chains that we group together under the common name *plastic* is misleading because it fails to differentiate between materials, leading to an impression that plastic could appear as virtually anything. In fact, what we call plastic is a set of materials grouped under a common process and derived from fossil fuels, but each molecular composition has its own characteristics, its own specificities. So what

kind of plasticity does plastic actually embody if not endless pliability, or the ability to appear in virtually any form, texture, or color?

As I will argue throughout the rest of this chapter, there is a deeper plasticity to plastic that needs to be examined, beyond just the terms of its production. I identify larger cultural trends that understand matter itself to be plastic. As the cultural theorist Roland Barthes wrote of plastic: "It is less a thing than the trace of a movement,"[4] where the underlying structure of plastic is plasticity, or what I am calling plastic matter. The plasticity that plastic embodies is an epistemic plasticity rather than an ontological plasticity. There is little plasticity in the actual objects of plastic, but there is a lot of plasticity in our cultural investments in this object and the epistemologies that came to inform how it was made. In other words, plastic consolidates and materializes an orientation to the world that already understands matter to be plastic. This plasticity can be traced through three primary mechanisms. First, plastic was one of the earliest materials created through the manipulation of matter at a molecular level. Its appearance represents an initial instance of chemical engineering, expressed by Primo Levi as a battle with "hostile hyle."[5] This orientation to matter emerges from a split between nature and culture, body and mind, that not only institutes a hierarchy but also has been conceived as an adversarial relationship. It comes to fruition in the form of what the philosopher of science Bernadette Bensaude-Vincent terms *technoscience*, the extension of a Western, Platonic understanding of matter as passive that has now morphed into a conception of matter as an endless field of possibility. Second, plastic serves to reinforce the expectations of petrocapitalism that both matter and people should be ceaselessly pliable, bendable, and subordinate to economic accumulation. Plastic reinforces these relations through waste, as yet another means of capitalist accumulation. Third, plastic is informed through and emerges from techno-utopian ideals. In the archives, there seems to be a sincere belief that the production of plastic will create a better world, one that is embedded with notions of prosperity as that which happens at a remove from earthly rhythms. Plastic represents freedom from the obligations and messiness of the earth, providing promises of protection and sanitization from a world that poses constant threats. For example, women were promised to be liberated from certain domestic tasks, like cleaning the dishes in favor of disposables, and there was a deep belief in its democratizing potential through the practice of consumerism.[6] In order to tease out these relationships, I first turn to the idea of plasticity itself, to clarify its terms.

Plasticity

The name *plastic* came to characterize the wide array of different materials, with myriad properties and molecular makeups, through the birth of a trade journal that grouped products together under that moniker in 1925.[7] A more accurate term would have been *synthetic polymers*—that is, polymers derived from fossil fuels. But the name *plastic* reveals something about how people were thinking about this new group of materials at the time. The word *plastic* comes from the ancient Greek πλαστός, which refers to a builder, creator, maker, molder, or shaper. *Plastic* dates to the late fifteenth century and refers to "the art of modelling or sculpting figures" or the "modeller, moulder, sculptor,"[8] primarily associated with the visual arts. The term also refers, from the mid-seventeenth century, to the more metaphorical associations of the word as an alleged virtue or force in nature that causes the "growth or production of natural forms" or, in a more philosophical sense, "generat[es] or adapt[s] non-material, aesthetic, or intellectual ideas, concepts."[9] The fact that plastic came to be named as such is a strong indicator of the ways that its manufacturers were thinking about these novel materials, impressed with associations of creative force, infinite pliability, and a hierarchical relation between matter and mind.

Plasticity, as the philosopher Catherine Malabou argues, is almost always understood to be a virtue. "In science, medicine, art, and education, the connotations of the term 'plasticity' are always positive."[10] Contemporary Western society values flexibility and the ability to morph into many different shapes, to be molded. We live in the Plastic Age not only because of the amount of plastic that is used in our everyday lives but also because of the pliable, flexible manner of life in late capitalism. Plastic matter and the privileging of change without consideration of the consequences is embedded in capitalist relations, following from Zygmunt Bauman's description of capitalism as "liquid modernity." Liquid modernity is the condition of increased change and constant mobility that defines relationships, identities, and global economics.[11] This is one of the primary expressions of capitalism's effect on worker's bodies: the demand to form and re-form into whatever role suits the expansion of profit, and as such plastic can be understood as emblematic of this liquid modernity. In late capitalism, companies that rely on flexible labor, such as Uber or Amazon, classed under the so-called sharing economy, are an expression of the vast undermining of workers' rights through this demand to become more liquid.[12] Just as we might be wary of the ways that this endless pliability is written into our bodies and work schedules, the flexibility that we associate with plastic "teaches passivity not action; acceptance, not resistance; compliance, not creativity," as the

feminist literary studies scholar Jennifer Wagner-Lawlor argues in relation to creative processes.[13] We need some type of resistance or struggle to produce action, not boundless pliability. The flaccid pliability of plastic is one of the things that Barthes found disturbing about it in the 1950s, just as plastic was about to transform material relations from reuse to a throwaway society. Liquid modernity here rendered material relations plastic, as infinitely replaceable, endlessly pliable, a new mode of being that pushed back against the bothersome attention and commitment required to repair and reuse. Instead of engagement and commitment to a set of relations, plasticity is a marker for disposability.

This orientation to matter as plastic emerged long before plastic itself. These ideas have their roots in the dualism proposed by Plato and famously extended by René Descartes, where the mind is active and matter is passive, to be impressed and molded. If the mind is separate from the body, matter and bodies are free for experimentation, free for exploration and exploitation in their plastic mode. As Jason Moore argues, the Cartesian revolution did three major things. It privileged the ontology of entities or substance over relationships; its logics were either/or, rather than both/and; and it "strongly favored the idea of a purposive control over nature through applied science."[14] Certainly, the development of plastics was continuous with the idea of purposive control over nature. Plastics can also be read as a materialization of the ideal of Form, lending itself to a synthetic universalism designed to be disconnected from a particular place, ideas that I further develop in chapter 2.

The imposition of a mold was not limited to matter but was also extended to people. The Enlightenment project coupled with the slave trade and settler colonialism was a potent mix for imposing a violent plasticity. Zakiyyah Iman Jackson understands plasticity to be at the heart of slavery and the dehumanization of Black people. Rather than figuring Black people as outside, or hierarchically situated within, the category of the human, Jackson argues that Black people were forced to endure a violent plasticity, of the body and of the ontological status of blackness in relation to the human. "Plasticity's telos," she writes, "is not the optimization of life per se but the fluidification of 'life' and fleshly existence. Plasticity is certainly an antiblack mode of the human concerned with apportioning vitality and pathologizing, but it is more than that. Plasticity is a praxis that seeks to define the essence of the black(ened) thing as infinitely mutable."[15] This plasticization occurs by way of the chaotic ungendering of Black people,[16] used to marginalize what Jackson calls "black(ened)" gender and sexuality.[17] This was central to the project of modernity where Black flesh was used to probe the limits of the body. This "plastic" approach to people and matter is fundamental to the ways in which Western scientific practices developed. The

later expansion of liberal capitalism necessitated a move away from slavery to a free market, yet both are undergirded by notions of flexibility, where capitalism itself is able to morph while not fundamentally questioning its founding premises in either antiblackness or plasticity.[18]

Similarly, the land itself was understood in the colonial period to be a formless chora, malleable, and in need of a definite shape. Settler colonialism proceeded by way of inflicting plasticity onto the land, forcing it to resemble the image of a displaced Europe. Settler colonialism is a displacement that happens in place, as "the removal of place—the loss of place in place—manifest in damaged ecologies," as the interdisciplinary scholar Anne McClintock argues.[19] The transformation of the earth itself, through damming projects, the introduction of new animal and plant species, and the transformation of wild grasslands to intensive agriculture involved the imposition of a form onto the beings that were encountered. This was not a relational mode, or a mode that allowed for a plurality of ways of existing, but rather imposed a particular vision onto the land. All these acts were intimately tied to the project of erasure, through plasticity, that is the imperative of settler colonialism. We could read these acts as a form of violent plasticity, engineering enacted on the land at both the ecological and the molecular scale.

Plasticity, in Malabou's framing, is different from elasticity. Whereas elasticity implies the return to an original form, plasticity is what results from a traumatic break, what she terms "explosive," "pathological," or "destructive plasticity."[20] In her careful articulation of the phenomenology of plasticity, a traumatic break caused by a brain injury or by a particularly harmful event can cause people to become other than who they were. They may keep going, but they are not themselves. Plasticity is the quality of coherence, but the identity or personality of those people may be altered permanently in such a way as to be rendered unrecognizable. In other words, they may be completely new, even as they continue to be associated with their previous incarnation. Plasticity is therefore the mark or the scar of an original traumatic event. Plasticity embodies an indestructible destructiveness, a transformation without continuation. What might it mean to think of plastic, the material, as this kind of mark or scar of a traumatic event, the event of the unearthing of fossil fuels? Might we then understand plastic to be a kind of haunting, where it adheres to the qualities of fossil fuels, even as it is turned to the service of bright yellow rubber ducks or cling wrap? For, as I will argue throughout the book, plastic never quite leaves behind its origins in fossil fuels; indeed, it is one of the primary ways that fossil fuels have intimately saturated contemporary life. Rendering matter plastic, then, might not be such a benign activity, even when it is imposed not on people

but on what is often conceived as inert materiality. Despite the natural curiosity and the incredible scientific discoveries that have been made through molecular science, what if this basic premise—the inherent pliability of matter—rested on a fundamentally violent orientation?[21]

Molecular Plasticity and the Development of Plastic

In the mid-nineteenth century, the first manufactured polymers, derived from plants, were invented. This represented the birth of what Esther Leslie has called "synthetic worlds," the "drive of the chemical industry towards the 'impersonation of life.'"[22] These new materials included synthetic dyes—manufactured from coal, where bright and vivacious color emerged from the deepest black—and celluloid that reflected back people's dreams, hopes, and desires through film. The first completely synthetic plastic—a polymer derived from fossil fuels—was Bakelite, produced in 1907 and patented in 1909 by Leo Hendrik Baekeland. Bakelite was a hard plastic that was originally used to manufacture radios, telephones, and other electrical devices, as it was nonconductive. Here, it transformed and transmitted the human voice across distances, extending the body. These intimacies of plastic and mass media I take up at greater length in chapter 3.

Numerous other plastics came shortly after Bakelite. Cellulose acetate, used as a film to replace cellulose nitrate (which is extremely flammable) and, later, as magnetic tape for IBM's 701 computer tape drive, was formulated in 1927. In 1930 Julian Hill along with Wallace Carothers drew a "superpolymer"—the first nylon—which almost immediately became indispensable during World War II for airplane tires, tow ropes, flak vests, and blood plasma filters. When it was spun into stockings, it was so popular that they were rationed, resulting in the so-called nylon riots, as the tights were marketed as virtually indestructible yet still feminine and sleek.[23] In 1942 polyethylene was first produced in England and later made in the United States for the navy as electric insulation. Polyethylene has gone on to be one of the most prolific and vilified plastics, as it is primarily used in packaging. World War II provided an incentive to vastly multiply the production of plastics, and it is difficult to separate out plastics manufacture from this historical event. The war effort produced everything from Teflon, employed in the atomic bomb, to novel textiles developed for parachutes, to plastic windshields of planes, known as Perspex or Plexiglas (which made the windshields less hazardous to the pilots),[24] as well as more insidiously to increasingly lethal weapons.[25] These inventions carried a triumphant feeling, deeply tied to the war effort. They were also embedded in

an epistemological orientation that presupposed that a chemically engineered world could offer better materials than those found in nature, and that these new materials could be almost endlessly produced.

There are two basic types of plastic: thermoset and thermoplastic. A thermoset plastic describes a plastic that can be formed once and is durable and hard. Thermoset plastics were the first types of plastic developed and include Bakelite, epoxy resin (often used as an electrical insulator), and polyester resin (used in the bodies of cars and boats). Thermoplastics were developed later and transformed the possibilities of plastic, as they melt at high heat and solidify again when cooled, allowing them to be remolded. This type of plastic includes polyethylene (PE), polypropylene (PPE), polyvinyl chloride (PVC), and polystyrene (PS). Thermoplastics can be reformed, but recycling can usually be done only once before the bonds between molecules become too weak to re-create the original item.[26] However, thermoplastics still carry this metaphorical relation to plasticity, as people diligently put them into recycling bins.

Surprisingly, the first plastics were developed without a basic understanding of their molecular structures. As the philosophers of science Bernadette Bensaude-Vincent and Isabelle Stengers assert in their evocative *History of Chemistry*, "Polymers were technological items before they were objects of knowledge."[27] Polymers were disliked by chemists because they did not respond in predictable ways, remaining hard when chemists wanted them to melt, and refusing to solidify when knowledge of materials would have predicted otherwise. Polymers, at the time when the first plastics were being developed, were referred to as substances of unknown structures.[28] The first real understanding of how polymers worked was the theoretical model introduced by the German chemist Hermann Staudinger, who began investigating the idea of macromolecules through a study of rubber. He proposed that rubber had a high molecular weight because it was composed of long chains of short, repeating molecular units. He published this study in a landmark paper titled "Über Polymerisation," in 1920—more than ten years after the invention of synthetic plastic.[29] However, the theory was greeted with skepticism when it was first published and was not widely accepted until decades later. Staudinger finally received a Nobel Prize for his work on polymers in 1953. In the meantime, a lot of research had been done on the technical nature of polymers, fueled and funded primarily by industry. For example, the DuPont Experimental Station, founded in 1903, was set up as a pure science laboratory that was not under pressure to produce commercially successful products. Instead, it was given an operating budget of $25,000 per month solely for the purposes of research and contributed some of the most recognizable plastics out of this lab, including nylon and

Teflon.[30] Staudinger's theories of macromolecules were accepted and applied earlier in these industrial settings, where they drastically changed the way we would think of the material world and what kinds of materials it would be possible to produce. Building on these theoretical models, the German company I. G. Farben was synthesizing a new polymer almost every day for ten years throughout the 1950s, an astronomical number of new molecular structures with all kinds of new properties and applications.[31]

With the understanding of the process of polymerization came the possibility of being able to create materials with specific qualities predetermined. Instead of having to form an object around the constraints of its particular materiality, as is the case with wood, metal, or clay, chemists could use polymer chemistry to make materials with a high degree of specific characteristics, which could then be molded into virtually any shape imaginable. In other words, the invention of plastics simultaneously united form and substance, eventually producing "new polymers with particular desired properties ('tailor-made molecules')."[32] It was not just a shape that was being created but the material and shape simultaneously. Materials no longer functioned as a creative restraint in the design of a particular object. This capacity in plastics production signaled a new era of molecular engineering, where materials appeared by design, according to pregiven specifications.[33]

The unification of form and matter through plastic represented the plasticization of matter, or what I am calling plastic matter. For the first time, matter could be manipulated at the molecular level. With the understanding of polymer chemistry came an ability to direct and create molecules, the fulfillment of a dream of the world as pliable to the whims of the human mind. As Bensaude-Vincent writes: "Matter came to be presented as a malleable and docile partner of creation—a kind of Play-Doh in the hands of the clever designer who informs matter with intelligence and intentionality. Just like the *demiurgos* in Plato's *Timaeus*, the material engineer can impose forms on a passive, malleable *chora*."[34] This idealist dream, or dream of transcendental idealism, represents the apex of the Cartesian split, as matter itself is dictated and rearranged by the human mind. Planned scientific control envisions the basic building blocks of matter as made to order. Engineering matter rests on the assumption that "nature" is no longer something that resists but is now a compliant and complacent actor in the drama of the human endeavor. Bensaude-Vincent argues that this conceptualization, while continuous with a Western tradition that originates with Plato, marks a shift from what she identifies as modern science—defined by inexorable laws and the recalcitrance of the material world—to technoscience, where matter is understood as an endless field of creative po-

tentials, opportunities, and affordances, easily harmonized with the desires and operations of late capitalism.[35] Plastic matter emerges in coordination with technoscience, impressing ideas of plasticity on matter at a molecular level.

The Plastic Economy

Matter figured as endlessly pliable is reinforced through petrocapitalist logics, where the plasticity of the market—ever-shifting and expanding—finds a metonym in the production of plastic products. Here, the manipulation of molecules is turned to the service of capital accumulation. Approximately 10 percent of global oil production is used to produce plastic. It is "one of the many processes by which the oil industry reterritorializes planetary life."[36] Petrocapitalism and plastic both rely on a particular version of a scientific worldview that began to produce the natural world as quantifiable. The ordering of matter in the form of the periodic table, for example, allowed for an increase in both the actual and the perceived ability to manipulate molecules. This made molecules into "materials for a chemistry that was concerned almost exclusively with commodification and economic gain."[37] Plastic, and plastic matter, emerge from this set of epistemologies and economies that are bound together, where the ordering of matter leads to its commodification, and where the plasticity of matter becomes an endless field of potentiality. For with the ability to create various kinds of molecular arrangements, these new polymers were immediately patented and put to the service of capital accumulation.[38]

In under twenty years, plastic production rose exponentially.[39] Part of what drove this initial, and ongoing, success, besides the remarkable attributes of these new materials—they were incredibly strong, flexible, and cheap—was the fact that they were quickly designed for disposability. This trend toward throwaway culture was amplified because of the reuse and attendant "misuse" of materials such as the polyethylene dry cleaning bag. Initially, people appropriated the bags for crib covers and other things, which ended up causing the deaths of more than eighty children and infants and were the means of at least seventeen adult suicides in 1959.[40] In the wake of the public scandal that surrounded these tragic events, plastics manufacturers marketed dry cleaning and other bags specifically as single-use items, encouraging people through public campaigns to throw away the bags as soon as they had fulfilled their function.[41] Of course, this tactic had the added benefit of increasing the market for plastic bags, an ingenious response at a moment when numerous newspapers were calling for outright bans on the "murderous bags."[42] The industry quickly embraced the advantages of the disposability of plastics. As the cultural historian

Jeffrey Meikle details, "an editor announced at the National SPI [Society of the Plastics Industry] Conference of 1956, 'Your developments should be aimed at low cost, big volume, practicability, and expendability'—with a goal of winding up 'in the garbage wagon.'"[43] The more that could be sold, the more profits there were to be made. This culture of waste created huge wealth for the plastics industry and would transfer the responsibility for disposal to the public. Despite increasing concerns about pollution and toxicity, the use of plastics has continued to rise exponentially.

In 1971, the Society of the Plastics Industry (SPI) formed a Public Affairs Council (PAC) to avoid potential negative publicity or legislation that might begin to curb the industry's profits.[44] The PAC was originally voluntary, collecting contributions from members, but eventually dues paid into the SPI were allotted to this mission.[45] The SPI was quite successful in heading off legislation that would have limited the use or sale of plastics, especially when it came to product bans and extended responsibility of manufacturers for the disposal or recycling of the products they produced. For example, after lobbying from the SPI and others, the Food Additives Amendment of 1958 moved the "burden of proving that additives which may reasonably be expected to migrate from the packaging material into food are safe has been shifted on to industry."[46] In other words, an independent body to monitor the safety of food packaging was eliminated, in favor of industry monitoring—which would of course support business over public safety. Another example, again from the SPI's own annual reports, showed how the plastics industry lobbied to eliminate legislation that disallowed plastic products. It documents how in July 1963 in Park Forest, Illinois (a Chicago suburb), the village amended its ordinance that had required the exclusive use of metal containers for all household waste to include plastic garbage bins.[47] These might seem like small examples, but they are two of thousands of incremental changes to legislation and monitoring that provided the conditions for the massive expansion of the plastics industry. These same tactics have continued throughout the years, incrementally adding up to the situation we now find ourselves in and showing how industry has actively lobbied to expand plastic's markets and, subsequently, to ward off any responsibility for its waste or potential public harm.[48]

But it is not just in the expansion of the plastics market that plastic reproduces the logics of limitless accumulation and profit, potentiality rendered here as plasticity. Rather, plastic participates in and extends petrocapitalism through the production of waste. Plastics were first manufactured from the waste of other petroleum products, representing the transmogrification of waste into a consumer product. For example, acetylene chemistry was developed from the

"troublesome by-products" benzene and coal tar from town gas.[49] The very incentive to create plastics and other petrochemicals in the first place was driven by the fossil fuel industry so that it could profit from its waste. This is a practice that continues, with plastics manufacturing facilities often set up next to, and enabled by, various fossil-fuel infrastructures.[50] The "waste" of the oil industry becomes its own industry, a way to amplify profit.[51]

As the science and technology studies scholar Gay Hawkins astutely observes, plastic is made to be wasted. The value of plastic is enacted both in its production and in its disposal. Hawkins writes, "the calculability of PET [polyethylene terephthalate] has been predicated on how easy it is to waste—on its disposability."[52] Plastic, especially plastic packaging, is profitable and desirable precisely because it is meant to be thrown away. It anticipates its disposal in its design. Plastic becomes profitable because it is possible for industry to externalize its own waste, shifting the problem onto individual consumers and local governments. As the art historian Amanda Boetzkes writes, "Plastic accumulates because its disposability is a function of its market value. To throw away plastic is to exercise and reify its exchange value."[53] The perpetual transmogrification of materials re-created as valuable commodities leads to a culture where waste cannot simply remain waste but is itself commodified.[54] Capitalism, as Boetzkes asserts, is plastic: the potential of waste is always understood to be profitable, and the transformation of materiality appears as a form of techno-utopianism.

Techno-utopianism

It isn't solely owing to its incredible profit margin, and the concerted efforts of industry, that plastic has proliferated. At the beginning of the twentieth century, there seemed to be an almost unbridled faith in technological progress, itself caught up in a telos of plasticity. In the Hounshell and Smith Oral Histories collected at the Hagley Museum, which includes interviews with forty-seven former chemical engineers who worked at DuPont's research and development programs, the excitement of the scientists to have been involved in the birth of the plastics industry is palpable. Many of these men (no accounts of the women who worked in the department were in the oral history collection) expressed pleasure and pride in the work that they were able to achieve. For example, Howard E. Simmons summarizes the utopian striving that was embedded in technological innovation. He narrates, "There's a big future and there are exciting new things, even if we don't use all of them or many of them, that there's new, exciting things and promise for tomorrow."[55] Simmons here claims that

the scientific innovations were not simply focused on the accumulation of capital but embedded in a desire and a belief that through scientific invention we could create a better world, miming the DuPont slogan, "Better Things for Better Living . . . Through Chemistry." Despite the almost cliché nature of his assertion, a sentiment that was famously satirized in the 1967 film *The Graduate*, Simmons's sincerity seems palpable. This interview is an important reminder that many of the scientists and members of the public at large deeply believed that the invention of plastics and other materials was going to lead to a better, more prosperous world and an easier life for everyone. It is also a reminder of the ways in which the world that we currently live in is the utopia of these predecessors. As the philosopher Kyle Powys Whyte argues, the present moment is the dystopian future of his Anishinaabe ancestors, and the utopian one of white settlers.[56] For just while these chemical companies were making profits and building worlds that benefited a certain group of people, plastics became the means of dispossession and harm for others. But this sincere belief in the utopia that would be created through plastic should not be easily dismissed, as this logic and belief in techno-utopia still animates our current politics.

Plastic fits within a blind drive toward the future, where the present is constantly being discarded and the past has ceased to exist. Even the associated pollutants of plastics manufacturing were understood to be signs of technological progress. Another former DuPont employee relates his experience of Charleston, North Carolina, in the early 1950s: "If you went away on vacation out of Charleston, then came in two weeks later, the smell of the Kanawha Valley chemical industry would hit you. It was regarded as the *smell of success*. You never heard people [complain], and of course once you were in it for hours, you didn't even notice it."[57] Pollution here not only becomes the smell of success but also indicates that one is home, produced as a domestic comfort. A parallel domestic comfort today might be "new car smell." It shows the ways in which chemicals saturate our world to the point that they are produced to elicit a sense of well-being or reassurance. Rendering chemical saturation pleasant also becomes a mechanism for its normalization. There is no reason to complain about chemical pollution if it signifies home or technological progress or even a version of utopia. At the time, technological innovation and industry were the markers of prosperity, and the environmental consequences were rarely considered, even when, as on this occasion, they seemed to beg for critical appraisal. This can be understood as a form of anaestheticization of the senses that the visual culture scholar Nicholas Mirzoeff identifies. He writes, "Imperial smoke is a positive sign of the energy and vitality of the modern metropole, whereas the smogs of developing world capitals are miasmas, threatening to health and

vitality."[58] The degradation of the environment was understood to be fundamental to the techno-utopian world of modernity, projecting its own forms of plasticity on to the surrounding environment.

Plastic seemed to promise a world of sealed, perfected, clean, smooth abundance, by encapsulating the fantasy of eliminating the dirt of the world, decay. Plastic "captured what high modernity expected from technology at large," Andrea Westermann argues. This was "a world freed from the material restrictions that nature traditionally imposed on humanity. By implication, we would also have a world freed of scarcity, a world of plenty."[59] Plastic represented a shiny new world, one that removed some people from the cycles of life and death, that superseded the troublesome, leaky, amorphous, and porous demands of ancestors, bodies, and the earth. By literally creating barriers, often embedded with biocides, plastic could postpone the decay of foods, and by implication, decay in general. By instituting a throwaway society, utensils and dishes could all be "sterile." Plastic, as Hawkins argues, came to be understood as a necessary "skin," rather than as a chemical imposition, an envelope that allowed the social body to be at an increased remove from the wider environment.[60]

The literal and figurative barriers of plastic helped some to imagine that the new worlds being built were a fundamental split from an earthly dwelling, while shifting the consequences of such worlds to other temporal and geographic regions, most often located on the homelands of racialized and poor people. Eliminating the demands of the earth promised prosperity through scientific control. It is striking how this unbridled optimism about plastic, girded by hubris as well as a deep anxiety about the world *as it is*, didn't last nearly as long as its creators would have liked. Although at this historical remove it is often difficult to sort out evidence of uninhibited excitement from industry advertising, it is clear that plastic still materialized a faith in industrial engineering and the value of technological progress.

It is also difficult to pinpoint precisely the moment when people began to lose this faith, though it can perhaps be tracked to the increase of negative metaphorical associations of plastic with cheapness, fakeness, and toxicity, emerging in the 1960s. It is clear that the detonation of the nuclear bomb caused a large-scale cultural reevaluation in the West of the role of scientific advancement, ushering in an era of mounting skepticism and anxiety. Additionally, the burgeoning environmental movement, popularly advanced by the incredible work of Rachel Carson, began to temper some of the original, great promises of plastic and other synthetic chemicals, shedding light on their dire unintended ecological consequences. Plastic's toxicity was vividly illustrated when many workers in PVC plants began developing angiosarcoma, a rare cancer, from the vinyl

monomer. Initially denied by industry, the connection between vinyl chloride and cancer was proven beyond a doubt by Dr. Pierluigi Viola in 1970, and steps were then taken to mitigate exposure of workers and the general public to the extremely carcinogenic compound.[61] However, such mitigation was, notably, differentially applied along lines of class and race. There remain places like "cancer alley" in Louisiana, which has one of the highest rates of cancer in the United States and is also located next to PVC manufacturing facilities, which I take up in more detail in chapter 3.

It is important to recognize that many of the practical, lingering problems of plastics were deliberately created, or at least not avoided, by the plastics industry. That microplastics are circulating in the world's oceans has been documented since March 1972, when Edward J. Carpenter of the Woods Hole Oceanographic Institution in Massachusetts conducted a study in Long Island Sound, finding microplastics at a density of one to twenty samples per cubic yard of water. He was alarmed by these findings because he theorized that they would transmit plasticizers into the marine food chain, become surfaces for bacterial growth, and block the digestive tracks of smaller fish.[62] This scientific finding was purposely ignored at the time, and the problem has since amplified to astronomical proportions, with Carpenter's fears now grim realities. Similarly, evidence of the effects on the endocrine system of Bisphenol A (BPA), a plasticizer added to many plastic products, including children's drinking cups, has been available since the chemical's production in 1930. Yet it was only in 2012 that legislation was implemented to begin to phase out the additive in the United States, replacing it with other endocrine-disrupting chemicals.

Employees of chemical companies have been hesitant to criticize the industry. In the Hounshell and Smith Oral Histories, this wariness was most apparent when it came to Teflon. Teflon was invented accidentally and had remarkable properties: it didn't combine with oxygen, no solvent could corrode it, it didn't conduct electricity, and it was discovered to be the slipperiest substance on earth. However, DuPont knew that C8, or perfluorooctanoic acid (PFOA), which is a central ingredient in Teflon, was linked to many negative health consequences, including the enlargement of rats' testes, adrenal glands, and kidneys, even at low doses. It is also a known human carcinogen and has been linked to human birth defects. The fumes given off from heating Teflon-coated pans will kill pet birds. These concerns surrounding Teflon were known since its manufacture. As one former DuPont employee narrates, the now common use of Teflon in coating cooking surfaces was originally curtailed. It is worth recounting at length:

> There's no question about it that, when heated to a high temperature, Teflon gives off noxious fumes. In fact, every carton we shipped had a label on it that said so. . . . Absolutely no coating of Teflon—not even in industrial uses where temperatures are controlled. I'd been told all that. Then we get word that our distributor in France is selling Teflon dispersion to some kook who's coating omelet pans with it. The response was that we've got to put a stop to that. I did write a letter to whoever was selling to this French distributor . . . saying, "Don't sell Teflon for the purpose of coating frying pans." Thank god nobody paid any attention to it. By my authority as Teflon marketing manager, I forbade it. Then some years later, of course, those frying pans began to appear in New York imports and by the thousands, and they just overwhelmed the market. And I don't know why it's safer now than it was then.[63]

Despite these proven concerns, and growing numbers of employees who directly experienced health problems, DuPont continued to use, manufacture, and dispose of approximately 2.5 million pounds of C8 in the area around Parkersburg, West Virginia, from 1951 to 2003.[64] Teflon continues to be widely used as a nonstick coating on cookware, and a similar molecule is used for high-end rain jackets in the product Gore-Tex.

However, despite the mounting problems of plastic waste and plastic's toxicity, ideas of techno-utopia have become more entrenched, rather than less. There is, throughout the literatures on plastic (and one could extend this to many technological problems), a "break it and fix it" mentality, an acknowledgment that industry often causes grave ecological damage, but that this can be remedied through the correct or right technology. Here is yet another example of the ways in which notions of plasticity inform Western relations with matter, where matter does not seem embedded with agency or limits but is rather always available for reconfiguration, for endless renewal and for Christian-style forgiveness. For example, a recent announcement that scientists had genetically enhanced a plastic-eating enzyme is being hailed as a panacea to the problem of global plastic pollution. Building on bacteria found in a garbage dump in Japan, the scientists accidentally discovered a way to enhance the capacity of the enzyme to biodegrade PET, the material that most water bottles are made from.[65] It is hoped that the enzyme can be used to fully recycle plastic bottles. While this is certainly a promising breakthrough in relation to the problem of plastic waste, it does little to engage with the deeper ethical and philosophical questions of our relations to matter and materiality more generally. Rather, it may inadvertently encourage the use of plastic, which may no longer seem to pose a problem.

This is an example of plasticity being used to address the problems of plastic, where the newly engineered enzymes are an example of the techno-utopian drive that I call plastic matter: an orientation to the world where organisms are living machines built to solve the problems of past technologies and where matter itself merely constitutes the building blocks of human technological capacity, full of limitless potential. The continued reliance on this way of thinking has led to a vicious cycle: materials are invented, which leads to problems, which leads to the invention of new sorts of technologies to solve these problems. Rarely do engineers or policy makers stop to consider what the consequences of technological development may be or to fully understand the ramifications of the introduction of new technologies.[66] Such strategies may be well intentioned, but they do nothing to address the underlying causes of plastic, waste, or toxicity, instead offering technological solutions that will allow for sustainability in the true sense: the continuation of current economic and political models built on boundless consumption and endless growth—in other words, endless pliability.[67]

The irony is that there is little actual plasticity in plastic, in the context of the wider environment and plastic's resistance to decomposition. As plastic was overdetermined through its plastic properties, its associations with plasticity, there was little to no consideration of the necessity for it to decompose. Instead, we could read plastic through Malabou's discussion of the "substantialist assumption" as the "travel companion of Western metamorphosis." "Form transforms; substance remains" could be the way to differentiate biodegradable materials (as form) from recalcitrant materiality (as substance).[68] What unifies plastic as a category is not its form, its qualities, or how it is used but rather its substance or molecular structure.

Indeed, plastic adheres to its identity under almost all conditions, as a version of a Platonic ideal. As the science and technology studies scholar Mike Michael argues, "if we take plasticity to connote the potential for new or renewed connections to be rendered domestically (i.e., outside of a professional or industrial setting) and thus for the functions of plastic to be recovered or altered or adapted or invented," there is little plasticity in plastic.[69] Although plastic is becoming domestic through technologies such as 3D printing, these do little to reimagine what this material is or could be.[70] Plastic is neither easily manipulable in household settings nor readily transformable in the environment. Instead, it adheres to its identity, or substance, breaking down into smaller and smaller pieces without any transubstantiation.

It might be more useful to think of this inability to break down as an overabundance of plasticity. If, along with Malabou, we think of plasticity as de-

structive indestructiveness, then this is precisely what plastic is and does. To decompose, plastic needs to have a formal relation to the world around it. It must not be infinitely moldable but rather elastic—co-constituted with other beings in the world but also with its own definite form.

Conclusion

Plastic has a lot to teach about Western cultural values and assumptions, economies, and epistemologies, through the workings of plastic matter. It has shown the seemingly endless expansion of the market and has led to the commodification and manipulation of the building blocks of matter. Plastic matter illustrates how techno-utopianism is still very much at work in how we relate to the world around us. And it betrays a continued belief in the separation of mind and matter, despite evidence to the contrary and the philosophical work that has been done to undo this binary. All of this is undergirded by an assumption of and fascination with making matter plastic, which extends beyond the creation of plastic itself to slavery and the hierarchy of being. Regardless of our ultimate judgment of this incredible material, it is necessary to think seriously about what the epistemological and ontological effects of plastic have been and may continue to be. For we are still stuck with this material for potentially thousands of years into the future.

One of the obvious lessons of plastic is that it cannot be contained: it extends plasticity out into the world, throughout biological and geological strata. In the next chapter, I take up the question of plastiglomerate, the fusion of plastic with geology, to show how these plastic relations are reconfiguring geological naturecultures. We might dream that plastic can be sealed off, but it is too much composed within the realms of plasticity, too adept at movement, transmission, pliability. And so, we now find plastic everywhere, including within the layers of the earth, as chemical companies write their signatures into geologic time.

2

Synthetic Universality

Our Plastic Age confronts the issue of duration. The ephemeral present of plastics is not just an instant detached from the past and the future. It is the tip of a heap of memory. . . . The present is conditioned by the accumulated traces of the past, and the future of the earth will bear the marks of our present. While the manufacture of plastics destroys the archives of life on the earth, its waste will constitute the archives of the twentieth century and beyond.
—BERNADETTE BENSAUDE-VINCENT

In 2013, at the suggestion of the oceanographer and activist Charles Moore, the geologist Patricia Corcoran and the artist Kelly Jazvac traveled with him to Kamilo Beach in Hawai'i. The three went in search of a geological formation, a conglomerate of plastic and sand that Moore and others such as Noni and Ron Sanford had been spotting for many years.[1] When Corcoran and Jazvac arrived, they easily found the rock-like substance multiplying on the beach. They decided to call it "plastiglomerate." The Geological Society of America approved the name, with the publication of the trio's article in the society's journal, to de-

FIGURE 2.1. Plastiglomerate sample, 2013. Plastics debris and beach sediment, including sand, wood, rock, and shell debris. The found-object artwork in this image and the ones that follow are the result of a scientific and cultural research study by the artist Kelly Jazvac, the geologist Patricia Corcoran, and the oceanographer Charles Moore. Photo: Jeff Elstone, courtesy of Kelly Jazvac.

scribe a "hybrid" material resulting from the fusion of plastic debris with natural materials such as lava, wood, metal, sand, and marine corals. There are two types of plastiglomerate. One is a hard, multicomposite material consisting of rock, other debris, and molten plastic. The other is an in situ type, where the plastic has adhered to rock outcrops, blending with the landscape.[2]

Kamilo Beach is a good breeding ground for these plastic matrices, because it acts as a sieve for the currents of the ocean, which deposit many of the things that are adrift in the Pacific, from wood to shells to bodies of people drowned at sea. These days, what is adrift in oceans is a lot of plastic. As the art historian Kirsty Robertson writes, "So much garbage collects on Kamilo Beach that it is listed in *Atlas Obscura*'s compendium of bizarre and obscure places to visit, where it is described as 'constantly covered in trash like some sort of tropical New York City gutter.'"[3] The sand has surprisingly little mineral material in it;[4] it is now the evidence and archives of the experiments in chemical engineering that we have been conducting for a little over a century, "when the laboratory has been turned inside out . . . so that the world has become the experiment."[5] When people go down to the water's edge to have a campfire, instead of merely enjoying the primordial glow, singing songs, roasting marshmallows, and spending time with friends, they are inadvertently participating in the creation of these new hybrid geologies, as the plastic on Kamilo Beach melts and adheres to other debris.

As much as we might like to think of substances like plastiglomerate as one thing, plastic, adhering or sticking to other things, like sand and rocks, "these are not two substances glued together, but multiple substances that *are one another*,"[6] as Robertson reminds us. The conglomeration of plastic and other beach debris reveals an important lesson about the nature of plastic itself: it cannot simply be separated out, cleaved from other forms of materiality, nor does it easily reside only within the category of the synthetic, despite our desires for it to do so. Plastiglomerate is a new kind of hybrid materiality, not two distinct classifications of substances. It is evidence of the plasticity of plastic, of plastic's ability to morph into virtually all shapes, to penetrate all environments, to reconfigure what is often understood as solid, even the literal rock under our feet. It embodies the paradoxical relation of plastic itself: a substance designed for its universality, nonlocality, and division from earthly troubles that, ultimately, enfolds back into the earth, becoming its surrounds. As the literary scholar Ranjan Ghosh writes, "The plastic objects swept up and unearthed reveal the threshold points of anthropogenic understanding of Earth and its elementality and phenomenality."[7] In other words, the earth always exceeds humans, even as humans, and our creations, are always thoroughly of the

earth. In this, plastiglomerate relates a deep and profound lesson about the fact of earthly being: try as we might to separate out matter from mind or synthetic from natural objects, there is an ultimate enfolding, enmeshment, imbrication, inter- and intra-action of matter in the world.

The Anthropocene

Plastiglomerate seems to symbolize and contain the Anthropocene within one object: the literal fusion of chemical companies and their signatures within the geological strata of the earth. Plastic, and its accumulation, is one material that scientists are currently considering as the proposed geological epoch's "golden spike."[8] Plastic is a useful indicator, as almost all the plastic that has ever been created, an estimated 90 percent, is still somewhere on the planet. The geological record shows a clear difference between the dates before and after the invention of plastic, as plastic remains embedded in the earth's strata. Plastic's effect on the geological layer is visible in archaeological deposits, especially in garbage dumps. It can also be seen in what is termed an *anthrosol*, an almost entirely human-made soil, in which microplastics mix with the earth, becoming blended environs, a vivid example of what Donna Haraway has called "natureculture."[9]

Plastic is a good indicator for the Anthropocene because it is so widely distributed everywhere on earth. As the geologist Jan Zalasiewicz and colleagues write, "Plastics are proving to be much more mobile than other human-made materials such as ceramics or glass. It took ceramics thousands of years to achieve anything resembling a global distribution, and they are distributed mainly in terrestrial deposits, with very little incursion into marine environments."[10] Plastic, on the other hand, is found not only all over the surface of the earth, on beaches and in farmers' fields, as well as in landfills, on city sidewalks, and in the decaying remnants of human settlement, but also in our waterways, our bodies, as microparticles in the air we breathe, as well as in consumables such as fruits, vegetables, drinking water, seafood, beer, and salt, where its effects have yet to be determined. And it has achieved this global distribution in just over one hundred years.

Plastic is so prevalent that it is creating what Zalasiewicz and colleagues have termed a "technofossil": a fossil composed of the remnants of human technology. Because of its ubiquity, plastic is "considered as one of the most important types of 'technofossil' that will form a permanent record of human presence on Earth."[11] Technofossils can be seen across the globe, having risen since the "great acceleration" of the 1950s to form a ubiquitous layer of tech-

nologies whose range and diversity rival biological variegation. Essentially, plastics are rapidly becoming one of the most important geological and archaeological records of our times, imprinting into the earth the wills of the petrochemical industry, consumer habits, modes of circulation, and our intimate enmeshment with ancient fossils, compressed and converted into an array of everyday objects. In its origins and afterlives, plastic composes two very different kinds of fossils, from compressed biological material to the markers of twentieth-century industrial chemistry. Plastic, read through the lens of the fossil, conflates geology with archaeology, figuratively imagining a future archaeologist who will discover these fossils.

As I will argue in the rest of this chapter, plastic geology is paradoxical. On the one hand, it embodies and occupies a utopic temporality driven by scientific progress that desires to sever relations from the earth and other creatures, what I am calling synthetic universality. On the other, despite this hubris, plastic cannot help but become part of the earth; indeed, regardless of its synthetic status, it is still a material of the earth, even if in a purposefully oblique and engineered fashion. It is necessary to think about both the geologic co-becomings of plastic with the earth and the ways it also exceeds human desires or interactions. Plastiglomerate materializes the lesson that everything is of the earth and will return to it. Yet, there is no homeostasis or equilibrium from which plastic comes or might return; there are only variable ecological assemblages that allow for certain life forms and forms of life to flourish at particular moments in time, determined both by haphazard variation and by the actions of humans, bacteria, and other beings. This does not mean, however, that there are no consequences.

In this sense, plastic matter points to one of the central problematics of our times: acknowledging the ways in which plastic is being absorbed back into the earth, as a geological entity, can be read as a kind of absolution from ecocidal guilt. The perspective of deep time that thinking with the geological offers can slide into a nihilistic nonaccountability, where extinctions were always inevitable, so the slow violence of toxic accumulation, starvation, or entrapment in plastic for humans and other animals is not important. Plastic as geology suggests an overwhelming timescale that resists the ethical demands of human and social life: geological time is difficult to fathom, and also promises comfort, with all incorporated back into the indifferent earth. Within this conception, the earth is inconsequential to human dramas. Plastic could simply be one object among the many forms in the universe, emerging and enfolding back into the immanent materiality of the universe itself.

In another way, though, the "indifference" of geology to humans, the ways that geology fundamentally exceeds humanity, offers a return to vulnerability, through the asymmetrical dependency of humans on the earth. "This vulnerability," Myra Hird argues, "calls for a heightened, not diminished, assumption of responsibility . . . a future environmental ethics that depends upon remembering what we have forgotten. An environmental ethics concerned not only with past and present damage but also with future unknowable vulnerability to harm."[12] For although it is not certain what plastic is really doing by encasing the planet, there are multiple harms that are caused by plastic's production and distribution. Just because many forms of other-than-human life and nonlife are indifferent to human actions does not mean that we can afford to be indifferent to theirs. As Elizabeth Povinelli has argued, drawing on the epistemologies of her Karrabing colleagues, if we wish to continue in our current form, we need to pay attention to, call forth, turn toward, or visit particular sites, for turning away might cause a turning into another kind of existence. In turning away, there is a risk of becoming "not what you are, but what you are in a different arrangement of existence": bacteria, earth, or rock.[13] The asymmetrical dependence of humans on the earth would seem to invite more care, rather than less, a more careful attitude to prevent the earth turning away, or withdrawal, to prevent it from becoming indifferent.[14] Additionally, if humans are understood to be one expression of nature, rather than fundamentally separate from it, many of these questions of "indifference" become mute. Caring for each other is caring for the earth, and the earth's care is expressed in and through people. The modern era, what Povinelli calls "settler late liberalism,"[15] in many ways, could be described as the forgetting of this essentially important lesson, evidenced by rampant pollution and disregard of nonhuman life, which "often create deserts, dry patches, and absences as the signs that a form of existence had turned its back on that which was within it, dependent on it but careless toward it."[16] The unthinking relation toward material existence embedded in plastic's disposability characterizes this careless era of spreading deserts and other signs that the earth has turned its back in response to the ravages of racial capital. Plastic tries, unsuccessfully, to coat over and cover up these damages, exacerbating them in the process.

If we see the recalcitrance of plastic, not as an opposition to the idea of plasticity, but rather as its logical outcome, we can see how plastic geology is, not the proposition and resolution of two different modes of plastic, but rather part of the same movement. Plasticity, through plastic matter, entails, not the endless transmogrification of matter, but rather its indestructible destructive-

FIGURE 2.2. Plastiglomerate sample, 2013. Plastics debris and beach sediment, including sand, wood, rock, and shell debris. Photo: Jeff Elstone, courtesy of Kelly Jazvac.

ness. It is the materialization of a desire for pliability outside the emergence of particular forms. It is the imposition of plasticity into matter, the impress of the hierarchy of matter and mind, the expectation that matter will perform for Western desire. The creation of plastic has indeed rendered the world plastic, where geology itself has become something different, where plastic circulates throughout the ecosystem. This enmeshment, of plastic with geology, seems to call for a heightened awareness of the intergenerational effects of plastic, not deep time as absolution, but deep time as a humble reminder of the embedded existence and multiple intra-actions that will inevitably exceed capitalism and colonialism.

Synthetic Universality

The synthetic or "artificial" nature of something suggests the way in which it develops, emerges, or is created *irrespective* of its surrounding environment. Plastics embody this philosophical presupposition of a neutral universal to which all matter can adhere rather than everything emerging in dynamic relation to its surrounds. Synthetics actively deny the relations in which they are embedded. Members of the plastics industry have differentiated synthetics from natural materials on the basis of their appearance, distinct from how "Man" creates them and how they otherwise appear in the world, thus recruiting synthetics in service of modernist tales of human betterment and progress.[17] As John R. Lawrence writes in the September 1970 issue of *Plastics World*:

> In the same way that we think of rayon and nylon as synthetics used for making textiles we might think of the automobile as a synthetic means of transportation. Or we might look upon atomic energy as a synthetic form of energy. Anything that man creates that does not occur in the same form in nature is synthetic. In this sense we are well into the age of synthetics. From heat-resistant plastics that help to take man to the moon, to textiles that make better clothes than natural fibers—man has synthesized materials that perform better than anything he can take directly from nature. There is hardly an area of man's needs where we are not using synthetics. Even some of the things computers do for us come close to being classifiable as synthetic ideas. . . . Whatever man's role is in the year 2070, we can be sure that he will be making full use of synthetics that he first developed to a high level of sophistication by producing plastics.[18]

Lawrence's pronouncement that synthesized materials will "perform better than anything he can take directly from nature" emphasizes the superiority of the new materials and the inherent supremacy of "man" over "nature," where it is nature's operation as mere standing reserve that draws a veil over the earth's becoming.[19] Here, plastic matter articulates the hierarchy of being. It is an aspirational image, where synthetics are asserted as materials that are not only *not* nature but better than it—materials that deny relations, including their embeddedness in and mutual composition with their surrounds, and their own fallibility, locality, mortality. Instead, synthetics appear virtually out of thin air,[20] or from the imaginations of chemical engineers, forgetting or rendering invisible the infrastructures, ideologies, labor, and materials essential to their production. This form of material alienation describes the attributes of synthetic universality. For it is plastic, as the philosopher of science Bernadette Bensaude-Vincent reminds us, that demonstrates the ability to manipulate matter at its most basic element and thus provides the beginnings of a vast field of molecular engineering. In particular, plastics have "encouraged the dream of dematerialized and disposable artifacts."[21] Plastics were the beginning of a long line of inventions which rest on the premise that ideal matter can be created through scientific and corporate technological practices and that the value of plasticity—that is, endless manipulability—fulfills the dreams of mastery over the material world. Plastic may thus be understood as providing both the material and the ideological basis of synthetics.

Plastics are *engineered* to feel universal. They are possessed of, or they are designed to want, the quality of universality. Plastic is not *of* this earth in the sense that the earth itself, and particular sites, carry memories of the beings and activities that have taken place on them. Plastics are engineered to express a desire to be removed from these earthly co-becomings. For, as they are created through an alienated industrial process, they are removed from the creation and inscription of memory that is the process of place-making. As Karen Barad writes, "*Memory—the pattern of sedimented enfoldings of iterative inter-activity—is written into the fabric of the world*. The world 'holds' the memory of all traces; or rather, the world *is* its memory (enfolded materialization)."[22] A particular place can be distinguished from an amorphous any- or everywhere by its capacity to retain the lives and stories of those that have passed through, human and other-than-human, and the relational systems that we are called on to respond to. In the process of creating synthetics, these relations, these stories, memories, lives, sedimented enfoldings, are actively and deliberately severed.

Plastic actively denies and defies geological agency: the agency and entwinement of the earth as a materialized record of life and as life's source of mineral

liveliness. Rocks bear traces, or an inscription, of their history, determining and being determined by the activities of the beings that reside, pass through, live and die within particular environments. Geology is an active participant in the construction of a particular place, and through fossils and other kinds of markers, it bears traces of times and beings past. Geology is the recording device for the stories of the earth. Plastic is designed to be separate from these processes, to have no connection to its surrounds. Plastic cannot be local. "Plastic," as the art historian Amanda Boetzkes and the critical theorist Andrew Pendakis write, "is always a 'some' or an 'any,' never a 'this' or a 'that.' It feels infinite because it sheds every trace of particularity, every index of a located space and time."[23] It proffers no birthplace, no evolutionary home. It has no Umwelt, or world that is made in a coevolutionary fashion, in the sense that Jakob von Uexküll articulates.[24] Each of these worlds or Umwelts does not arise on its own but rather in dynamic call and response to the other animals, plants, winds, air, rocks, and sun that compose its particular environment. Plastic is not made from this interrelationality, except as it is informed by a voracious economic system and a Western epistemological structure that understands matter to be endlessly available and pliable.

Plastic is in relation to laboratories, chemical formulas, businesses, trade routes, and vast distribution and collection systems, but each of these relations is deliberately alienated and estranged. In this sense, it is the perfect material of the modern age's dream of human mastery over, and separation from, the earth: infinitely reproducible, down to the molecular level. Although each production facility may use a slightly different formula for its particular plastic, plastic cannot easily be traced or distinguished by its chemical markers. To date, to determine when particular objects came into circulation, plastics museum conservators often rely on the history of design, rather than on the objects' chemical makeup, which requires access to a nuclear magnetic resonance (NMR), Raman, or mass spectrometry machine and can only tell the conservator what general type of plastic an object is made from, not all the chemicals that have gone into its fabrication. The nontraceability of plastics (which is partially due to the proprietary secrets of chemical companies) also inhibits activist intervention in holding companies accountable for their products and for the unregulated release of nurdles, or preproduction plastic pellets, as it is difficult, if not impossible, to trace a particular piece of plastic back to its manufacturer. Most of the time, what can be known is the type of plastic and its basic chemical structure but not its source of origin or its movements once it has been produced. In this way, plastics are designed and engineered to be universal, replicable, exchangeable, untraceable, and nonlocalizeable.

This is exactly what is attractive about plastic. Aside from its practical applications, which are myriad, plastic relieves us of our obligations to the earth, to place. Plastic's synthetic universality has it leaving the factory floor free of historical weight, lightened by the prospect of a better future and appearing endlessly transformable. In the 1950s, when plastic was first emerging but quickly coming to define consumer capitalism, it "was marketed as a substance that was not degraded by history or nature."[25] Plastic represented a resplendent new world, free of the demands of death and decay.

The literary scholar Robert Pogue Harrison argues that the desire to evade the obligations or ethics of the earth, to be unlocated, stems "from a single-minded effort undertaken by the West in the last few centuries to emancipate ourselves, by whatever means necessary, from our millennial bondage to the land and our servitude to the dead."[26] Harrison here articulates the driving force toward a placeless universalism that figures as a version of freedom. This desire to rid ourselves of the earth is a particularly Western phenomenon, which has had many destructive consequences, but is foundational to people who "think they are white."[27] As the philosopher Alexis Shotwell argues, "That feeling, of wanting to be people unmoored from history, of endorsing the pretense that we have nothing to do with the past that constitutes our material conditions and our most intimate subjectivities, is a feeling that defines us [white people]."[28] It is not simply what has defined us, but because of Western hegemony, it has imposed a colonial logic and materiality on the rest of the world.

Harrison describes this placelessness, this drive toward the universal, this "destruction of place that is occurring almost everywhere at present, and that has been occurring for some time now [as] linked in part to an anxious and even frenzied flight from death."[29] The use of plastic to stave off decay and decomposition—think of cling wrap and other mechanisms for preserving food—contributes in part to the imagined belief that we could, if not escape death, at least postpone it. The use of plastics in some versions of plastic surgery similarly fashions this desire for everlasting youth into our bodies. Obscuring the demands of the dead, denying any reciprocity with ancestors and the earth, plastic has promised a world of prosperity achievable through scientific control.

The synthetic universality that is expressed in plastic can be understood as a form of colonialism. As Max Liboiron has argued, plastic pollution is colonialism because it subjects people, especially land-based peoples, to exposure to pollution without their consent.[30] The ubiquitous use of plastics as infrastructure means that we are subjecting everyone to one system of relating to the world around us, one mode of subjectivity, and one that produces pollution as a part of its course. This pollution primarily effects the land and people who live

off the land, foreclosing and shaping the ways in which people can be with the land, which, she argues, is an imposition of Western knowledge and material practices on Indigenous and other peoples.[31] Plastic, and its unfettered distribution, can be understood as the continuation of extractivist policies that use Indigenous lands as dumping grounds as a means of dispossession. The imposition of the understanding of land as a resource, the severing of matter from land, body, and soul, is a colonial epistemology, not coherent with Indigenous philosophies or ways of life. Robertson has also identified plastic pollution, and plastiglomerate, as a consolidation of colonialism, capitalism, and consumerism. As she writes in relation to the emergence of plastic as a common material, this process was made possible through a continuation and amplification of extractivist logic: "As extraction from some communities (i.e., rubber trees and animals) became unfeasible, scaling up these three c's [colonialism, capitalism, and consumerism] was made possible through extraction from others (i.e., oil fields)."[32] She speculatively traces the path of one lighter that ends up as plastiglomerate: from its manufacture, to its use, to its journey through waterways to end up on the shores of Hawai'i. This story, she asserts, is one of "ouroboric exploitation, of places invaded, oppressed, neglected, destroyed, with the invaders taking the masks of colonizers, tourists, garbage-makers. This process repeats, such that eventually, the landscape eats itself, it becomes its own finalized entity, melding landscape and discard in a single geologic element."[33] The same currents, Robertson remarks, that facilitated the plunder of lands and bodies in colonization become the paths of plastic pollution, the continued and ongoing slow violence of these same processes.

In a brilliant book on artifice, nature, and the chemical industry, Esther Leslie describes the promise of universality in terms of a struggle with and over time: "Time's dominion was to be cracked . . . through the accelerating power of chemical reaction—modern magic consists in the short-circuiting of natural processes. . . . In time, technology remakes time itself, removing it from natural rhythms to an *abstract universal*."[34] Plastic appears without ontology because of this accelerated dislocation, this chemical overriding of natural rhythms to be that which can become anything, can be found anywhere. In its aspirational universalism, its abstraction from the processes of embedded earth dwelling, plastic appears devoid of any stable substance: ontologically protean. This problem is what is alluded to in its name: the ability to morph, be molded, or transform. Roland Barthes, in his 1957 essay "Plastic," writes, "More than a substance, plastic is the very idea of its infinite transformation; as its everyday name indicates, it is ubiquity made visible . . . less a thing than a trace of its movement."[35] Boetzkes and Pendakis echo this sentiment, writing that plastic

"is less a substance than its antithesis, a paradigm in which substance is transformed into a way of being unmoored from the coordinates that stabilize presence and meaning."[36] I would argue that the process of mooring oneself to the coordinates of presence and meaning is what it means to be earthbound, to form and to be informed by enmeshed relations to mineral, animals, water, and air; to processes of change, transformation, and metabolization. The product of a short-circuiting of the earth's rhythms, plastic enters the world by design and of necessity in universal vestments.

That plastic could be the Anthropocene's "golden spike" is not incidental, for the logic of the Anthropocene also rests on a nihilistic desire for the universal inherent to geological ways of knowing, built on two foundational assumptions. The first is the problem of the *anthropos*, which has been widely critiqued among humanities scholars for lumping all people into the position of responsibility for the ongoing ecocide that marks this epoch, rather than addressing the power structures of capital and colonialism. The figure of the human that the Anthropocene takes up is one, that, as Donna Haraway argues, is derived from the etymology of *anthropos*, the one who looks up to the sky, rather than *humus*, connected to the soil, the earth.[37] The Anthropocene represents a break with humic foundations, despite its obvious ties to the geological. But the anthropos covers up and denies these power relations, reasserting a false universalism and vision of the human as divided from the earth, either as the ultimate power of the human or as the figure of our evacuation.

The second foundational assumption rests in the Anthropocene's designation of a complete remodeling of the earth and of the erasure of place under the conditions of contemporary petrocapitalism. The sense of the local has been systematically undercut through massive extraction projects and the importation and expansion of plantation systems throughout the world.[38] Neither climate change nor the Anthropocene is a new event, but each is fundamental to the project of settler colonialism.[39] Settler colonialism's purpose and aim was to reshape the biospheres, hydrospheres, and atmospheres to imitate Europe—representing a profound material universalization of a particular locality.[40] Therefore, the use of plastic as an indicator for the Anthropocene goes beyond simply its distribution and ubiquity on the planet. Both plastic, as a material, and the Anthropocene, as a concept, participate in the same colonial universalist logic of plastic matter that fundamentally disrupts the possibilities of developing and sustaining ethical relationality toward the other beings we share the world with, human and other-than-human.

Accumulation without Metabolization

Metabolism is the mechanism through which a body integrates the outside or, in the case of bacteria, how an organism creates its environment.[41] It is the process by which the body incorporates what surrounds it, where some materials remain, and where some are excreted. This is always a process in time, in material liveliness. *Metabolism* as defined in the *Oxford English Dictionary* includes "the chemical processes that occur within a living organism in order to maintain life; the interconnected sequences of mostly enzyme-catalysed chemical reactions by which a cell, tissue, organ, etc., sustains energy production, and synthesizes and breaks down complex molecules."[42] The science and technology studies scholar Hannah Landecker astutely describes this process of integration as an "articulation of the animal's ability to turn the environment into itself through nutrition," and thus "constitutive of the argument that each organism, plant or animal, has the whole of life within it, and one is not 'made' to serve the other."[43] For Landecker, "metabolism, in this analysis, was not a boundary between two things, but a dynamic production of there being two things at all: without metabolism, there would be no need to have inside and outside, organism and environment, animal and world."[44] By incorporating the outside—minerals, bacteria, and nutrients—an organism comes to be; a cut is made between the organism and environment. Clearly plastic is not a living organism, at least not within standard definitions, so it cannot really participate in metabolic processes, but it disperses the inability to metabolize outward, as it fills the stomachs of various organisms without providing any usable energy, without metabolizing itself under most conditions.

Because plastic is designed to resist these mechanisms of metabolism, it materializes the desire for *accumulation without metabolization*. A central concern of plastic waste is that when animals eat it, it most often either accumulates in the stomach or is excreted without metabolization. Some of the most widely seen and horrifying images of plastic's accumulation have been through Chris Jordan's photographs of decaying bodies of baby albatrosses who have been killed by their parents' attempts to feed them with the Pacific Ocean's plastic trash (*Midway: Message from the Gyre*, 2009–present). In his more recent work (*Camel Gastrolith*, 2016), Jordan graphically documents the contents of one camel's stomach: a negative-space sculpture composed primarily of plastic bags. Plastic is itself incapable of metabolization, except in processes of expensive and inefficient recycling, through exposure to the sun in the ocean,[45] or by being broken down by specific bacteria or fungi. More often, it overwhelm-

ingly and rapidly accumulates, a situation that the political philosopher Michael Hardt observes, is "counter to metabolism in general. The end point of accumulation, and specifically the accumulation of plastic, is the death of metabolism."[46] In this death of metabolism, plastic remains the synthetic replication of itself, refusing its outside. Accumulation, as opposed to metabolization, reasserts the possibility and continuity of the same binary mode of thinking about nature and culture that paved the way for plastic to emerge.

This is an example of what McKenzie Wark, following Marx, would call "metabolic rift."[47] Metabolic rift describes the extractions of molecular flows that cannot be returned. Marx was concerned with phosphorus and nitrates; Wark turns her attention to carbon, specifically carbon dioxide. Metabolic rift describes the ways that it is not possible to simply move a molecule from here to there without consequences—systems do have outsides that can result in vastly different configurations of ecologies. Plastic is certainly the extension of metabolic rift as Wark describes it, the odd sequestration of carbon dioxide into temporarily stable forms, as plastic fossils, that then are returned to ecosystems without the ability to metabolize, without the ability for the cycle to renew itself.[48] Plastic, like systems of global warming, depends on fossil fuels to be dug up and recirculated, not into the atmosphere per se, although plastic does end up in the air, but throughout the ecosystem. Plastic returns to the geological, but so slowly that the metabolic rifts appear wide and vast in the meantime, threatening to swallow up those in its path.

In this sense plastic loses its time-being, resisting the processes of becoming tied to questions of metabolism. The result of chemistry's "cracking" of time's earthly rhythms, to borrow Leslie's formulation, plastic occupies a temporal register, a distended temporality, that denies earthly time.[49] Compressed and recomposed, it exists outside the cycles of life and death while nonetheless acting on them, embodying an existence akin to the geological. Rather than assuming the slippage of an ontological category through the figure of plastic, it may be more productive to think of plastic as possessing a geontological power, which Povinelli describes as the "tactics used in late liberalism to maintain or shape the coming relationship of the distinction between Life and Nonlife."[50] Plastic's geontological power is its ability to transmit synthetic universality through the maintained divisions of the lively and the inert, where because it is produced as inert, its liveliness is denied. This is the trick of plastic appearing in its universalized materiality: it represents a stiff ontology, an ontological formation decoupled from the drag of substance, a stubborn being infinitely mutable but refusing to go away. However, the life cycle of plastic does not con-

stitute a protean, nonontological force, but an all-too-material and materialized set of implications for multiple beings, humans, and nonhumans alike. It is a fully active agent in the production of particular kinds of worlds.

Memories of the Future

Notwithstanding plastic's obdurate resistance to processes of decay, decomposition, and metabolization, when it becomes part of the geological layer—that is, when it is folded back into geology, back into its fossilized precursor—how does this transformation change the relation to its surroundings? Plastic is a "tip of a heap of memory, the upper layer of many layers of the past that have resulted in crude oil stored in the depths of the soil and the sea," as Bensaude-Vincent writes. This tip then also encompasses the processes of petrochemical manufacture, global distribution networks and faulty or nonexistent waste management, toward the becoming-geologic. For, despite the hubris of plastic, despite its resolution to crack earthly rhythms as the ultimate synthetic product, plastic bears the fate that we all do: ultimately, it returns to the earth. Its process of becoming-geologic means that the divisions between the synthetic and the natural cease to function. Without wanting to push aside too quickly the horrors of plastic's legacies, or the worlds and lives that it literally suffocates, it is also important to acknowledge that once plastic is buried, once it is folded into the earth, it begins to bear the marks and traces and memories of the creatures that surround it, readily breaking down at the macrolevel. Plastic is nibbled, moved, or pummeled by the activities of all the beings in its environment. As the universal logic of plastic is folded into the earth itself, the material of plastic necessarily becomes specific, particular, local. As time passes, plastic accumulates the marks and movements of passing creatures, winds, water, and the crusts of the earth itself. It cannot help but be folded into the logic of the earth. The geontology that corresponds to this process is an inadvertent refusal of a universalist/particularist binary, which was "never about choosing sides but instead about the impossibility of selecting a side at all without inadvertently activating the logic of the other."[51] Plastic seems to move as a binary—toward separation and, then, eventual enfolding—but each movement activates the logic of the other, through its relation to plasticity. Hence plastiglomerate.

In this process, one kind of fossil—fossil fuel—is folded into the plastic technofossil, and, presumably, eventually, back into oil. The question is, as Kathryn Yusoff has argued, to ask after the geopolitics of our mineralogical becomings, the geology of subjectivity in differentiated planetary inhabitation and corpo-

real affiliation, rather than just imagining unilateral destruction.[52] "To imagine the Anthropocene as an event, we must become attuned to fossils—seeing ourselves as the material expenditure of the remains of late capitalism," writes Yusoff.[53] This shift toward thinking with and through fossils—the processes of fossilization, technofossils, and future fossils—understands the ways in which death is the condition of life, and, in a sense, has already happened. There is a twofold inscription process in the creation of fossils. The fossils themselves become a kind of written record in the earth, for creatures to decipher using all manner of semiotic systems. But the earth also writes itself into the fossils, rendering the category of technofossil and its possible subdivisions simply an object that bears the marks and movements of the history of the earth. And, gradually, all these fossils will become less and less distinct in their particularities, merging more and more with their surrounds, becoming their environment, and eventually being metabolized. Plastiglomerate points to this internal contradiction within plastic: it is neither natural nor synthetic but a fully hybrid material that folds time by fusing a future technofossil with the ancient compression of fossils that resulted in oil. It is a compelling example of what Jason Moore calls "capitalism-in-nature"[54]—that is, modernity tethered to, rather than severed from, the processes of the earth and all its manifestations. As Moore has passionately argued, capitalism is not an economic or social system; rather, it is "a way of organizing nature."[55] Plastic matter also produces a way of organizing nature.

Plastiglomerate is an example of what Moore terms the "double internality"[56] that composes capitalism as world ecology. Despite its synthetic universalism, which maintains plastic stubbornly apart from the relations of the world, it eventually becomes part of the cycles of the earth. It cannot help but be marked by the passage of time, by the inquisitive gestures of animals, by the roots of plants and the digestive capacities of microbes. Plastic, in this sense, returns to its original form as a fossil, the source from which the future is generated. In this light, plastic has the ability to take us back and forward in time, millions of years, to be a vector of time travel. As Yusoff notes, "By understanding fossil fuels as active within contemporary corporeality, we can think about a mobile and mobilising material conversation between 'dead' fossils and 'live' bodies amongst the geopolitical subjects of the Anthropocene."[57] The divisions that break down, between the living and the dead, between the universal and the particular, in the process of returning to a fossilized state of existence thwart the hubris of a modernity eager to rid us of our ancestors and our relations to the earth.[58]

Plastiglomerate as Art

In parallel to its life as a marker of the Anthropocene, as a new geological entity, as a scientific curiosity, and as an instantiation of plastic matter, plastiglomerate has also had a life as an art object. Jazvac has shown plastiglomerate in art exhibitions as sculptural ready-mades to demonstrate human impact on nature, and the works have been collected or displayed at the Yale Peabody Museum, the Het Nieuwe Instituut (Rotterdam), and the Natura Artis Magistra (Amsterdam) as specimens that captured changing natural history. What does it mean to say that this marker of the obdurate legacies of extraction that is plastiglomerate has now become a ready-made artwork? Can it be understood as a new form of *land art*? Situating these objects within the art world asks us to look at them again, to think about the consequences of petrocapitalism and its legacies long beyond our own lifetimes. In the most generous reading, plastiglomerate as ready-made serves to draw attention to the ubiquity of plastic and its unintentional consequences and to see it as a call to action. Art can help to visualize things that are otherwise hard to grasp, especially when it comes to something as all-encompassing and overwhelming as plastic pollution. Yet, by placing plastiglomerate within the institutions of art, it also lends itself to the processes of commodification, individualization, and anaesthetization that are endemic to the art world.

Plastiglomerate came into public consciousness through the dual and combined lenses of art and science. As a "matter of concern," in Bruno Latour's phrasing, it emerged from and continues to generate a gathering of ideas, forces, and actors that circulate around concerns for plastic pollution as it is distilled in this object. Plastiglomerate became a public matter of concern through the cross-disciplinary dialogues and collaboration of an artist and scientist. This collaboration is, in large part, why plastiglomerate has circulated so widely. It has been taken up in scientific journals; in mass media, such as the *New York Times*; and in art settings. The understanding of what plastiglomerate is, and what cultural and scientific significance it could have, was deeply informed by these cross-disciplinary conversations, where neither party could take its training for granted. Corcoran, for example, felt that plastiglomerate was less significant because it emerged not through volcanic activity, as originally supposed, but through human beach behavior. Jazvac, on the other hand, found the revelation more poignant as it pointed to the thorough entanglement of plastic, cultural practices, and the material forces of Kamilo Beach. Jazvac and Corcoran's plastiglomerate was an exemplary project of art and science collaboration as it was a mutually constituted object, where neither artistic nor scientific

FIGURE 2.3. Plastiglomerate sample, 2013. Plastics debris and beach sediment, including sand, wood, rock, and shell debris. Photo: Jeff Elstone, courtesy of Kelly Jazvac.

practices were an "add-on" to the other.[59] The initial trip that Corcoran and Jazvac embarked on began a multiyear-long research collaboration on questions of plastic pollution, now focused on the Great Lakes region.[60]

However, just as plastiglomerate was always thoroughly an object of artistic and scientific interest, its placement within the art world means that it couldn't escape the processes of institutionalization that are embedded in those settings. In particular, to understand plastiglomerate as art, one must rely on the historical avant-garde and the provocation of Marcel Duchamp's ready-made. The art historian Peter Bürger argued that a ready-made is legible only through the institutional practices of art, so to analyze a ready-made, one must also analyze the art world itself.[61] There is not adequate space here to properly examine this

question, but suffice it to say that art institutions in many ways emerge from colonial and capitalist practices that depend on systems of extraction for the creation, circulation, and display of art objects. Environmental guidelines for museums and art galleries were developed at a time when energy was cheap and the climate crisis seemed a long way off, as the 2010 report of the International Institute for Conservation of Historic and Artistic Works argued. Recirculating plastiglomerate in these settings may only be a kind of curiosity, a document of our times, that does little to shift policy or public perception, but it does help consolidate the authority of the artist and positions art galleries or museums as conscious of environmental problems without addressing their own contributions to energy crises and waste. The potential value of plastiglomerate to function as an object of critique is certainly dampened by the weight of art institutions as arbiters of value.

Another way to think through plastiglomerate-as-ready-made is to consider it within the genealogies of feminist ecological art. In particular, Mierle Laderman Ukeles's groundbreaking work on landfills is echoed in Jazvac's appropriation of plastiglomerate. Ukeles, who has been an unsalaried artist in residence at the Sanitation Department in New York City for over forty years, began as a feminist performance artist and quickly saw the links between her art practice and her daily labor as a wife and mother, under the rubric of what she termed "maintenance art."[62] She then made the connection between maintenance as feminized labor and maintenance workers, a largely male, working-class group, and began working on questions of waste, maintenance, and labor. Through her work, she proposed to understand the construction of landfills as social sculpture, something that we all, whether we like it or not, contribute to and participate in. Together, we create landfills as a form of land art. As the curator Patricia C. Phillips writes, "Ukeles thinks of [landfills'] artificial, often ungainly topography as variously created 'public landscapes' or 'social sculptures,' referring to the work of Joseph Beuys, who aggressively opened art as an inclusive social process. She sees [landfills] as active, accessible alternatives to the late twentieth-century earthworks that were developed in remotes sites on private land."[63] Ukeles's provocation challenged the ways that land art was being made at that time, as large interventions by well-known artists such as Robert Smithson and Michael Heizer served to buttress the sense of human control over the world rather than to question it. Ukeles, instead, used the form of land art to question the narrative of artistic genius and grand gestures and to draw attention to consumerism and the daily, repetitive labor of care. In her work, Ukeles makes landfills more visible rather than less. She believes

in the power of art as a platform of visibility to allow audiences to have a more thorough understanding of waste, its economies, policies, and environmental impact.

Plastiglomerate can be understood, under these terms, as a social sculpture that similarly wishes to take advantage of the audiences of museums and art galleries to bring to light questions of waste. In line with Ukeles and other feminist environmental artists, Jazvac is not interested in reasserting human control over the landscape but instead in using plastiglomerate to comment on the fundamental intra-action of nature and culture. Plastiglomerate engages an environmental critique of ready-made art, as, instead of focusing on the production of factory objects, it asks after the unintentional and accumulative effects of throwaway culture. Its display in art museums exhibits the effects of consumerism, returned to us in these sanitized spaces, prompting moments of reflection. There is a wager here that making the repetitive, daily effects of consumption and capitalism visible will help change people's ideas and investments. Plastiglomerate can become a way to tangibly understand the effects of plastics on the world's oceans and geologies, as various objects are still visible, such as a lighter and rope, while others have congealed into one multicolored stone. Understood as social sculpture, it asks us to consider what we are collectively making, while it displays how plastic is already being folded back into the earth as a naturecultural object. Plastiglomerate in this context can be understood as an educational tool to make the ubiquitous or wicked problem of plastic pollution more tangible and visible. Whether or not this educational possibility is overwritten by the determining factors of art museums as institutions is an open question.

As it moved into the realm of art, plastiglomerate began to be created by artists and architects fascinated with this new geological formation, not just displayed as a ready-made. Fabricated plastiglomerate reads less as a critical appraisal of contemporary culture and an invitation to consider the intimacy of the disposable than as a nihilistic fascination with our own violence. Plastiglomerate made by artists operates within the logic of the Anthropocene. Artistic production can become a way to naturalize or even proliferate ecocide, through the value that objects such as plastiglomerate can take on. Or, as Robertson argues, "if the Anthropocene is a narcissistic category, then the art world is the mirror."[64] By making plastic pollution visually appealing, it risks neutralizing the potential for it to be understood as an object that enacts harm. Plastiglomerate in the art world risks becoming just another form of desirable commodity.

Plastiglomerate, as a visual art, is no less paradoxical than it is as a geological object. It serves *both* to maintain the status quo, anaestheticizing the viewer through fascination with our own violence, implicitly accepting the ongoing destruction of plastic pollution, *and also* to draw awareness to the global impacts of plastic pollution. For the fact that plastiglomerate is naturally found within one of the more remote and beautiful sites on earth—Kamilo Beach—asks us to consider its ubiquity as well as the impossibility of separating natural from cultural artifacts. Plastiglomerate is a visual and material reminder of the fact that matter cannot be contained and that the categories of the natural and the cultural are always muddied. The fact that plastiglomerate is aesthetically interesting, if not beautiful, creates this complex reading while displaying the limits of artistic interventions as an activist strategy.

Conclusion

Plastiglomerate represents both the success and the failures of synthetic universality central to plastic matter. It at once attests to the violence of severing matter from mind, where the results can be seen readily in oceans and on land as the presence of plastics is rapidly changing ecosystems without thought or care, as garbage piles up on remote beaches, materializing a belief that it is possible to maintain a separation between these realms. But, in its failure to remain in place, to remain unattached to location and geology, plastic serves as a marker of the ways in which this separation cannot be maintained. It is a material category of separation while not actually being able to maintain its boundedness. For, as Kim De Wolff writes, "On the beach plastic displays its remarkable ability to long outlive single uses. But on Kamilo (and I would argue elsewhere), to gather and endure is to transform and be transformed."[65] In other words, plastic is both an obdurate material and an instrument of widespread transformation.

The enmeshment of plastic with the earth seems to subvert the logic of plastic itself, showing the ways in which the earth's logics cannot be escaped, only violently suppressed. The cleavage of the natural from the cultural can only ever be this violent abstraction, doomed to failure. However, in the formulation of a material designed to be universal, designed to resist metabolization, a technofossil in the making, it enacts widespread destruction within the biological world. Instead of presuming the separation between the two, plastic reveals the active work and conscious design that goes into the cleavage of these spheres, a division that is only possible because of continued violence to the earth and

its inhabitants through the active denial of relationality. A politics of location and embeddedness does not mean that we have to disallow mobility or be blind to its realities but that we must reconsider plastic's founding wager: the will to remain separate from place, from one's surrounds and one's kin, of all kinds and species, in line with a destructive modernity.

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3

Plastic Media

Upon first glance, the photograph may appear somewhat banal. It pictures an empty lot: a cement foundation, hedges on either side, a road in the background. It is a photo of abandonment, a photo of what remains. It looks as if it might once have been a driveway, now ridden with cracks, plants pushing through. The hedge on the left still retains a round shape. There are tall trees rooted in a lawn that still looks like a lawn. It is difficult to tell when the abandonment took place, or precisely what is gone. Was this someone's home? A business? The move feels recent, as if, with little effort, the lot could be restored. In that animated, yet abandoned state, it seems haunted. The photo is part of the series *Solastalgia* by Courtney Desiree Morris. *Solastalgia* is a neologism coined by the environmental philosopher Glenn Albrecht. Intentionally playing off the word *nostalgia*, *solastalgia* refers to the distress produced by environmental change while people are still directly connected to their home environment. In other words, it describes the loss of a place in place. This is the type of loss that people are experiencing all over the world as climate change and other factors linked to extractivism rapidly reshape ecosystems through

FIGURE 3.1. Driveway, 2018. From the series *Solastalgia*, by Courtney Desiree Morris. Courtesy of the artist.

flooding or wildfires or drought or pollution.[1] It describes how a place once familiar has been slowly made foreign. Unlike nostalgia, a loss produced by movement, it implies that there is no possibility of return. In Morris's series, *solastalgia* describes the forced displacement of her grandmother's community, Mossville, Louisiana, through plastics and other petrochemical production. While much of the focus of the environmental harms of plastic center on postconsumer practices and systems, to fully understand how plastic operates as a mechanism of synthetic universalism, imprinted with plasticity, we must examine its production, its implication with media, and the ways that plastic haunts particular bodies and geographic regions.

In this chapter I take up the recent turns in media theory toward infrastructures, critically examining materials and thinking media elementally to examine how plastic production participates in environmental racism and classism. Through the examples of PVC in southern Louisiana and the Kodak plant in Rochester, New York, a critical infrastructure, to the ways the plastic subtends mass and digital media, I show how plastic is both a logistical and an elemental

medium. I then ask how plastic might operate as a medium that communicates between the living, the recently dead pictured in photographic media, and the long-dead organisms whose bodies compose fossil fuels. Might these fossil fuels be trying to communicate with us? And what might they be saying? This haunting could be refigured as a reckoning of the extractivist economies of settler colonialism and anti-Black racism. First, I return to Mossville.

Plastic and Anti-Black Atmospheres

Mossville was founded in the 1790s as one of the first communities of free Black people in the South. The town was a haven for Black families throughout the backlash to Reconstruction and the Civil War and into the "1950s and '60s as the Ku Klux Klan resurged in defiance of the civil rights movement."[2] For over two hundred years, Mossville was a site of refuge, but now it is mostly abandoned. In 2012 the South African company SASOL began the process of buying up the property of the former five hundred inhabitants to expand its petrochemical plant through a large tax break and subsidy provided by the Louisiana government. The company now has the notorious title of being the second worst "super polluter" of airborne toxicity in the United States.[3]

Southern Louisiana is notorious within the United States for its high concentrations of petrochemical plants, leading to the appellations "cancer alley" or "death alley." In particular, it produces much of the country's PVC, which is transformed into shower curtains, piping, toys, signage, and traffic cones, among other things. Constitutive of contemporary infrastructures, and particularly the built environment, PVC is the most toxic of plastics produced. The building and construction sector uses 69 percent of all PVC. It is made through pyrolysis (thermal cracking) of petroleum, followed by the addition of plasticizers and stabilizers, added to create flexibility, durability, sheen, and adhesive capabilities. It is the plasticizers and stabilizers, key among them phthalic acid esters and brominated flame retardants, that can be toxic, releasing and offgassing volatile organic compounds such as formaldehyde, benzene, and perchloroethylene. Owing to all these additives, PVC is nearly impossible to recycle. Because it is mostly used for durable goods, the toxicity from PVC is often localized in its production phase, transmitted through the bodies of residents near the plants, rather than being found in the wider environment, as is the case with waste disposal associated with polyethylene.[4]

In the *Solastalgia* series, the SASOL and other petrochemical plants appear in numerous photographs, like a kind of specter, hovering at the edges, in the backgrounds, with flares and lights and unknown emissions. Even before the

residents were incentivized to move, the site was being transformed, undermined. The toxicity from the nearby PVC plants seeped into everything, permeating the water and air. In 1998 the Agency for Toxic Substances and Disease Registry drew the blood of twenty-eight Mossville inhabitants and found that the average dioxin level among the residents was triple that of the general US population. This finding is unfortunately unsurprising owing to the fact that between 2004 and 2013, 180,644 pounds of vinyl chloride were released into the greater Westlake area, where Mossville is located.[5] Presumably, this was not the first time huge amounts of vinyl chloride were discharged uncontrolled into the environment.[6] As a result of these and other toxins, residents regularly suffered a range of health problems including cancers, diabetes, asthma, and skin ailments. As Morris's grandmother describes:

> The trees were very pretty they were all green. During the time when this plant was in operation every tree died. . . . I remember the times when this plant would let off fumes or when it would erupt or something like that, they had a horn that they would let you know. They would tell you cut off your air conditioning during that time you had fans to cut them off. Put a towel down by your door, underneath your door put a towel down there. Close your windows so these fumes would not enter your home. We lived with that for years until I left and moved up a little more than a mile from the plant. And I think we were still affected.[7]

This poignant description of life in Mossville tells of the diminishment of the world, its loss of place in place. It speaks to what the cultural theorist Christina Sharpe conceptualizes as the weather—that is, "the totality of our environments; the weather is the total climate; and that climate is antiblack."[8] Plastic weather is anti-Black, it renders the atmospheres of Black towns in Southern Louisiana unbreathable, unlivable.

This is a pattern of legislation that has been widely contested, most recently by RISE St. James, which is fighting a proposed plastic production facility in its community.[9] The founder of the organization, Sharon Lavigne, makes clear the environmental racism that is behind the placement of this project and others. In her statement to the councilors in her district to request a moratorium to the proposed project, she writes,

> We have observed that the only examples in recent history of facilities that have been rejected by the Parish government were those that were proposed for sites that are in communities that are majority white. To be clear, we are glad those facilities were rejected because we don't think

FIGURE 3.2. Plant construction site, 2018. From the series *Solastalgia*, by Courtney Desiree Morris. Courtesy of the artist.

> *any* community should be saddled and burdened with these toxic industries. But it is painful to see a land use map that so clearly signals the disregard of our lives and communities—one that assumes that neither we, nor our children or grandchildren, will be on this land in the not-too-distant future, clearing the way for more industry, more pollution, and more harm.[10]

The letter goes on to spell out, in clear and eloquent terms, the necessity for an immediate moratorium. It speaks to the ways that pollution is used as a means of dispossession, the loss of place in place is a form of anti-Black racism, the inability to desire or imagine Black thriving communities into the future, the continued fungibility of Black bodies.[11]

In the production of plastic infrastructures, the legacies of petrochemicals are felt in bodies and in abandoned towns. The slow violence in Mossville and throughout the region accumulates and concentrates white supremacy through plastic infrastructures. PVC and other petrochemical manufacturing exhibits what Morris calls the "raw materiality of race," which describes "how the state

and the private sector rely on common-sense ideas of racial difference that mark Black communities as violable and disposable."[12] The placement of these plastics factories shows how toxicity is naturalized to Black communities.[13] As the famed environmental justice scholar Robert Bullard makes clear, the economic development of regions in the South largely do nothing to address social inequalities and injustice but rather often serve to exacerbate them, evidenced in the unlivable cycles of petrochemical pollution and coastal erosion (also linked to fossil fuel extraction) that serve to undermine vibrant Black communities. This can be seen in the differences between Mossville and Westlake—its wealthier, white counterpart. There, the wealth accrued through the jobs that are provided by the petrochemical industry serves as an incentive to ignore the systematic health problems found in the region. Instead, there is widespread belief that health problems are caused by genetic inheritance or lifestyle choice—reproducing thinly veiled racist assumptions.

Black land and bodies are forced into an "ontologized plasticity," as Zakiyyah Iman Jackson has called it.[14] The land is presumed to be there for development, for progress, for infinite and limitless transformation, and so the saturation of petrochemicals is a form of synthetic universality in the guise of this progressive manipulation. The loss that happens here is a loss imposed by this violent plasticity; the land, air, and water made plastic through petrochemicals, rendered unrecognizable and unlivable. Similarly, the ontologized plasticity of Black people, the ways in which their bodies are made to soak up the toxicity of capitalist industry, is a similar violence enacted by willfully ignoring the limitations of form, of rootedness. PVC distributes the effects of white supremacy in the air, water, and soil. As the sociologist Denise Ferreira da Silva argues, it is impossible to understand contemporary capitalism without acknowledging the ways that it is built on, and continuous with, the project of slavery. This is particularly evident in how capitalism endures through settler colonialism as a mechanism of dispossession and dislocation by making the land itself toxic. Toxicity is justified as necessary to progress and economic growth, where some bodies are deliberately held as accumulators of toxins so that others can profit. The dispossession of Black people and the transmission of toxicity continue through what Ferreira da Silva calls, drawing on C. L. R. James, "total violence," where "slavery, which is a dimension of the colonial juridic-economic architecture . . . necessitated total violence for the extraction of the total value, that is, expropriation of the productive capacity of the conquered lands and enslaved bodies."[15] The collusion of the Louisiana government and industry continues this legacy, where slavery was not, as Sharpe argues, a singular event but rather a singularity.[16] This singularity continues, pulling into it bodies and land, here

operating through plastic. Plastic's inheritance, the wealth and supposed safety and sterility that it brings for certain people, depends on the disposability of Black, Indigenous, and poor communities.[17]

Here plastic is transmitted onto people and land. *Transmission* has two primary meanings. The first is associated with conveyance or transference, from one person or place to another. Chemical transmissions are also a form of transference, transferring the harms and costs of technological progress onto peoples and places at a remove from those who directly benefit. The second definition speaks more specifically to the ways in which the concept of transmission applies to mass media, where transmission often refers to light, heat, sound, and electromagnetic waves, as in a broadcast. This latter definition is taken up in media studies, where transmission describes the flow of information from source to audience.[18] Understanding transmission in the sense employed in media theory helps make clear that transmission is not just a movement, but that to transmit "could come to serve, or seem to serve, as a form of unified social intake."[19] We can see this kind of unification of social intake as a form of plastic's synthetic universalism. However, as many media theorists have argued, the transmission of information is often full of noise, and the audience is not without its own capacity for response, or interpretation, as Stuart Hall has made clear.[20] In the process of plastic's transmission, it has encountered a lot of resistance. The Black communities that are being dispossessed fight all the way to keep their homes and bodies safe.

If we take these theories of communication to apply to biosemiotics or the communicative capacities of the material world, plastic becomes a particular form of information that is transferred to bodies where the information that it carries is then interpreted, sometimes mistakenly as hormones, other times as rapid cellular division, as in cancer. These chemical transmissions are not uniform or entirely predictable. They may skip a generation or pass over a particular person. Plastic and its chemical legacies transmit unevenly and unexpectedly but are deliberately directed toward Black, Indigenous, and poor communities as an extension of synthetic universalism.

Chemical Media

It is not only through the content of *Solastalgia* that plastic is linked to photography; photography is a medium that has always been dependent on plastics and petrochemicals. One of the first precursors to plastics as they are known today was celluloid. Celluloid was the generic name for cellulose nitrate, made from a polymerization process derived from plant material. It was originally

created to replace billiard balls and was later used as an alternative to horn or ivory. But celluloid became famously associated with media technology through its use in cinema. As the journalist Stephen Fenichell remarks, "Celluloid film succeeded in raising the first plastic's cultural profile from a medium of mere mimicry into a priceless repository of human memory."[21] Plastic becomes central, not just to the material culture of twentieth-century life, but to mass media and human memory, including in photography. Later, audiotape, vinyl, and CDs came to etch the human voice, music, and images onto various synthetic polymers. The worlds of art, representation, and imagination now rest on plastic and oil as their basic substrate. As the English literature and environmental humanities scholar Stephanie LeMenager writes, "Oil itself is a medium that fundamentally supports all modern media forms concerned with what counts as culture—from film to recorded music, novels, magazines, photographs, sports and the wikis, blog, and videography of the Internet."[22] Contemporary culture is saturated in oil, which means that it is also saturated in the differential harms and benefits of inheritance and transmission. This is not to say that we should abandon contemporary media, but we need to think seriously about its relations beyond its appearance as a communicative medium. In other words, when engaging in oil media, we need to make our words, our images, count.

Moving from analog to digital did not lessen our dependence on oil or plastic—plastic constitutes approximately 17 percent of most electronic devices, including digital cameras and the computers and phones we look at photographs on. The infrastructure of digital media relies on plastic to function, as it coats the underwater and underground cables that are the invisible yet fundamental substructure of the internet. Plastic is used in these circumstances for its ability to insulate and because of its nonconductivity. For, far from being an immaterial "cloud," the internet relies on very specific and highly material infrastructures, such as transoceanic cables and server farms, which themselves are very much dependent on the material of plastic.[23] In fact, plastic constitutes the conditions of digitality, included in everything from the networked infrastructures to the hardware to the production of various photographic and display technologies. It provides the infrastructure for the offices and other buildings in which all these materials are developed and produced—from the carpeting to the paints to the desks and clothes of workers.

As plastic has become so central to communications and infrastructure, plastic operates as a logistical medium—that is, a medium that sets the "terms in which everyone must operate."[24] Plastic determines so many of our relations, including the goods we can access, the distribution of food, access to water, medical supplies, and an infinite variety of other things that arrange and regu-

late the movements of people and the qualities of our lives. It is a leverage point of power, distributing and amplifying other systems of inequality.

In understanding plastic as a type of media, I intend *media* to refer not only to media technologies such as radio, television, and the internet but also to an older understanding of the term, one that describes the elements. As the media studies scholar John Durham Peters has eloquently argued in his book *The Marvelous Clouds*, the definition of *media* as only referring to media technologies is a historically contingent, and relatively recent, phenomenon. As Jochen Horisch writes, "Well into the nineteenth century, when one spoke of media, one typically meant the natural elements such as water and earth, fire and air."[25] In other words, media, broadly understood, are the conditions of relation through which we move and around which contemporary life is structured. And plastic, at the moment, is central. Plastic can be understood as elemental, in the sense that it defines and structures the relations of possibility that we have, the decisions that we can and might make about the world, through its extensive networks. By aligning plastic with the elements, I do not mean to suggest that it is inevitable or that our current use of and dependence on plastic will continue in its existing configurations. As the previous chapter argues, plastic is a shifting material that despite its recalcitrance cannot remain stable. Plastic, like everything else, always undergoes transformation. Therefore, to describe plastic as a medium akin to the other elements is not to say that its relations are predictable (as if fire, water, or air was ever predictable) or predetermined but rather to say that it is one of the fundamental materials that constructs and shapes contemporary life. "Media," as Peters writes, "are vessels and environments, containers of possibility that anchor our existence and make what we are doing possible."[26] And so understanding plastic as a medium asks us to inquire into the *kinds of* vessels, environments, and containers of possibility that have been built. Plastic may indeed have become "naturalized," meaning that it is easy to take it, and the relations that it enables and produces, for granted, but through the process of naming plastic as a medium, it again brings the material forward for critical analysis, allowing us to ask how it circulates and what infrastructures and legacies are being built with it, what material presents and futures we have created, what have been foreclosed, and for whom.

Plastic as Medium

I want to suggest that plastic's makeup in mass and digital culture, the fact that it has become the medium through which life in the twenty-first century is negotiated, involves a haunting. This is not only because of the ways that plastic

transmits a violence outward, and how it shores up white supremacy, but also because of the ways it relies on the unearthing of ancient plants and animals for its basic composition. Plastic can, in this light, be thought of as a medium, communicating with long-dead organisms to make their vital presence felt among the living. The unearthed beings of fossil fuels released in our present day through vast communication networks represent these multiple hauntings, of immediate and more protracted violence, in the form of toxicities and also in the undead relations of fossil fuels themselves. For plastic relays deathly messages back and forth across its networks while instantiating consciousness of deep time and extending precarity and toxicity into the deep future.

Peters explains that the shift between thinking of media as elemental and thinking of it according to the narrower definition of media that indicated communication technologies "happened in the nineteenth century with the slow turn of *medium* into a conveyance for specifically human signals and meanings," as a fascination with the occult grew.[27] This move from medium in an expansive sense to medium in the inter-human sense, represented a reduction in the expressive capacities of the earth. But what if the notion of a medium could be extended beyond communication between only humans (even dead ones) to communication between other forms of previously embodied life and nonlife? As I will argue in this section, plastic is just such a medium, communicating the messages of lively fossils and the long dead, while troubling the clear-cut boundaries between the living and the dead.[28] In this sense, we can think of plastic as a kind of ghostly presence, or a form of haunting. It is the voice or the agency of those long-dead plants and animals returned to be a lively presence in the world.

Plastic haunts in part through its ability to preserve the images and voices of those who have passed, who live on in these media, as spiritual mediums to afterworlds. Cinematic and photographic media transform into mediums that enable the long-dead plant and animal matter compressed into oil to transfer the voice of the recently or not-yet-dead. Photographic prints now use polyethylene-coated paper, polymer ink, and film that is made of a plastic base; they utilize fossil fuels as the medium through which images appear. But these long-dead organisms also transfer their own messages. In his famous discussion of the punctum—the wound of photography that grabs the attention of the viewer—the literary theorist Roland Barthes speaks of a simple family photograph of his mother as a child, viewed after her death, and insists on the utter irreplaceability of her suffering and her life. The photograph operates, Barthes argues, as a melancholic accounting of the passage of time: the subject is frozen in time, in a deathly state, through the capture of the image; we are forever looking back at a moment passed (even when that moment was a second or

two ago). The photograph is a continuous reminder of the inevitable passage of time, a record of life's passing. Yet in light of the fossil fuels that compose that image as an object, Barthes's photograph also acts as a fold in time, collapsing and compressing present, past, and deep geological time. And also, possibly, future, as plastic does not easily decompose. Through plastic, the photographs become the medium to our loved ones, and they then transmit petrochemicals out into the land and bodies. As Barthes argues, "It is often said that it was the painters who invented Photography (by bequeathing it their framing, the Albertian perspective, and the optic of the *camera obscura*). I say: no, it was the chemists."[29] By stressing the way in which photography, and mass media more generally, are thoroughly engineered, and the ways that this engineering affects photography's purpose and power, Barthes also prompts a consideration of photography's saturation in fossil fuels.

Kodak and Its Afterlives

The working-class city of Rochester, New York, used to be the home of the Kodak factories. Rochester was historically a predominantly white city, but it is now quite mixed, with a slowly declining population.[30] Kodak filed for bankruptcy and got out of photography in 2012 after it failed to make the shift from analog to digital. In its heyday, Kodak was synonymous with photography; and plastic was foundational to the film that it produced. For example, the photographic film ESTAR was based on a polyethylene terephthalate (PET) substrate. Silver was then applied as a photosensitive medium to record the light that hits the film. This material process, known as photopolymerization, was developed in 1958 and has been used ever since, at least until the digital revolution overturned ideas about photography itself.

In Rochester, New York, Barthes's melancholic analysis of photography can also be read through the carcinogenic and other harmful legacies of the Kodak company. The association of photography with death is, in its now abandoned factories, literal. The images that capture our lives and that metaphorically foreshadow our passing are produced through the chemicals that have foreshortened many people's lives and caused many deaths. There, photographs and film become a vector not only to the lives of ancestors and others who have come before but also to the legacies of toxicity, which will have untold consequences for an indeterminate period into the future. "Those billions of stilled memories and moving fantasies suddenly had a toxic unconscious," writes Elizabeth Povinelli. "The material afterimages of those Kodak moments emerged as fibromyalgia, neuropathy, and primary biliary cirrhosis."[31]

The Kodak plant's toxic transmissions go back decades. In 1990 Kodak paid a total of $2.15 million for chemical spills and extensive groundwater pollution because of a failure to notify the state immediately of a spill of "5,100 gallons of methylene chloride, a solvent used to make film and a suspected carcinogen, in February 1987."[32] However, despite this penalty, the company continued to pollute the air and water in the area. In 2000 Kodak was the prime contributor of dioxin, a known carcinogen, into New York's environment, according to the Environmental Protection Agency (EPA). And in 1999 Kodak was ranked "as New York State's leading producer of recognized airborne carcinogens and waterborne developmental toxicants."[33] Since this time, the plants have shut down, but their legacies linger, like ghosts, in the air and water of the area, the molecular hauntings of the desire for a moment, through an image, to endure. The capture of a particular time and place has transferred itself into the future not simply through the medium of photography or film but as a chemical medium that endures, in the land.[34] These long legacies illustrate the notion that "pollution is not just a harm in the moment but part of ongoing violence that stretches across generations, across communities, and across Land."[35]

Photographic media, soaked in oil, continue to speak, to roam and to affect the people in the area, demanding to be heard. The results of these pollutants, the messages of the long-dead organisms that have become petrochemicals, find their way into the bodies of the residents, living there and mutating, apparitions that trouble the bounds of life and death, pulling living bodies into untimely ends while proliferating the lively attributes of deathly substances. As was reported in 2003: "The New York State Department of Health found that 'women living near Kodak Park had approximately an 80 percent greater [than average] risk of developing pancreatic cancer,' which is often fatal. That rate increased to 96 percent among women who lived in the Kodak Park area for at least 20 years."[36] As in the darkroom, shadows emerge that slowly turn into forms over time. Photography pulls bodies into the liminal zone where, as Barthes writes, "I am neither subject nor object but a subject who feels he is becoming an object. . . . I am truly becoming a specter."[37] Although this sentence was written in relation to the uncanny feelings associated with being photographed, of the processes of being frozen and engorged by time, it also speaks to the slow eating-away of the body from the proximity to dioxins and other harmful chemicals, to the latencies and residencies of petrochemicals in certain bodies, appearing as cancer, that compose petro-time.[38]

Barthes's conflation of death and photography suggests a present-moment haunting: the inability of the dead to let the living go. The petrochemicals and other toxins that were used in the Kodak factories do not simply go away with

the closing of the plants themselves. Instead, the petrochemical past haunts the future, continuing to speak through whichever mediums they find, where lively petrochemicals continue to assert their presence. The toxic legacies of photography and cinema refuse to be transformed, remaining in waterways and in the air, transferring the grief of the land, as these fossil fuels were unearthed without their consent, through the generations. It is often difficult, if not impossible, to remediate these landscapes. Instead, they will haunt future generations with imperceptible chemical threat, fading into the background, but transmitting the legacies of those that came before, much as with an old photograph. They will continue to speak through the mediums that are chemical media, extending plastic matter through the reverberations from the past into the future.

They continue this haunting differentially, where the inheritors of the plastic project are often shielded from these negative outcomes. As Fred Moten writes, in a poignant critique of the lurking universalism in Barthes's analysis and the ways that it utterly fails to account for differences within death, within suffering, "You need to be interested in the complex, dissonant, polyphonic affectivity of the ghost, the agency of the fixed but multiply apparent shade, an improvisation of spectrality, another development of the negative."[39] What Morris's *Solastalgia* series pictures is not the suffering of photography, not the ways in which plastic is embedded in these modes of suffering through photography as a chemical medium, but instead it stages the chemical medium's excess, drawing where the photographs of Mossville are animated with a "powerfully *material* resistance."[40] The use of this chemical medium, the photographs that transmit so many messages between so many living and dead bodies, animates a powerful act of seeing a disappearance, which operates as a kind of abundance. This is an abundance of the power of the ancestors, haunting, not just in a negative sense, but as a powerful force, in particular highlighting Morris's relationship to her ancestors, drawing on the power of her grandmother in her resistance to SASOL's erasure of Mossville. It is not just in seeing that the resistance is staged, but in not seeing, seeing what is not there, in this form of haunting.

Petro-time

The kinds of folded dimensions of time found in *Solastalgia* speak to what I call petro-time. In the photo series, Morris is positioned with her grandmother, who has now passed away, in a town that is no longer there, pictured through the remains of long-dead organisms used in the service of contemporary media production. These pasts, these pasts piled on top of each other, transmit

unevenly into the future, transmitting cancers and other health problems out into the world, where the persistent organic pollutants and plastics will remain, for an untold amount of time. Petro-time unleashes a plastic time that speeds up ecological processes. The times of the petrochemical present mean that the effects of oil's haunting, its afterlife, are not necessarily immediate but involve the manipulation of generational forms in the future. Petro-time builds on what Michelle Murphy has called latency, referring to the intergenerational unfoldings and foreclosures of distributed reproduction under chemical regimes of living. It describes the wait between chemical exposure and symptom, the ways in which that temporal lag, sometimes appearing generations later, distributes harm and renders the haunting of petrochemicals pervasive. For example, some endocrine-disrupting chemicals are known to alter the gametes of fetuses, meaning that a person two generations removed could be affected by chemical exposure. As Murphy writes, "To be latent is to be 'not-yet': a potential not yet manifest, a past not yet felt."[41] Latency is the lag between exposure and effects within a regime of chemical reproduction, which necessitates a nonlinear accounting of time. Petro-time is an inhabitation of the earth by fossil fuels for millennia to come but more immediately describes the invading toxicity in bodies, the accumulation or residence of toxins that don't metabolize or break down.

Petro-time describes the compression of time, through the bodies of the long-dead plants and animals, into oil. When burned or used in plastics, this geological compression of time is then unleashed. For even though oil, through plastic, participates in the time-eating acceleration that characterizes petrocapitalism, it is also one of the main residues of this time: technofossils and petrochemicals refuse to disappear and will continue to haunt and exist intergenerationally. The notion of progress and utopia subtends the emergence of plastic, yet once it is unleashed, the neat relation between cause and effect, or linearity, becomes scrambled. Time itself is plasticized. Petro-time describes an unruly relationship to time, one that folds and bends from the deep past into the deep future. Petro-time takes the idea of inheritance and its structuring relations but adds an understanding of the nonconsensual element of transmission. Petro-time, in its bent and folded times, where the past, present, and future commingle, is a kind of haunting. As the sociologist Avery Gordon writes, "Haunting raises specters, and it alters the experience of being in time, the way we separate the past, the present, and the future."[42] Haunting in petro-time involves humans and the long-dead organisms that compose fossil fuels.

Haunting

If we think of petrochemicals as coming to tell us stories, to communicate their inhuman messages, we might also be invited to think about oil as a kind of grand-kin, highlighting the connection of our life force now with the lives of those long-dead organisms that appear as oil. But these more-than-human relations have been unearthed, weaponized. These are not easy relations but rather ones that disturb multiple boundaries of time, memory, the living, and the dead. Oil could be invited, as the anthropologist Zoe Todd asserts, as a reminder of the ancient life that came before ours, that is still a part of us, that makes our lives possible through intergenerational knowledge, through a deep indebtedness to our ancestors, through evolution. Recognizing these long-dead organisms, feeling their vibrancy could be an invitation to a profound sense of interconnection. But these organisms have been unearthed from their resting place without their consent. As Todd writes, "To turn the massive stores of carbon and hydrogen left from eons of life in this place, weaponises these fossil-kin, these long-dead beings, and transforms them into threats to . . . the 'narrow conditions of existence,' which Blackfoot scholar Leroy Little Bear reminds us we are bound to."[43] Instead of an invitation into an evolutionary and intergenerational acknowledgment of the ways that our lives are made possible through the knowledge and creativity of so many others, human and other-than-human alike, we have turned these potential grand-kin against themselves. They appear as specters, all their compressed time and stores of energy unloosed to wreak havoc on the living.

In a brilliant article, the critical race and Indigenous studies scholars Eve Tuck and C. Ree compare the different versions of haunting and ghost stories in American and Japanese films. They note that in America the narrative asserts the possibility of appeasement. As long as the protagonist does the right thing, the vengeful ghost will rest at last. Once the innocent hero destroys the monster, balance will again be restored to the world. In the Japanese films, on the other hand, the ghost often cannot be appeased, and "the hero does not think herself to be innocent, or try to achieve reconciliation or healing, only mercy, often in the form of passing on the debt."[44] Instead, people are forced simply to live with these ghosts. Tuck and Ree use these two genres of horror films to talk about two different approaches to settler colonialism. In the American version of the ghost story, the settler is an innocent bystander incomprehensibly attacked by a specter that will not leave them alone. We could read this as the continuing demands for land back, reparations, or abolition that fall on uncomprehending ears of white settlers, or the narrativization of white fragility

that includes death paranoia. The Japanese narrative describes something else. It describes a reckoning with the total violence of slavery and settler colonialism. It describes the way that there is no resolution or reconciliation, only the possible hope of mercy. It describes a temporality that is indeterminate, that refuses progression, and instead asks us to sit with what has been done, understanding that the harms committed are permanent, the lives taken cannot be returned. Tuck and Ree continue, "Haunting doesn't hope to change people's perceptions, nor does it hope for reconciliation. Haunting lies precisely in its refusal to stop."[45] This understanding of the ongoing and insistent legacies of plastic as an extension of the ecology of white supremacy functions precisely "in its refusal to stop." For the toxicities unearthed through plastic are not going away. The examples of southern Louisiana and the photographic practices that have also etched their marks in Rochester, New York, tell of the ways that this haunting plays out in particular forms. Black and low-income communities are left with a devastating mess, a place that is no longer their place, a grief that has set into the land without a clear sense of how to clean up or move on. Plastic's increasing production mean that these harms will become more commonplace.

Despite the willful desire for containment, the white fantasy of barricade, these chemicals will continue to leach. They do not adhere to the bounds of geography. There is no holding this toxicity at bay, as the anthropologist Nicholas Shapiro identifies. Unlike Immanuel Kant's formulation of the sublime, "the objects of the chemical sublime cannot be held at a distance."[46] But perhaps they never could. Although Shapiro concludes that these chemicals begin to "corrode the optimism and anthropocentrism of the Enlightenment,"[47] in some sense they buttress it. For the project of producing humanity through the Enlightenment relies on the exclusion, separation, and plasticity of Black people. Here, Black communities are imagined and produced as separate from other communities, as accumulators of toxicity, made to endure a continuing plastic ontology. Enlightenment logic endures through the "fiction of comfort" of white people, at the peril of everyone.[48]

Instead of turning away in horror or fear, plastic's multiple and conflicting temporalities need to be taken seriously. Settlers need to learn the lessons of haunting, even as we are being haunted by this material that refuses to let us go. Full reparation here, carrying the meaning of the attempts to repair and also the desire to account for immeasurable loss and violence, is impossible. This does not mean that we should not be held accountable; on the contrary—accountability or reckoning may appear as a haunting. For we, white people, are certainly not innocent. Instead of moving so quickly to evade the present, producing times that circle violently forward and back, what would it mean to

sit with this refusal, this total violence, this materialization of the toxicity of white supremacy? What might we learn if we listened to what these chemical media were transmitting?

Under the conditions of white supremacy, knowledge systems and institutions are not well versed to be attuned to these hauntings, to all that has been lost. This is especially true because the social is built on the disappearance of those losses, but these memories, these hauntings and losses, give us a much richer sense of our present moment and offer a different, I would argue, decolonial, knowledge. For haunting involves a "transformative recognition" rather than "cold knowledge."[49] To make a world otherwise will only be possible when we face what has been lost. For haunting is not the same as the racial exploitation and oppression detailed throughout this chapter; it is an animated state where this violence is making itself known. It is a forced seeing, sensing feeling of that which has been repressed, excluded, or forced out. Through the commingling of ancient beings with raced and classed bodies, this violence comes to the fore, as a refusal to stop. Gordon, in her account of haunting, points to its strange potentiality: "To be haunted in the name of a will to heal is to allow the ghost to help you imagine what was lost that never even existed, really. That is its utopian grace."[50] This is a utopian grace barely recognizable as such, a queer toxic opening that offers little safety but potentially some solace through lines of relation that open onto ancestors, those to come, and the more-than-human world.

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4

Queer Kin

after everything we had tried to say to prove that human was human beyond gender. after people had cobbled together the bodies of loved ones out of rubble that didn't segregate or care. after the water content and advocacy advance led to historically unprecedented numbers of proud intersex leaders. after the pronoun transformation and the protests and the institution building and the ostensibly safer spaces, we let that go and took a different approach. we liked to think of it as an evolutionary approach. and really at that point what could anyone do with this rising water but emulate the amphibians. what we had done to the planet made us crave and need a bothness of slick skin and webbing and genital adaptability.

. . . we could become whoever we needed to be for each other.

we created the future in form.—ALEXIS PAULINE GUMBS, *M Archive*

On April 11, 2014, the Norwegian newspaper *The Local* reported that Bjørn Frilund had caught a cod that, he discovered as he was gutting it, had swallowed a dildo.[1] The image that accompanied the story showed a middle-aged white man still in his fishing clothes grinning in front of a large fish while holding,

FIGURE 4.1. Bjørn Frilund displaying the cod he caught—and the dildo.

pinched between two fingers, an orange sex toy. Frilund speculated that the cod mistook the dildo for one of the multicolored octopi that are its usual food source and are common to the area. This is certainly not the first case of a marine animal mistaking a piece of plastic for food. Everything from whales to birds to turtles to coral to bacteria has been documented consuming plastic,[2] presumably in a moment of misrecognition, or owing to an inability to filter out the plastic that is now, in some parts of the ocean, six times more abundant than plankton.[3] But what is interesting to me about this example is the explicit enmeshment and strange congruence of oceanic plastic as it ties into nonreproductive sex and queer futurity. It is unknown how long plastic may stick around for, but it will likely last thousands of years under most conditions, especially in oceanic depths. Under some conditions, however, plastic can be biodegraded through new organisms such as bacteria and fungi that have evolved to use plastic as an energy source. The proliferation of plastics is now driving evolutionary processes. Given these conditions of longevity and evolution, plastic and its associated bacteria can be understood as *nonfilial human progeny*, bastard children that will most certainly outlive us. Additionally, plastic and

its associated petrochemicals are heralding a future where, regardless of one's gender, sexual orientation, or religious beliefs, reproduction is increasingly decoupled from sex. Plastic is contributing to nonreproductivity while birthing a future of strange new bacterial life forms adapted to deal with these chemical environments. What kind of offspring is plastic? How might it intersect with questions of queer life and (non)reproduction? And in light of our increasingly nonreproductive futures, might there be something to be learned from queer theory and the embodiment of queer subjects that have never assumed biological reproduction to be the ultimate signifier of hope?

This chapter brings the worlds of plastic and queer theory together under the conditions of nonreproduction and extinction, where progeny may not even be human, much less filial. Here, I follow Nicole Seymour's assertion that "queer values—caring not (just) about the individual, the family, or one's descendants, but about the Other species and persons to whom one has no immediate relations—may be the most effective ecological values."[4] This fissuring of reproductive logic from biology and kin-making could be one of the most important lessons in a world that is increasingly toxic.[5] For, as Catriona Mortimer-Sandilands and Bruce Erickson write in *Queer Ecologies*, "Queer attachments work both to celebrate the excess of life and to politicize the sites at which this excess is eradicated."[6] This is a political urgency: neither to retreat into a stasis that amounts to the continuation of heteronormativity and the reproduction of whiteness nor to deny the emergent flows of chemical toxicity, of evolution, of life itself but to find ways of embracing the inevitable emergence of multiple strange and beautiful life forms and forms of life while holding chemical companies to account for the vast harms they are enacting on numerous bodies, human and nonhuman.[7]

Plastic Oceans

A huge amount of plastic waste, as the dildo illustrates, ends up in the oceans. This happens through a variety of mechanisms.[8] Plastic gets inadvertently blown from garbage trucks into lakes and rivers, where it then follows streams and sewage pipes out to the ocean. In countries that lack waste management systems, plastic is often placed in informal dumps, sometimes near riverbanks, where the plastic blows into or is discarded in waterways; it can also enter the water supply directly by way of microbeads found in cosmetics or toothpaste and by washing synthetic clothes, such as fleece or skinny jeans, where up to two thousand plastic fibers come off per wash and go down the drain.[9]

Most of the plastics that end up in the ocean, unlike the perfectly intact dildo, are incredibly small—microplastics that are less than one centimeter in diameter. For although plastic rarely biodegrades, it does readily photodegrade (exposure to the sun causes it to break down), and it cracks, breaks, and tears with both use and the actions of the waves. When plastic is exposed to the elements, it becomes brittle, causing it to degrade more readily. These fragments get smaller and smaller, but they rarely go away. These processes have resulted in the now infamous "Great Pacific Garbage Patch," located in the North Pacific Gyre.[10] However, the figure of the floating masses of plastic in the gyres depicted in geographic terms such as "the size of Texas" can be misleading because it imagines plastics in their domestic forms rather than as these very small pieces that are found dispersed throughout the water column as well as on the ocean floor. Passing through the North Pacific Gyre is not the same as going to a garbage dump. Instead of the obvious barrage of the senses—the gathering of animals such as vultures and bears, and the overwhelming sights, smells, and noise as trash is moved around—in the ocean one could peacefully drift by without even noticing the vast amounts of plastic all around. A keen eye, or scientific investigation, is required to see that the flecks in the water are tiny pieces of plastic, constituting what Charles Moore and Cassandra Phillips have called a "plastic soup."[11] Although there are the occasional clumps of plastic that stick together—the alarming portrayals of more obvious clusters of plastic bags, fishing nets, and other identifiable debris in the oceans—plastic pollution does not generally appear as the hypervisible mediatic images that are represented as "plastic islands."

Despite its lack of visibility, the proliferation of plastics in the oceans is fundamentally reshaping life and its relations. In one of the most striking examples, plastics are becoming new forms of habitat. Microplastics throughout the oceans have become "plastispheres," rafts of biodiverse ecologies for bacteria and viruses. Over a thousand different species were found to be living on a single piece of microplastic.[12] It is unknown whether these bacteria and viruses were eating the plastic or merely found it a perfect milieu. But in time, it is quite likely that the vibrant, attached communities may develop complex bacterial societies, flourishing on their synthetic surfaces, eating each other and the vast sources of unlocked carbon energy, mutating and evolving.

Here is the incredible vivacity of life, its persistence and ability to use what is at hand as a creative mechanism for proliferation and flourishing. Here is also an example of the ways plastic matter has permeated all realms of life. There is something to be celebrated in the appearance of these new forms of microbial communities, of the abundance and adaptability of life itself, but they simul-

taneously tell a cautionary tale. As the microbiologist Ed DeLong asserts: "Microbes are responsible for the health of the oceans. They shape the chemistry of the sea and the atmosphere. . . . These little guys control the biogeochemistry of our world. They are the stewards of our planet."[13] The fact that plastic is radically reshaping the bacterial and viral communities of the oceans will have significant impact on the rest of the oceanic ecosystem, and the earth as a whole, as microbial oceanographers identify marine microbes as "a force of leviathan significance."[14] It is impossible to say what impact microplastics and their associated bacterial communities will have, especially in the long run, but it is certain that that impact, given the amount of plastic in the oceans currently and its projected increase, will be felt at multiple scales. And for the larger organisms that inhabit the oceans, the presence of so much plastic has already had a powerful impact, as shown through Frilund's fish, where an object of pleasure became, in its afterlife, one of slow violence and starvation.

The lifespan of plastic itself, the projected amount of time that it may take to successfully biodegrade, speaks to the mutual imbrication of bacteria and plastic. For biodegradation really suggests an *evolutionary* movement rather than a chemical progression initiated within the polymers themselves.[15] In other words, the figure of hundreds or thousands of years—what is sometimes identified as the length of time it would take for plastic to biodegrade—is the projected evolutionary time span for organisms that can successfully metabolize plastic to proliferate. Certain organisms can do this already;[16] for example, two strands of bacteria have been found in the stomachs of mealworms that can effectively digest Styrofoam.[17] Wax worms can degrade polyethylene because they evolved to live in beehives and to eat the wax, which has a similar molecular structure, so it was relatively easy for the wax worms to adapt.[18] The fungus *Pestalotiopsis microspora*, found in the Amazon, can biodegrade polyurethane under both aerobic and anaerobic conditions, and a number of other fungi were identified that could degrade plastics.[19] In another example where the concentrations of plastic are leading to novel organisms, the bacteria *Ideonella sakaiensis* 201-F6 evolved in garbage dumps in Japan and was found to use polyethylene terephthalate (PET) as its major energy source for growth.[20] And in 2018 scientists, building on this knowledge, accidentally produced bacteria that can speed up the process of consuming PET plastic through the enhancement of the enzyme PETase.[21] The hope is that these enzymes can be harnessed to biodegrade plastic—though there is also some concern they could significantly degrade our existing materials and infrastructures if let loose into the wider environment. The proliferation of plastic is pushing evolution to develop novel ways of dealing with this incredibly rich material; microbial and human

genealogies are becoming further entangled even as the consequences of this evolutionary collaboration are unknown. We can, following Myra Hird, think of these new bacteria and fungi as indifferent symbiogenetic organisms, feeding off capitalism's excess,[22] proliferating and flourishing in our miasmic plastic soups created out of the unregulated advancements of chemical engineering.

Each of these new microorganisms that has evolved to respond and adapt to its environment can also be understood as a kind of human descendant, a new type of offspring dissociated from the heteronormative biological imperative of reproduction as the production of sameness. Just as Michelle Murphy, following Vanessa Agard-Jones,[23] argues that Monsanto can be understood as a kind of grand-kin, "a toxic relation inscribed into energy infrastructures, white privilege, Indigenous dispossession, anti-Blackness, water, and metabolism,"[24] these new bacteria and fungi can be understood as *queer kin*, produced from the matrix of chemical companies, capital accumulation, modernity, techno-utopianism, and the creativity of bacteria. For, although this analysis is very much a departure from traditional understandings of kinship systems that are either tracked through genetics or biology or, as in the definition given by Claude Lévi-Strauss, forged within practices of exchange, I would like to propose these bacteria as our queer kin, ones constituted through an extension of the human habitus. The widespread use of plastics and the responsive capacities of bacteria are a form, albeit capacious, of renewed relationships that Elizabeth Freeman defines as the mechanism of queer kinship.[25] These renewed relationships between humans and plastics may not have the same kinds of reciprocal care that are expected from other kinds of familial bonds, but they do express the ways in which petrocapitalist subjects return, again and again, to ways of life that generate and proliferate plastic. And in a sense, maybe they do exhibit care for us, by flourishing off our waste. Whether we, those inheritors of plastic, now or in the future will care for them, and how, is an open question.

Petrochemical relations could then be thought of as an intimate tying through lines of descent, and thus the prolongation of ways of being on earth, extended and enhanced through the durability of plastic and the evolutionary emergence of new forms of bacteria. Here, kinship that Freeman asserts as "resolutely corporeal" expands and extends the human body to the bodies of bacteria, challenging the bounds of the normatively figured and bounded body itself, while opening up questions of inheritance beyond the confines of property, genetics, and patriarchal filial norms.[26]

Reproductive Toxicity

As plastics begin to transform the ecologies of the land and the oceans, they not only cause the formation of new kinds of ecosystems, new kinds of kin but also accumulate and disperse toxins, such as pesticides and flame retardants, owing to their similar molecule structure.[27] In addition to the capacity to absorb other toxic chemicals, plasticizers are added to plastics as colorants or to contribute specific qualities, such as heat resistance or flexibility. These plasticizers are not molecularly stable, so they tend to leach and off-gas. Perhaps the most infamous of plasticizers is Bisphenol A (BPA), known for its reproductive toxicity as well as a host of other health problems including cancer and neurological disorders.[28] This chemical, among many others collectively known as phthalates, affects the human body both through an overexposure to the hormone estrogen and by way of endocrine disruptors that mimic hormones in the body and replace their functioning, sometimes queering the gender of the body in which it resides. On the relationship of harm to BPA, the science journalist Susan Freinkel writes, "Scientists have known since the 1930s that bisphenol A acts as a weak estrogen allowing it at least two possible ways to cause static in the body's normal hormonal conversations: by binding with estrogen receptors on cells and by blocking natural stronger estrogens from communicating with cells."[29] In calling attention to the ways in which endocrine-disrupting chemicals (EDCs) and other chemicals can interfere with what is considered "normal" gender expression, and in the use of the term *queer*, I understand that I may be falling into the trap, identified by Celia Roberts, where "even critical environmentalist arguments configure normative sex/gender relations as 'natural' and consequently in need of protection."[30] However, I hope to convincingly argue throughout the rest of this chapter that the queering of the body should be understood as opening on to new, and ecological, possibilities rather than reasserting a threatened heteronormative configuration of sex/gender.

Phthalates and other chemicals cannot be tasted, smelled, or directly perceived by our human sensorium; they are imperceptible at many levels but have specific and sometimes drastic effects on our, and multiple other species', bodies. The duration, route, and timing of exposure may also influence how the chemical is metabolized and therefore its impact on the body.[31] EDCs affect bodies more while they are still being formed, "since developing organisms are extremely sensitive to perturbation by chemicals with hormone-like activity,"[32] as happens during infancy, puberty, and pregnancy. Synthetic hormones last longer in the environment than do naturally occurring hormones, and most

municipal water filtration systems are not able to remove them. It is important to note, however, as Roberts has thoroughly argued, that the science surrounding EDCs is bound to very specific mechanisms of understanding the human body.[33] Despite the intimate enmeshments with patriarchal material-semiotic systems, there is ample evidence that EDCs "disturb multiple boundaries: of time, generation, sex, geography and species."[34]

The effects of EDCs may not be felt immediately but are involved in what Murphy has called "chemical latency," a key component of what I am theorizing as petro-time. That is, exposure to EDCs may affect the development of eggs inside the fetus of a pregnant person's body, which would then cause symptoms in potential grandchildren. Chemical harm is displaced temporally and generationally but continues nonetheless since plastic matter complicates the linear trajectories of inheritance and transmission. Sediments dredged up in waterways from industrial pollution may themselves be decades old in addition to having the potential to affect lives two generations into the future. This temporal lag means chemical companies are more difficult to indict; often the company has ceased to exist by the time its harms are felt.[35]

The disruptions that these chemicals can cause to human bodies have produced much anxiety over reproduction. As Schug and colleagues write, "Perturbations in hormone signaling resulting from chemical exposures during developmental periods could contribute to ovarian disorders and declining conception rates in human populations."[36] Since the 1950s scientists have noted disturbing wildlife reports in many different parts of the world, from Denmark to the Great Lakes, that "involved defective sexual organs and behavioral abnormalities, impaired fertility, the loss of young, or the sudden disappearance of entire animal populations."[37] The same kinds of abnormalities have begun to be noticed in humans.[38] Although the exact cause of this potential reduction is still unknown, the vast proliferation of synthetic chemicals in the environment is thought to contribute to growing infertility. Reduced sperm count has also coincided with a jump in testicular cancer and genital abnormalities. What all these studies reveal is that the chemicals that are being added to our environment, of which plastics play a central role, are interfering with reproductive systems.

These concerns around human reproduction are linked to the perceived threat to traditional masculinity, as much of the literature focuses on sperm counts, male behavior, and male genital formation.[39] The maintenance of the paternal line, and the stability of male gender expression, are caught up in these anxieties. Di Chiro importantly argues that the focus on male infertility and on the queering of the body by way of endocrine disruptors has often served to

buttress what she calls "eco(hetero)normativity."[40] This is made especially clear in the centrality of threat to conventional masculinity that is expressed in these studies. In the face of claims of queerness or the diminishment of overt signs of normative masculinity, patriarchal formations of heterosexuality are perceived to be under threat. Focusing on the fragility of heteronormativity and normative masculinity, she argues, limits the ability to build a truly coalitional politics because it serves to alienate the LGBTQIA+ community. While this is true, it is also impossible to ignore the material realities of these transformations, where, as Malin Ah-King and Eva Hayward write, "the supremacy bestowed to sexual difference—its ontological force—is outpaced not only by social or political movements, but also by metabolizing pollutants, xenotransplanting toxicants, and intravenous banes."[41] The question, then, is how to celebrate, socially and ecologically, the difference of these queer bodily formations and also hold companies accountable for the harms that they are dispersing, as often these harms fall on the bodies of Black, Indigenous, and poor communities. Part of the tension here is the fact that the queering of bodies through EDCs is not a consensual process. There was no choice to embark on this journey; instead, it was imposed by the greed of chemical companies. However, might there be a parallel here to the ways that Donna Haraway famously characterized the cyborg, as an ironic figure that was an "illegitimate offspring of militarism and patriarchal capitalism, not to mention state socialism"? She adds, "But illegitimate offspring are often exceedingly unfaithful to their origins. Their fathers, after all, are inessential."[42] Might these queer kin, these bacterial progeny, birthed from chemical companies, show us how their fathers are inessential?

Regardless of one's heteronormative, patriarchal, queer, or feminist investments, there is a need to acknowledge that these chemicals are queering bodies and the bodies of multiple species in a manner and volume that seem to be unique to the historical present. As plastics enter directly into the water stream, there is an inadvertent allegiance between certain forms of queerness and the petrochemical industry. Plastics contribute to queerness, causing mutations and inhibiting sexual reproduction. Some of the effects of reproductive toxicity that arise because of the prevalence of plastic in the environment enact a queering of the body. As Max Liboiron asks, "Is feminization of male fetuses abnormal, or even pathological? Is it a form of harm? The lesbian, gay, bisexual, transgender and queer (LGBTQ) community has argued that it is not. So, too, has the chemical industry."[43] Here, the strange alliance between queer forms of life and the life form of plastic comes into stark relief. For the threats of extinction and reproduction are especially felt by nonhuman animals who certainly integrate queer sex into their lives without the looming threat of extinction but

whose reproductive systems are less and less able to function for a host of reasons, one of which is chemical disruption.

Further, and more important for my argument here, queer theory may have much to offer in terms of creating different models of the world that refuse eco(hetero)normativity, and help us imagine ethical and empathetic movements across species, as it is clear that plastic and its associated chemicals are entangling many forms of bodily arrangements. Plastic matter may open up queer possibilities, despite the fact that these openings were forced through colonial and nonconsensual lines. They can be read as chemical cyborgs, potential liberatory becomings birthed from violent origins. As Murphy writes, "Any reference to nature or biology in the twenty-first century is already conditioned by the chemical distributions of industrialism. Thus, in a similar spirit, one might pose the question: why should reproduction end at our bodies?"[44] Why not, in other words, think of reproduction as a continuous system that incorporates these industrial chemicals into the processes of reproductive capacities? And given this reality, what might queer theory have to teach us about embracing nonnormative genders and reproductive forms while also recognizing the harms of chemical toxicity and their complicity with settler colonialism?

Reproductive Futurity and Queer Life

As the ability of humans to reproduce is being blocked by the chemicals that we all encounter daily, there are ever more strident calls to maintain our reproductivity, and more so, the health of children. As Donna Haraway, Nicole Seymour, and Rebekah Sheldon have all elaborated, it is hard to avoid the trope of the child as the vision of hope for the (environmental) future.[45] This trope is used both by so-called pro-life advocates as well as environmental activists, both of whom premise their arguments on historically and culturally specific idealized family forms that rest on their naturalization, which serves to freeze and fix the notion of nature itself.

Our increasingly nonreproductive future, one filled with the rearrangement of hormonal systems that are often indexed to gender and the differentiation of sex from reproduction, aligns with a queer politics as articulated by Lee Edelman in *No Future: Queer Theory and the Death Drive*. Edelman highlights the ways in which an appeal to the "Child" elicits a social consensus that is impossible to refuse. Simply put: it is politically impossible to be against the Child. He writes that reproductive futurism imposes "an ideological limit on political discourse as such, preserving in the process the absolute privilege of heteronormativity by rendering unthinkable, by casting outside the political domain, the

possibility of a queer resistance to this organizing principle of communal relations" that rests on the maintenance of the Child.[46] In other words, reproductive futurism organizes political discourse and the social imaginary as the projected fantasy of continuance. In this, the figure of the Child, decoupled from the experiences of actual children, or the adults that they may grow up to be, lies at the center. According to Edelman, "That Child remains the perpetual horizon of every acknowledged politics, the fantasmatic beneficiary of every political intervention."[47] Figured another way, the Child becomes the stand-in for a certain mode and expression of inheritance that often serves to uphold or buttress current social and power formations. This is especially true when it comes to environmental discourses, where the notion of reproductive futurity is precisely what is defended, in the almost ubiquitous appeals to "protect our children" or to "save the planet for future generations." However, what these discourses are often seeking to protect is not the health of any future child but rather the maintenance of a particular way of life.

It is obvious what needs to change to end the runaway climate crisis and virtually ubiquitous pollution—drastic reduction in the reliance on fossil fuels, petrochemicals, and extractivism—yet there is also a complete, practical denial of this, both at the policy level and in everyday habits of consumption and transportation. It is by turning to the Child (figured as able-bodied, cisgendered, and white), who is imaginatively projected into a future that will serve as the beneficiary of our contemporary way of life, that present consumption is shortsightedly justified. Because the inheritors and beneficiaries of petrocapitalism so desperately want to maintain current forms of life and to pass them on to our children, we blindly proceed to foreclose those very futures. That we want a "better" future for our children, so often translated into material and economic wealth, without considering the costs on other (often figured as poorer and racialized) children, or the actual children that will be birthed, we uphold an economic voraciousness that defies all logic.

This reliance on the figure of the Child's symbolic capacity to project a future, not only of biological reproduction but of a certain kind of social reproduction, is incredibly pervasive, as Rebekah Sheldon, also building on Edelman's argument, has brilliantly elaborated in *The Child to Come*. As she argues, "The child, then, is a kind of retronaut, a piece of the future lodged in and under the controlling influence of the present"—where the child metonymically stands in for the notion of futurity itself, and where "management over the future to protect the future's children" serves to consolidate a relationship between humanity and our broader environment as one of protection and control.[48] The child stands for resistance to change, through fantasies of enclosure.

For "the future known in advance presumes no change in kind,"[49] regardless of what kind of future is being projected. The child becomes the site of anxiety management over a future that is always changeable, influenced through present actions, and ultimately unknowable/unknown, owing to the fact that it never arrives. The child embodies a conservative politic that is expressed in sustainability narratives, since "the figure of the child stands in for a futurity that strips the future of everything but repetition and yet insists that repetition is progress," as Sheldon so astutely quips.[50]

What might the lessons of queer nonreproductivity offer here, as they manifest in the negative social field that Edelman articulates, and that Sheldon elaborates, in the face of overpopulation, overconsumption, and the horrifying extinction rates of nonhumans that are occurring, in part, because of plastic?[51] Queerness, in Edelman's configuration, occupies a negative relation to the social that could furnish a particular kind of opposition. He writes, "Queerness names the side of those not 'fighting for the children,' the side outside the consensus by which all politics confirms the absolute value of reproductive futurism."[52] Here, queerness is aligned not only with a rejection of heteronormative coupling, and the social imperative of biological reproduction, but also with an acknowledgment that the figure of the Child stands in for the reproduction of the existing social order. Queerness, as understood by right-wing homophobes, *does* mean the end of the future, a nonteleological orientation to time that brings about social disruption. It aligns itself with negativity, with a refusal to participate in the symbolic or the social order. This break from futurity as continuity harbors a potentially important lesson for the current moment. Edelman asserts embracing negativity "not in the hope of forging thereby some more perfect social order—such a hope, after all, would only reproduce the constraining mandate of futurism, just as any such order would equally occasion the negativity of the queer—but rather to refuse the insistence of hope itself as affirmation, which is always affirmation of an order whose refusal will register as unthinkable, irresponsible, inhumane."[53] In distinction from José Muñoz's claim that queerness exists as a future horizon,[54] Edelman asserts "no future" for queers, and this, regardless of whether or not one agrees with Edelman, is already a reality for so many species for whom sex acts of all kinds most likely happen at regular rates while reproduction increasingly does not. Through the saturation of the world with modern chemistry and its multiple forms of endocrine disruption, Edelman's queer future is no longer a particular political position but rather biological reality.[55] Sex, regardless of its gendered arrangements, is increasingly unlikely to create children. Nonreproductive sex has always been common, as Bruce Bagemihl makes clear in *Biological Exuber-*

ance. Forms of queer life in sex, coupling, and child-rearing exist across a huge range of species, as everyone from monkeys to birds has homosexual relations or can be categorized as transgendered, nonbinary, or genderqueer.[56] Biological life has exceeded the bare imperative of reproduction. But in our current moment, where species collapse and extinction are occurring at unprecedented rates owing to a multitude of anthropogenic causes, this biological exuberance seems to have become a kind of biological detumescence. In the face of no future for many species, queer theory's insistence on negativity may provide a useful model for rethinking temporality, social reproduction, and kinship.

In an extract from *This Changes Everything* that appeared in the *Guardian Weekly*, Naomi Klein opens with a reference to her own son, who, she fears, may never see a moose. Her child is particularly enamored with a book about a moose, and so this moment of realization is coupled with a deep sense of grief. This rather oversentimentalized call for action, centering around the needs of one white, upper-middle-class child and his relation to an overdetermined signifier of nature, becomes a rallying call for environmental action, repeating the logic of reproductive futurity that Sheldon and Edelman critique. It also manifests as a confessional over the guilt that Klein seems to feel about bearing this child and her own complicity in reproductive futurism. But something stranger happens within Klein's text. She then proceeds to narrate her reproductive problems—she had multiple miscarriages before a successful pregnancy—coupled with her experiences covering the BP oil spill in the Gulf of Mexico in 2010. Her article then provocatively moves away from her own concerns about biological reproduction, and the figure of the child, to a moment of transspecies empathy or bonding. It is worth quoting at length:

> Spring is the start of spawning season on the Gulf Coast, and Henderson knew these marshes were teeming with nearly invisible zooplankton and tiny juveniles that would develop into adult shrimp, oysters, crabs and fin fish. In these fragile weeks, the marsh grass acts as an aquatic incubator, providing nutrients and protection from predators. "Everything is born in these wetlands," he said. The prospects for these microscopic creatures did not look good. Each wave brought in more oil and dispersants, sending levels of carcinogenic polycyclic aromatic hydrocarbons (PAHs) soaring. And this was all happening at the worst possible moment in the biological calendar: not only shellfish, but also bluefin tuna, grouper, snapper, mackerel, marlin and swordfish were all spawning. Out in the open water, floating clouds of translucent proto-life were just waiting for one of the countless plumes of oil and dispersants to pass through

them like an angel of death. If a certain species of larva was in the process of being snuffed out, we would likely not find out about it for years, and then, rather than some camera-ready mass die-off, there would just be . . . nothing. An absence. A hole in the life cycle. It was then that I let go of the idea that infertility made me some sort of exile from nature, and began to feel what I can only describe as a *kinship of the infertile*.[57]

Although the figure of the child operates at the heart of this article, as the literal embodiment of hope, as well as a particular kind of environmental guilt, Klein's description of slow violence, of suffering marked, not by some spectacular event, but more ominously by "an absence," "a hole," opens up a queer ecological imagination. Mirroring her own problems with fertility, she invokes a queer futurity that is marked by trans-species empathy and identification. The "*kinship with the infertile*" that Klein notes might be the beginnings of a queering of social reproduction that would allow a different kind of narration to enter into the massive extinctions currently happening, one less focused on individual reproductive capacity and oriented instead toward love and care that extends outward, beyond one's immediate biological family, and potentially beyond one's own species. It offers a moment to rethink how kinship is formed, an opportunity to care for those beings already in the world, even if outside normative family units.

The philosopher Claire Colebrook, in her essay "Sexual Indifference," calls attention to the myriad ways in which extinction is thought of, how sexual difference itself is premised on "a necessary loss of distinction and opening to annihilation."[58] Colebrook suggests an evolutionary becoming that recognizes how sexual reproduction leads, not to continuity, but to radical difference that implies the emergence of new beings. In line with this, she invites her readers to think beyond sexual reproduction—a future at once more technological and bacterial. This future is, of course, already here. More and more, predominantly upper-middle-class people are turning to various forms of technological assistance, or outsourcing reproduction to surrogates in poorer countries or regions, to be able to conceive. Recently, scientists at Northwestern University announced they were able to print a 3D prosthetic ovary for mice that allowed the previously infertile mice to give birth. The hope is that this technology could eventually be used in humans, which would mean that anyone with these ovaries could conceive at any point in their life.[59] Despite the queer potential of such technology, it is hard to believe that this will be widely available. Instead of a queer logic of trans-species empathy that is potentially opened up by Klein in her "*kinship of the infertile*," the mechanisms and technologies of advanced

capitalism turn fertility and reproduction into another commodity to enforce class hierarchies, and to be bought and sold.[60] As the theorist Neel Ahuja has aptly pointed out, the sovereign ability to choose whether or not to reproduce is increasingly a privileged position.[61]

Evolutionary becoming seems to be especially fertile for bacteria. In many ways, the fact that plastic is leading to evolutionary shifts in bacteria points to the vitality and creativity of life itself, and certainly in the realm of gender and sex, it might be quite instructive for humans to learn from bacteria, especially in relation to queer forms of life. If bacteria were understood as queer kin, the plurality of forms of sex, reproduction, and gender that bacteria embody could metaphorically provide new forms of social organization for humans as our bodies increasingly morph into queerer formations.[62] Bacterial progeny of plastic create new organisms to understand, metaphorically and literally, the potential relations of sex and reproduction beyond sexual difference.

These trajectories of the technobacterial future, of reproduction without sexual difference, where sexual pleasure exists only for itself, disconnected from any biological imperative, where hormones and hormone disruptors blur and change sexual morphology without direct intent, are oddly, perversely, queer. Plastic co-occupies and modifies this queer nonreproductive futurity, just as it begins to proliferate new forms of life. However, it is not just that one thing (floating rafts of microbial diversity or newly evolved microorganisms) can replace something else (biodiversity of the oceans). Without wanting to privilege forms of life that we, as humans, can more easily identify with, we must remember that ecosystems depend on *certain* species. Extinction and biodiversity loss aren't simply about numbers. Species count does not equate with ecological functionality in any simple sense: keystone species are foundational to particular ecologies. Biodiversity depends on geographic and ecological distribution, not just quantity. The bacterialization of the future is bringing much needed awareness of the importance of bacteria to the ecosystem, while at the same time a future that is only composed of bacteria is one that would mark tremendous loss, grief, and culpability. We cannot simply trade current biodiversity for the bacterial future without recognizing the implications, commitments, and responsibility of petrocapitalism for the extermination of one world while another is being birthed.

How to think through increasingly queer futurities that might usefully threaten the symbolic or social order but that also interfere with the biological continuance of life as it currently appears? In other words, how to celebrate the queering of the social order while resisting the destruction and oppression of life forms, including queer ones? What kinds of allegiances might be made, or

affordances found, both in a nonreproductive future and in asserting a kind of decolonial feminist futurity away from the apocalyptic nihilism that subtends Edelman's argument? For here, despite how much I agree, viscerally, with Edelman and wish to align myself on the side of the complete destruction of the social order of which he speaks, especially as this converges with a punk aesthetic that Jack Halberstam identifies,[63] when this queerness passes over into the realm of the biological, it is harder to uphold. The figure of the Child necessarily does this work in Edelman's thought, merging the literal continuance of the species with a political futurism, but extending this outward (which, of course, was not his intention) to the most rapidly occurring mass extinctions the earth has ever seen seems ethically untenable.[64] This kind of nihilistic imaginary does the work of upholding the social order rather than acting in opposition to it. Current extinctions project "no future" asymmetrically. And extinction might be usefully thought beyond the extinction of taxonomic species to forms of life and ways of knowing, including particular communities and cultures.[65] The privileged, white, heteronormative, reproductive couple that becomes the figure of the political future that Edelman wishes to foreclose, or at least not participate in, seems to become more powerful under the current conditions of toxicity, rather than less, in these times of multiple extinctions. The disintegration of existing social orders often results in a clinging to conservatism, fascist retrenchment, a desperate attempt to reinforce modalities of privilege, rather than their undoing. It seems important then to be able to imagine a future that acknowledges nonreproductivity and extinction while working to build queer, feminist, and decolonial realities for as long as humans may exist.

The antisocial turn in queer theory, extended here through nonreproduction to the biological world of mass extinction events, is often figured within an apocalyptic logic that seems to simultaneously hold out for some kind of redemption, of either the religious or the techno-utopian variety. These imaginaries or "apocalyptic aphrodisiacs" seem to be "fundamentally conditioned by the legacy of the Cold War excision of revolutionary thought from the thinking of *the horizon*," as Jordy Rosenburg writes.[66] He continues: "Thus, rather than imagining a world in which the horrors of instrumental reason (with its attendant racist, eugenic, and exploitative logics) are directly confronted—and give way to a costewardship of/with the earth—the only possible outcome is extinction: of the species, of cognition, of the problem of the socius *tout court*."[67] Rosenburg articulates the political resistance to imagining worlds otherwise, where the current economic and social orders have become so entrenched that their ends seemingly also spell the death of the world. In the face of rampant species extinction and the prediction of drastic human loss of life under the

conditions of increasing chemical toxicity coupled with climate chaos and habitat loss, tending toward an apocalyptic narrative could potentially be forgiven. But what is incredibly important in Rosenburg's and Ahuja's positions is the articulation that the move toward extinction is happening differentially, increasing the urgency to address social and political matters that are entwined with and, indeed, cannot be separated from, the ecological. The evacuation of the space of the future, rendered through the figure of extinction, offers an opportunity to understand environmental and social justice as more pressing, rather than less. And thinking through the ethics of apocalypse enacts a different valence to Edelman's queerness, replacing it with a no future that refuses to acknowledge the slow suffering that has already begun. For, it may not really be the end that is the threat. Slow suffering and continuous pain are far more taxing, more demanding, than the clean break of "no future."[68] Apocalypse and its associated narratives are a way to avoid responsibility not least because apocalypse in the total sense is fallacious. The earth and many forms of life will continue past whatever violences humans might enact; the point is the lives that are lived now and intergenerationally.

Queer Toxicity

Without abandoning the political refusal that is necessarily entwined with Edelman's project, I want to think through what kinds of queer affordances are less categorical about nonreproductivity and extinction. There are numerous feminist and queer precursors to this project, and Mel Chen's work on toxicity is exemplary. Toxicity provides the advantage of not positing the possibility of a radical split, or a clean end. Toxicity is about a kind of futurity that struggles to be hopeful but is certainly not apocalyptic. Instead, toxicity, and the figure of queerness that Chen puts forth, recognize and privilege mutation, sickness, and the permutation of the body by its outside. Extinction, or nonreproductivity, under this rubric cannot be neatly sealed off. Understood from this perspective, queerness allows for an ecological perception that embodied beings are not impenetrable. Rather, we are composed of what surrounds us. Our bodies are porous and permeable; they cross over in ways that resist categorization. Further, the (colonial, heteronormative) assumption of the inviolability of the body is part of the foundational logic that allows for the bioaccumulation of toxins in the environment and in bodies in the first place. For, as Chen writes, the "internalization, even privatization, of immunity helps to explain the particular indignation that toxicity evokes, since it is understood as an unnaturally external force that violates (rather than informs) an integral and bounded self."[69] To give

up on the fantasy of extermination or apocalypse is also to give up the segregation of the world, to learn to embrace the porosity of life as an organism. Where catastrophe or apocalypse appears as protection to shore up the fiction and necessary fantasy of the bounded entity, toxicity forces a revelation of the ways in which embodiment is always multiply composed, of plastic, of petrochemicals, of queer morphologies. The framework of embracing toxicity—not as a good unto itself but as a refusal of the fantasy of containment, management, or barricade—allows for the potential to face futures that consist of suffering, joy, slow death, decline, survival, flourishing, and hope, rather than clean breaks and ends. The fiction of independence and impenetrability is one that only a few bodies can bear. In fact, most of us already know the ways in which these categories are breaking down and have never adequately functioned in the first place. For those who can afford it, this knowledge of the permeability of the body, particularly by toxins, often results in the attempt to barricade bodies off from their surrounds. Fortification is precisely what underpins the logic of the emergence of plastics in the world to begin with, the fantasy that the self can be sealed off from the outside world, providing a pure, clean surface that will preserve and protect. But this is a fantasy that can no longer be sustained. And plastic itself, coupled with its coevolutionary becomings, shows the ways in which even the materializations of containment always crumble under the endless movements, mutations, and entanglements of matter.

Now that we, the inheritors and beneficiaries of petrocapitalism, are increasingly being impinged on to acknowledge the porosity of our bodies, we need to find ways of *living with toxicity*, for it is certainly not going away. Toxicity is certainly far from a utopian state, but as Chen asserts, "I am reluctant to deny the queer productivity of toxins and toxicity, a productivity that extends beyond an enumerable set of addictive or pleasure-inducing substances, or to neglect . . . the pleasure, the loves, the rehabilitation, the affections, the assets that toxic conditions induce."[70] Toxicity is a condition that increasingly defines our present moment, from the animals whose bodies live with the remnants of the Chernobyl disaster to the condition of "sick building syndrome" that Murphy has so eloquently written about.[71] In each of these cases, toxicity becomes a lively device, which, although far from ideal or idyllic, nonetheless mobilizes forms of understanding the world as inherently entangled, where the attempt to build discrete barriers is ultimately futile. Under the conditions of toxicity, the body becomes an enfolding of the environment, in both pleasurable and devastating ways, in what Stacy Alaimo has called "trans-corporeality."[72] The valence of queerness offers a way in which to approach the question of toxicity with a measure of curiosity, and with an understanding that what initially may

look like an unwanted deviance from the norm also carries with it a host of abilities and affordances. The extensive work of disability theorists and those differently abled make apparent the fact that what may be culturally understood as a deficit is in fact structurally produced. It is not the fact of difference of ability or form that is really damaging but rather the structures that assert a difference from a presumed and enforced normative bodily arrangement, both ideologically and materially, making it difficult for bodies to move or communicate in ways outside these predetermined structures. But these bodily differences carry within them their own abilities, their own ways of seeing and moving in the world that may become an incredibly rich resource in light of the intensifying toxicity of the environment.

In a world increasingly marked by toxicity and climate breakdown, the processes of evolution, both cultural and biological, seem to propose rather queer solutions. Instead of completely balking in horror, retreating to eco(hetero)normativity, or seeking the refuge of perfectly contained apocalyptic narratives, might there be a way to live with this toxicity, coupled with its "despairing, painful, screamingly negative affects," as Chen has described them?[73] Might there be something interesting and productive in a future where sex and gender increasingly morph, and where reproduction slows? In fact, might the proliferation of queer toxicities provide new avenues of biological proliferation? For, as Bagemihl writes, "the capacity for behavioral plasticity—including homosexuality—may strengthen the ability of a species to respond 'creatively' to a highly changeable and 'unpredictable' world."[74] Here, the insistence on queerness as a collectivity that Muñoz argues for inflects futurity with a different valence. Hope, he acknowledges, is often disappointed, but its political function is still necessary in the manner of felicitous speech acts: the concrete utopias that he advocates for may not come to exist in reality, but in their articulation a queer political collectivity is formed.[75]

Alexis Pauline Gumbs, quoted in the epigraph to this chapter, points to some of the ways that these questions might be understood. In *M Archive: After the End of the World*, the narrator writes after the apocalypse, where the racial capitalist ecocides of our present moment have peaked and the descendants are left to adapt in the wake. In this world after, founded within the rubble of our current existence, Black people evolve to be able to live underwater and, following both fish and frogs, to be able to change sex and self-fertilize. As Gumbs writes, "our range of ancestors moved beyond the eunuchs to a more ancient and just as relevant set of references. some said it would be the extremely logical end point of our individualism and ownership: self-impregnation. but we, the evolutionaries, knew it was just as valuable as transparent water-proof skin

over your eyeballs."[76] To reimagine life, specifically Black life, from the point of view of these watery evolutionaries helps construct a speculative future that is, in many ways, already with us. What is so essential in what Gumbs proposes is to open a future that reckons with the toxicities of our present moment but that moves with and beyond them, ecologically, toward Black queer futurity that refuses to be contained or corralled, a futurity that is already here.[77]

The process of imagining futures, of imagining futurity, is an ethical and political exercise. This propositional Black queer futurity of new beings that are adapted to their toxic surrounds illustrates the ways in which life alters and resists through persistence. This is the proposition that Murphy has named "alterlife," where "alterlife names life already altered, which is also life open to alteration."[78] This is of course the definition of all life, the determining condition of life itself, but the enfolding of destructive human logics and economies, of racialized and gendered systems, of heteronormativity, tend toward afterlife, the reduction and foreclosure of the possibilities of life. Alterlife, rather, seems to work within the scope of our current realities, to something otherwise, something queerer, which asks after the unintended possibilities that appear within unusual and sometimes ethically untenable mutations. Alterlife focuses on the possibilities of difference and mutation as forms of repair. The world will most likely not be what it once was, but this focus on change is also a basic fact of existence. It might be useful to turn with curiosity and interest to queer futures that involve novel ecologies as modes of healing.

Regardless of their form, of their gender, or even of their species, to imagine the generations to come, of humans and many other creatures, with a notion of collective responsibility refuses the easy individualist turn toward nihilism. To be responsible for an unimaginable futurity means to understand the deeply relational fact of being, of being in a place and a time, of being alive. And this fundamental relationality that is at the core of being means that the future may not look good, but it is not foreclosed. Imagining a future that extends from but arrives at a place radically different from the present, as Gumbs has done, will help us navigate what is coming with more grace.

Conclusion

The plasticity of plastic matter here is framed, not in the binary terms of positive and negative, but in the complicated enmeshments of lively being in and through toxicity. Plastic and EDCs reveal the ways in which our bodies, as well as the bodies of other creatures, are continually morphing, changing, queering,

and becoming queered. For what the circulation of these chemicals reveals is that the barriers between ourselves, our environment, and the boundedness of the skin are conceptually and materially produced notions that ultimately break down under the conditions of life. Gendered configurations are merely one historical, cultural, and evolutionary form that is always undergoing transformation. Plastics are instructive as they inflect, inform, and enmesh the bodies of other species, particularly bacteria, with our own. Coevolutionary becomings, intentional or not, arise from even the most strident attempts to divide the world into strict categorizations of nature and culture. In this light, queer productivity of new forms of life—that found, for example, on the plastisphere, in the bellies of wax worms, in the generative landscapes of garbage dumps, or in the imaginations of poets like Gumbs—might be vital for reimagining earthly relations. For we have no idea what may die off in the next couple hundred years, but life will certainly continue. Which of us will suffer, and how that suffering is regulated or managed, is the political question of our times. To think of these new forms of life as a kind of kin involves thinking of our related responsibilities toward them, to think of our entanglements, inheritances, and enmeshments. It involves an intergenerational obligation that extends beyond the human. For human progeny may very well be these reduced worlds of bacterial and fungal flourishing, and thinking of them as such requires a kind of caretaking that we might otherwise eschew.

Just as plastics are inadvertently creating all kinds of new worlds, to address chemically induced ecocide, we, the inheritors of plastic matter, must also learn to accept all kinds of strange life forms, human and nonhuman, toward which we generate care, compassion, and commitment. We must learn from queer subjects to build worlds of familial care that are not bound by biology or genetics and to proliferate systems that acknowledge our interspecies dependencies and futurities. We need to generate a sense of responsibility for our nonhuman progeny, these strange new forms of microbial life, while at the same time recognizing that their existence is predicated on the extinguishment of multiple other forms of life: humans, animals, plants, and bacteria alike. When an economic system dependent on petrochemical proliferation is what is fueling this evolution, subtended by colonial regimes, we who are deeply enmeshed and implicated in these systems need to take account of our queer children, these strange new bacterial communities, and our monstrous murders, the massive species deaths and the deaths of poor and racialized people from increasing levels of toxicity.

For nihilistic, apocalyptic, or techno-utopian versions of the future will only lead us to the continued reproduction of the social order. To acknowledge that

the future will be queer, in the sense of completely disruptive, means finding a way to live with toxicity and extinction and without the reassurance of the open horizon of the future. For toxicity is already here. However, embracing the strange alliances and ambivalences of queerness and petrochemicals may allow for new types of analysis, for a "queer knowledge production that gives some means for structural remedy while not abandoning a claim to being just a little bit 'off.'"[79] The lessons of queer social structures, of families not based on biology, and lives not necessarily afforded protection from the state or other institutions of power, might be instructive in facing both our nonfilial, nonhuman progeny and a world filled with increasing uncertainty. Thinking through the ethics of the future, and the futures that are already present, requires this kind of lateral connection. Instead of biological children, plasticized, microbial progeny will offer a decidedly queerer world, one that is being birthed from the violence of our present moment.

Conclusion

Plastic Futures

The queer futures of plastic matter bump and crash against its inheritances and transmissions, churning through the violence of settler colonial extraction, creating unexpected openings and new relations. Plastic's multiplicitous appearances do not lead to a single ending or to a unidirectional future orientation. Instead, its futurities are multiple, and its temporalities compressed, coiled, and refracted. Plastic first appeared little more than one hundred years ago, and so the question of what it is doing in the world is still very much open-ended. Some of the most recent research on plastic shows the ways its futurity rests on the ecologies and beings that preexisted plastic, and that reincorporate it back into the earth, through the bacteria and fungi that can decompose it, and through its new geological formations in plastiglomerate. There is little linearity or progress to plastic's development and dissemination; instead it is a material that congeals and disperses, disrupting ecologies while consolidating antiblackness and settler colonialism. Plastic spreads synthetic universality, but it is also creating queer kin.

In light of these emergences, and multiple directions, I offer three stories that give some sense of possible trajectories and the different temporal registers that plastic matter evokes. Each story tends toward either the past, the present, or the future but does not neatly lie within any of these time frames. Each story also evokes the complications and irony of plastic matter, the way that we will have to learn to forge new relations with it, but we cannot wish it away. Each story offers one of three strands of what I see as the most important lessons about plastic and plastic matter.

Failed Praxis of Being

My grandparents have now both passed away. The last time I saw them was over two years ago. I was heading back to New York after visiting my parents and stopped in at their nursing home just outside Ottawa. I bought tea and coffee and some treats. I tried to communicate my love for them in awkward, unpracticed phrases. My grandfather has always been deaf in one ear and his hearing got worse with age. Because of dementia, he didn't really communicate near the end of his life. It was hard to tell how much he heard or how much he understood. My grandmother also had dementia but was more lively and engaged in conversation. We moved from their room to the courtyard to enjoy the noonday sun, choosing a patch of shade to protect our fair skin. Their nursing home was a relatively cheerful, if institutional, place. It was the best that my grandparents' substantial accumulated wealth could buy. They hated living there.

My family, which includes nineteen first cousins, used to get together once a year. Now, as my grandparents can no longer host us, more and more time passes between visits with any of my relatives. We are dispersed across three continents, with thinning ties between us.

Despite the fact that the world we now live in is the utopia that my grandfather helped build, it does not offer the comfort he envisioned. Instead of stronger bonds to each other and the unencumbered expansion of a particular way of life, we are facing environmental crisis and social alienation. Do white people, the sociologist Ruha Benjamin asks, have cousins?[1] In my experience, it is rare for white people, especially middle- or upper-class white people, to have a committed network of extended kin and to rely on those relations regularly. The structures of whiteness work against these bonds. White people are often unpracticed in ethical relationality,[2] how to care for each other or the beings around us. We struggle to be accountable to each other just as we struggle to be accountable for the harms we have done and continue to perpetuate. Our time

is marked by what Zakiyyah Jackson calls a "failed praxis of being," instantiated in the ways that whiteness understands what it means, and how, to be human.[3] This failed praxis of being not only involves the hierarchy of humanity but extends out into materials and materiality, like the clean, perfected, and sealed humanness that my grandfather and others like him took for granted. Settler colonialism is built on severing ties with the nonhuman world, the discarding of relational obligations to each other, other beings. The saturation of the world by fossil fuels is a potent manifestation of our turning away. Under these chemical regimes, there is no barricade or safe zone. There is no control group, no before to return to, no cleaning all of it up. Rather, we, the inheritors of plastic matter, are forced into being-with.

Being-With

When I saw, in the summer of 2018, an announcement that there would be a production in Montréal's Festival TransAmériques of an experimental show that was about trash, I knew I had to go. I went by myself to the small theater. *Oblivion*, produced and performed by Sarah Vanhee, starts with a fable. She describes a family with an inverse relationship to waste. Instead of seeing it as something to be removed, to put at a distance, to push away, it is something that is cultivated. Garbage is delivered to the house where the children and adults take the grime and smear it over surfaces and themselves, mixing cold, overcooked spaghetti with hair and lint, deliberately valuing, reveling in, what would normatively be deemed gross, spoiled, rubbish. Vanhee tells her story while unpacking the trash that she collected and accumulated over the course of a year in 2014 and 2015. Everything that she otherwise would have thrown away she kept, cleaned, and meticulously logged in boxes. For the duration of the two-hour-and-fifteen-minute performance, Vanhee unpacks boxes whose contents eventually cover the stage, mostly consisting of packaging for food and other items.

Vanhee's powerful provocation is that the waste she collected is not for repurposing through economic or resource cycles; it is left to exist as seemingly useless, if fetishized and performed, material. Vanhee suggests that proper, liberal, individual subjectivity is formed, in part, by one's ability to throw things away. Throughout *Oblivion* Vanhee speaks about her accumulated trash as mimetic and figurative. She explains how she had become attached to all these little items—rubber bands and tea bags—that now seemed like old friends, quipping that she will remember more precisely the time she collected all this detritus than any other year in her life. Vanhee asks her audience what our re-

lations to our objects are and if, in the process of so much consumption and disposability, we are also losing pieces of ourselves, of our lives and memories.

As I watched, I couldn't help but think that if this was one hundred years ago, this project wouldn't exist; there simply wouldn't have been this level of waste accumulated in such a short period of time. It is also likely this project will not be possible in the future. And so Vanhee's objects become a very particular snapshot of an almost incomprehensibly brief moment in history but one with very long and far-reaching consequences.

At the end of the performance, the entire stage was filled with trash. Almost all of it was plastic. Here is the emblematic material of contemporary consumer society. The personal performance gives way to petro-time, in which fossilized time is compressed and unleashed, where consumption and disposability are built into the pace of movement and production, and where the legacies of oil, materialized in plastic, haunt the earth and its bodies. These chemical signatures dig into the earth, extending petrocapitalism into the deep future. Although these mimetic objects look like friends to the performer, and although I am compelled by this reevaluation of the possibility of waste, I can't help but think of the ways in which all these objects leach and off-gas. Vanhee's privilege protects her, like a spell, from the worst of the effects of petro-time, from the latencies of cancers and ill health.

The Myths of Purification and Containment

My privilege, my inheritance, continues to protect me as well. In the summer of 2018, as wildfires raged and heat waves claimed the lives of fifty-four people in the province of Québec, I escaped to the country, forests, and parks as much as possible, seeking lakes and trees that were sometimes, nonetheless, saturated in smoke. I packed my bags, made of nylon, with Helox+ rain pants and coats, silicone dishware, a spork made from Tritan. My down sleeping bag, with an outer shell of Pertex Quantum, polyester camping mat, and nylon tent would be further encased in a 75D polyester dry bag or a low-density polyethylene garbage bag to protect them from potential rain. Equipped, I set off, with my rented Acrylonitrile butadiene styrene canoe and high-density polyethyelene paddles, gliding across lakes, quietly contemplating the feel of the water and the air on my skin. Listening to the frogs and the loons. Watching for the flash of a beaver tail beside a dam as I drifted by.

And everywhere I went, I shed tiny pieces of all these fabrics, with their unpronounceable, highly specific names. Like hair and pieces of skin, these synthetic materials sloughed off me as I moved through waterways and portages,

leaving bright red marks of plastic on rocks as well as tiny, invisible pieces of fabrics, traces of industrial engineering creating markers of my path and movements. Minuscule, almost imperceptible signatures of oil and its world-shaping residues; signs of this particular time in geological history that will last for untold futures, enmeshed in bacterial and fungal becomings, slowly and inevitably accumulating. It is not lost on me the irony of these movements and entanglements, the ways in which these technologies facilitate more comfortable forays into the wilderness, how these two terms, of technological progress and nature, mutually support and constitute each other, while always undermining their supposed distinction. It is not lost on me either, the way I borrow Indigenous technologies, such as the canoe, to access parks that have often served as a mechanism of Indigenous dispossession, where the plastics I shed continue the legacies of colonialism.

Thinking with and through plastic exposes the length of harms, their entanglements, and the ways we cannot return. Despite the ongoing spread of toxicity, despite the continuation of harm, the earthly lessons of plastic, their queer proliferations, point toward a politics of decolonization that offers an expanded understanding of kin, responsibility, and relationality. Denise Ferreira da Silva writes that decolonization "is the unknowing and undoing of the World that reaches its core."[4] Plastic matter is at the core of the world—as we know it now, and as it is now. Unknowing and undoing are difficult, complicated, compromised work. It is a work of reevaluating, a hard work of learning to look and see again, to recompose our relations differently. It is the work of recognizing that we cannot return to a pristine world before plastic, but plastic offers us this lesson of intractability to imagine worlds differently, queerly, through toxicity. They said plastic was disposable. Turns out, plastic will not let go.

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Notes

PREFACE. COMPLICATED INHERITANCES

1 Whyte, "White Allies."

INTRODUCTION. PLASTIC MATTER

1 Masson, *Story*, 6.

2 Some of the ways in which biodegradable plastics are marketed as an environmentally safe alternative are misleading. For example, many biodegradable plastics require industrial composters and therefore will not biodegrade in either a domestic composter or a landfill. Additionally, the starch sources that form the base of bioplastics often come from food items such as corn, which implicitly invites the question of whether we want to be using agricultural lands for making plastic. For a more thorough analysis, see Fairs, "Bioplastics."

3 *Between the Waves* is composed of a five-channel video installation, first commissioned for dOCUMENTA (13). In reverse order, Channel Five taps out a strobe message, communicated in Morse code, that flashes too quickly across the screen to decipher. Channel Four is an animation of transformation, where faces and bodies of humans and other animals merge and morph into each other, as well as into eyes and apartment buildings, escaping any easy identification. Channel Three is a long take of a crescent moon made of acrylic mirror pasted onto cardboard. The moon catches fire, seemingly through the intensity of the sun, and slowly burns down to ash. The next two channels have people in them, interacting with surreal, otherworldly landscapes. Channel Two, "Landfill Dance," shows multiple femme performers dressed in plastic costumes dancing on top of a huge urban landfill. The final screen, Channel One, "A Circular Fable," comes closest to a narrative, where two main characters move through a mythical world that unsettles fixed notions of utopia and dystopia, fiction and reality. The characters are equally enigmatic, dressed in the manner of the performer from Rebecca Horn's iconic feminist

performance *Unicorn* (1970–72), which uses imagery borrowed from Frida Khalo's *Broken Column* (1944). The "humanimals," as Shah calls them, do indeed blur the boundaries between humans and other animals. They also convey a capacious eroticism that involves homosexual acts between them as well as a generalized queer ecological sexuality expressed by stroking trees and caressing the sand.

4 These costumes were made from materials gathered from a raddi-wala or kabaddi-wala—that is, a local recycling person. According to Shah, these people are becoming increasingly scarce in India, although they were quite common in the 1980s and 1990s.

5 Lehner et al., "Emergence."

6 For more on waste colonialism, see Liboiron, "Waste Colonialism."

7 The documentary *The Story of Plastic* (2020), directed by Deia Schlosberg, does an excellent job of explaining how plastics are marketed and sold differently to European and Asian countries.

8 Liboiron, "How Plastic Is a Function."

9 The Deonar landfill is the oldest in India as it was set up by the British in 1927. Situated on the outskirts of Mumbai, the landfill receives approximately one thousand tonnes of waste daily, and measures more than thirty meters high. It frequently makes the news because of methane emissions that have led to intractable fires.

10 As Yusoff writes, "The semiotics of White Geology creates atemporal materiality dislocated from place and time—a mythology of disassociation in the formation of matter independent of its languages of description and the historical constitution of its social relations." Yusoff, *Billion Black Anthropocenes*, 16.

11 I am grateful to Waqia Abdul-Kareem for pushing me to think more deeply about the fact that we are not all the inheritors of plastic; rather, there needs to be a differential analysis in talking about the intergenerational legacies of plastic. They suggested the distinction between inheritance and transmission, so the credit for the term *transmission* properly belongs to them.

12 This queer ecological sensibility, which permeates *Between the Waves*, is also expressed through the appearance of "totem animals" in each of the five channels, that flash across the screen. These totem animals, which Shah considers protective deities, consist of turtles, pygmy sea horses, and blind salamander. They are all "queer animals." As outlined by Bruce Bagemihl in his influential book *Biological Exuberance*, more than 450 species display same-sex coupling, eroticism, or child raising, and many other forms of life, such as bacteria, have a startling and vast array of reproductive capacities and genders.

13 For an excellent definition of queer ecologies, see Sandilands, "Queer Ecology." There is a rich and growing body of literature in this field, one that often highlights the contested relationship between sex and nature but also questions notions of purity, offering avenues for generatively thinking through toxicity. See Chen, *Animacies*; Ah-King and Hayward, "Toxic Sexes"; and Ahuja, "Intimate Atmospheres."

14 While I very much appreciate the necessary theoretical intervention that Bennett puts forth, I am troubled by the ways in which her claims to agential matter seem to systematically ignore both the long traditions of Indigenous thought that never

cleaved the world apart by separating matter from mind and the lessons of Black theory where matter could never be understood as lacking agency because of the ways in which people were made into objects. There is so much more to be said on this topic, in particular the slippage between the universal "child" that Bennett draws from to understand matter's agency and the ways in which both Indigenous and Black people are continually infantilized. For more sustained critiques of racial blindness in Bennett's work, see Todd, "Indigenous Feminist's Take," and Jackson, "Outer Worlds." For a critique of the ways in which vitality and liveliness are cast in a too-positive light, not attending to the ways that matter can be both vital and deadly, see Buchanan, "What Must We Do."

15 Alaimo and Hekman, *Material Feminisms*.

16 Alaimo and Hekman, *Material Feminisms*, 7.

17 Alaimo and Hekman, *Material Feminisms*, 12.

18 Barad, "Nature's Queer Performativity."

19 Boetzkes, *Plastic Capitalism*, 8, and Boetzkes and Pendakis, "Visions of Eternity."

20 Hawkins, "Made to Be Wasted," 49.

21 Hawkins, Potter, and Race, *Plastic Water*.

22 There are deep resonances here with the ways that queer people and communities have similarly been described as "cheap, fake and toxic." This is part of the reason that I argue that plastic should be understood as having queer agency. Thanks to David Bering-Porter for this insight.

23 As I revise this book in the midst of the COVID-19 pandemic, people are increasingly turning to plastic for its associations with sterility and cleanliness. While this may be the case for single-use medical equipment, there is wide evidence to suggest that plastic is not the best material for keeping the general public safe. The plastics industry has taken advantage of the conditions of the pandemic to push for rollbacks on various bans on plastic bags and other single-use plastics. For a comprehensive account of the use of single-use face masks, see Allison et al., "Environmental Dangers." For the ways in which industry has been pressuring governments to roll back single-use-plastic legislation, see Leber, "How Big Plastic." For more general discussion of plastic during the pandemic, see Denne, "Coronavirus Pandemic"; Ossolo, "Pandemic"; and Scaraboto, Joubert, and Gonzalez-Arcos, "Using Lots of Plastic Packaging."

24 Trowsdale, Housden, and Meier, "Seven Charts."

25 Rochman et al., "Classify Plastic Waste."

26 It is important to recognize that different types of plastic constitute different potential risks. According to MacBride, "The toxicity of polymers containing chlorine and styrene and of plastics containing certain additives in the phthalate category is well documented, while polyethylene and polypropylene do not suggest risk." MacBride, *Recycling Reconsidered*, 182. This has played out in places like Reserve, Louisiana, where the risk of cancer from air toxicity is fifty times higher than the national average. For more details, see the extensive coverage in the *Guardian*. Larty and Laughland, "Special Report." I also take up the relation between plastic and environmental racism in chapter 3.

27 Rochman et al., "Classify Plastic Waste," 170.
28 Rochman et al., "Classify Plastic Waste," 170.
29 Thompson et al., "Plastics."
30 Teuten et al., "Transport."
31 Part of what plastic reveals is that our current understandings of environmental harm are often inadequate. It is widely acknowledged throughout the scientific literature that there is a need for many more studies on the relationship between plastics and health, as a number of questions remain unanswered. Considerably more research is needed on the mechanisms for the uptake of toxic chemicals found on and in plastics that are ingested by animals, and the subsequent effects on those bodies. A significant challenge to all these studies is the fact that it is often difficult, or outright impossible, to establish control groups, as people or animals who have not been exposed to plastic and its associated chemicals are virtually nonexistent. Additionally, plastics and their chemicals are not circulating in the environment alone. Instead they interact with other chemicals and toxins in our environment, producing what is referred to as the "cocktail effect," the compounding of various chemicals that may be benign individually but harmful in combination. JRC Science for Policy Brief, "Something." It is practically impossible to study these cocktails as there are simply too many possible combinations and effects on the bodies of a range of beings. These prolific problems indicate the ways that plastics and their potential health effects pose serious challenges to how scientific knowledge is acquired, especially in relation to environmental health. They point to how plastic is inherited or transmitted differentially across populations, and how methods of replication and control are often impossible with chemicals in the wild. In other words, plastics and other environmental toxins ask us to reconsider some of the ways that we have been trained to think about public health and environmental harm. Max Liboiron has been actively questioning the epistemological problems associated in analyzing and producing knowledge about plastic pollution in the lab that she founded, the Civic Laboratory for Environmental Action Research (CLEAR). The lab is dedicated to thinking through feminist and anticolonial protocols of citizen science—how we might need to change the very relations of the production of knowledge in order to deal with these "miasmic" pollutants. See Liboiron, *Pollution*. These are the kinds of practical solutions that are required to break free of the pervasive logics of what I call plastic matter.
32 Latour writes that "'purification,' creates two entirely distinct ontological zones: that of human beings on the one hand; that of nonhumans on the other." Latour, *We Have Never Been Modern*, 10–11.
33 National parks were also part of the process of Indigenous dispossession, as Dina Gilio-Whitaker makes clear. See Gilio-Whitaker, "Story."
34 Hird, "Waste," and Hird, "DEW Line."
35 Douglas, *Purity and Danger*.
36 Haraway, "Speculative Fabulations," 243.
37 Timothy Mitchell traces how the infrastructures of coal enabled forms of unionization that pushed for increased democratic participation in society and then

how the availability of oil undermined these efforts. Mitchell, *Carbon Democracy*. Dipesh Chakrabarty argues that the concept of freedom arose in tandem with the widespread use of fossil fuels. See Chakrabarty, "Climate." In their edited volume, Sheena Wilson, Adam Carlson, and Imre Szeman trace how liberal political philosophy is deeply embedded with what they call "petroculture," or the ways that fossil fuels have saturated all aspects of culture. Wilson, Carlson, and Szeman, *Petrocultures*.

38 As the journalist Tim Dickinson writes for *Rolling Stone*, "Global plastics production and incineration currently creates the CO_2 pollution of 189 coal plants. By 2050, that's expected to more than triple, to the equivalent of 615 coal plants. At that rate, plastics would hog about 15 percent of the world's remaining 'carbon budget,' or what can be emitted without crossing the two-degrees Celsius threshold in global temperature rise that scientists warn can trigger calamity." Dickinson, "How Big Oil."

39 Klose, *Container Principle*.

40 Watts, "Resource Curse?"

41 Boetzkes and Pendakis, "Visions of Eternity," 6.

42 Fenichell, *Plastic*, 233.

43 Robertson, "Oil Futures/Petrotextiles."

44 Hird, "Waste," 111.

45 Bruno Latour, Donna Haraway, and Annamarie Mol are all seminal to biological approaches to STS; Karen Barad and Isabelle Stengers have been central to the development of STS of physics; discussions of chemistry are sparser but gaining more traction. For historical work, see Bensaude-Vincent and Stengers, *History*, as well as Klein and Lefèvre, *Materials*. More recent work on the STS of chemistry has addressed its vibrancy coupled with its harms. See especially the special issue of *Cultural Anthropology* on "Chemo-ethnography," edited by Nicholas Shapiro and Eben Kirksey (2017), and the special section Chemical Entanglements: Gender and Exposure in *Catalyst: Feminism, Theory, Technoscience* (2020), edited by Rachel Lee.

46 Murphy, *Sick Building Syndrome*; Murphy, "Chemical Regimes"; Murphy, "Distributed Reproduction"; Murphy, "Alterlife"; Shadaan and Murphy, "Endocrine-Disrupting Chemicals"; Povinelli, *Geontologies*; Shapiro, "Attuning"; and Agard-Jones, "Spray."

47 Stacy Alaimo coined the term *transcorporeal* to emphasize the imbrication of human bodies not only with each other but with nonhuman beings and physical landscapes. Alaimo, *Bodily Natures*.

48 Nancy Tuana argues that viscous porosity "involves recognizing the interaction of nature-culture, genes-environment in all phenomena" that include human categorizations, such as gender and race, but that also incorporate more-than-humans as well. Tuana, "Viscous Porosity," 209.

49 Murphy, "Chemical Regimes."

50 Rose, "Molecular Biopolitics."

51 Murphy, "Chemical Regimes," 698.

52 In this way, we can understand plastic to be "storied matter," as the cultural the-

orists Serenella Iovino and Serpil Oppermann have developed the term. Matter, understood as active and agentic, "can be 'read' and interpreted as forming narratives, stories." Iovino and Oppermann, "Introduction," 1. Matter itself participates in an ongoing process of historiography, where stories emerge from and with the interaction and co-constitution of beings and their environment, and that these relations and histories can be understood as narratives, as stories. This understanding of storied matter draws significantly on the transformative work of the feminist science and technology scholar Donna Haraway, who argues that "every being that matters is a congeries of its formative histories." Haraway, *Haraway Reader*, 2. Haraway highlights the mutual interactions of the material and semiotic worlds. Also building from Haraway, the environmental humanities scholar Timo Maran argues for what he calls the "semiotization of matter," which describes the ways that humans imprint semiotic patterns into matter, writing our stories onto matter in a way that can be harmful to how other beings perceive and interpret the world, as in the way I formulate synthetic universality. Maran, "Semiotization." Western Enlightenment values have been imprinted into plastic, leading to the disruption of other patterns of semiotizing matter by humans and more-than-humans.

53 Morton, *Hyperobjects*.

54 Kimmerer, *Braiding Sweetgrass*, 155.

55 Pasek, "Fixing Carbon," 4 (unpublished manuscript).

56 *Oxford English Dictionary*, "inheritance."

57 Lipsitz, *Possessive Investment*, vii.

58 Yusoff, "Geosocial Strata."

59 Haraway, *Staying With the Trouble*, 34.

60 Derrida and Roudinesco, *For What Tomorrow*, 3.

CHAPTER 1. PLASTICITY

1 Susan Freinkel, "A Brief History of Plastic's Conquest of the World," *Scientific American*, May 29, 2011, https://www.scientificamerican.com/article/a-brief-history-of-plastic-world-conquest/.

2 The potential combustibility of celluloid is described by John Hyatt in rather humorous, if macabre, terms: "Consequently a lighted cigar applied to the balls would at once result in a serious flame and occasionally the violent contact of the balls would produce a mild explosion, like a percussion guncap. We had a letter for a billiard saloon proprietor in Colorado mentioning the fact and saying he did not care so much about it but that instantly every man in the room pulled a gun." *World of Plastics*, 28.

3 Meikle, *American Plastic*, 11.

4 Meikle, *American Plastic*, 97.

5 Levi, *The Periodic Table*, 154.

6 This is perhaps most evident in Roland Barthes's short essay "Plastic," where he writes, "Until now imitation materials have always indicated pretension, they belonged to the world of appearances, not to that of actual use; they aimed at reproducing cheaply the rarest substances, diamonds, silk, feathers, furs, silver, all

the luxurious brilliance of the world. Plastic has climbed down, it is a household material. It is the first magical substance which consents to be prosaic. But it is precisely because this prosaic character is a triumphant reason for its existence: for the first time, artifice aims at something common, not rare." Barthes, "Plastic," in *Mythologies*, 98.

7 As the cultural historian Jeffrey Meikle elaborates: "Nothing so clearly announced the new field of 'plastics' as the first issue of the trade journal of that name in October 1925. Until then chemists and engineers relied for random coverage on journals broadly devoted to industrial chemistry and electrical engineering or narrowly focused on automobiles and aviation. Launched under the editorship of Carl Marx, a chemical patent attorney, *Plastics* served as a vehicle for material suppliers who bankrolled it with advertising revenue and plied it with articles touting their own products." Meikle, *American Plastic*, 99.

8 *Oxford English Dictionary*, "plastic."

9 *Oxford English Dictionary*, "plastic."

10 Malabou, *Ontology*, 3.

11 Bauman writes, "Flexibility has replaced solidity as the ideal condition to be pursued of things and affairs." Bauman, *Liquid Modernity*, ix. Bauman recognized that under the terms of liquid modernity all social entities are plastic, meaning that they change over time.

12 In *Capital Is Dead*, McKenzie Wark argues that this new economic formation, mobilized primarily through information and digital communication technologies, represents a new and terrifying turn that serves to further undermine people's rights in favor of the consolidation of power, money, and authority in the hands of tech giants.

13 Wagner-Lawlor, "Persistence," 74.

14 Moore, *Capitalism*, 20.

15 Jackson, *Becoming Human*, 11.

16 Spillers, "Mama's Baby."

17 Jackson, *Becoming Human*, 10. Jackson uses the term *black(ened)* when referring to Black people throughout her book to draw attention to the production of blackness as a category, to its plasticity.

18 For an elaboration of racial capital that indelibly ties slavery to capitalism, see Jodi Melamed, who offers a succinct elaboration: "The term *racial capitalism* requires its users to recognize that capitalism is racial capitalism. Capital can only be capital when it is accumulating, and it can only accumulate by producing and moving through relations of severe inequality among human groups—capitalists with the means of production/workers without the means of subsistence, creditors/debtors, conquerors of land made property/the dispossessed and removed. These antinomies of accumulation require loss, disposability, and the unequal differentiation of human value, and racism enshrines the inequalities that capitalism requires. Most obviously, it does this by displacing the uneven life chances that are inescapably part of capitalist social relations onto fictions of differing human capacities, historically race." Melamed, "Racial Capitalism," 77.

19 McClintock, "Monster."

20 Malabou, *Ontology*, 3, 5–6, 70–72; 6; 2–5.

21 With this question I do not mean to shut down all engagements with machines or molecules; rather, the question is meant to open up how we might engage with these things differently, how we might build systems of more ethical or reciprocal relations. Suzanne Kite's contribution to the Indigenous AI protocol paper, "How to Build Anything Ethically," drawing on Lakota principles, is one example of trying to work through these complications. See https://www.indigenous-ai.net/position-paper.

22 Leslie, *Synthetic Worlds*, 8.

23 For a detailed analysis, the full story on nylon, and its claims of feminine indestructability, see "Nylon: Domesticating a New Synthetic," in Meikle, *American Plastic*.

24 For an evocative history of the development of Plexiglas and its incorporation into the human body, see Catts, "Exploring."

25 As a former DuPont employee explains: "That's how Tokyo was literally burned down, by these bombs that were developed at this time. I learned a bit about arson in those days, how to go about it. We made jellied gasoline with pyrotechnic additives, that is, oxidizing and reducing agents, added to make it burn more fiercely. The consistency of this mix was established by use of an isobutyl methacrylate polymer, which was manufactured by DuPont and the specifications for this polymer were arrived at pretty empirically." Hounshell, "William Franta," 6.

26 This is one of the numerous reasons why recycling is a poor, even potentially harmful, response to the question of plastic pollution. Recycling is not a net environmental good, despite its constant framing as such. Instead, it is deeply embedded in the cycles of endless growth and consumption. In addition to the problems of energy use, economics, and the fact that plastics can often only be recycled once, recycling also distracts from addressing actual solutions to plastic pollution, including extended producer responsibility laws and drastic cuts to production. Recycling also effectively individualizes an industrial problem, turning the proper disposal of industrially manufactured goods into questions of moral virtue. As Max Liboiron writes, "The recycling symbol itself was sponsored by the Container Corporation of America (Rogers, 2006: 171), and recycling programs are often supported and even underwritten by industry (MacBride, 2012; American Chemistry Council, 2010) because it means that the ever-growing production of disposables can continue." Liboiron, "Ethics." For more on the distraction of recycling and its use by industry, see MacBride, *Recycling Reconsidered*, especially chapter 5; and for more on the moral individualism of waste and recycling, see Hawkins, *Ethics*, and Hird, "Microontologies." In addition to all these problems, until recently plastic recycling relied heavily on waste colonialism, where recycled goods were exported to China and other countries in Southeast Asia. Instead of the problem of plastic pollution being understood in relation to how much is being produced and the lack of industry accountability, the problem is outsourced to individual consumers and to countries that do not have the infrastructure to deal with the overwhelming amounts of plastic that are used, primarily in packaging. For an excellent overview

of these problems, see the 2019 documentary *The Story of Plastic*, directed by Deia Schlosberg.

27 Bensaude-Vincent and Stengers, *History*, 202.

28 Bensaude-Vincent and Stengers, *History*, 135.

29 It wasn't only Staudinger who was working on polymer science. In the early 1920s, the Swedish scientist The Svedberg invented a powerful new instrument, the ultracentrifuge. It showed definitively that polymers were not simply irregular physical aggregates but molecules of undreamed-of size, as Frank McMillan documents. Svedberg "measured molecular weights of as much as one million, in contrast to the 100, or less, characteristic of most ordinary compounds. This meant that a single molecule could contain, not just a few atoms, but hundreds of thousands." McMillan, *Chain Straighteners*, 4.

30 Fenichell, *Plastic*, 153.

31 Fenichell, *Plastic*, 152.

32 McMillan, *Chain Straighteners*, 6.

33 Despite the many advances, it should be noted that the specificity of design in relation to molecules is still quite crude, compared with the possibilities and elegance with which other creatures, such as spiders, can produce polymer structures. As Philip Ball explains, "In a linguistic analogy, our state-of-the-art polymers read something like this: aaaaaaabbbbbbbaaaaaaabbbbbbbaaa . . . Nature's polymers meanwhile, are more like this entire sentence, pregnant with meaning." Ball, *Molecules*, 168.

34 Bensaude-Vincent, "Plastics, Materials and Dreams of Dematerialization," 22.

35 However, even in the mid-fifties these dreams of complete control of matter could not be upheld without some serious reservation. The "plastic years" inspired this critical reflection by a chemist in 1956: "It appears that the success of plastic is in large part due to the profound and unconscious tendency of man to bypass nature and admire himself through his own creations in the center of a pantheon of ersatz." Meikle, *American Plastic*, 204.

36 Boetzkes, *Plastic Capitalism*, 184.

37 Fors, *Limits*, 149. It should be noted that there were different approaches to chemistry throughout the past five hundred years, and it is only in the late nineteenth century that this relationship to control and economic gain solidified in such a way as to create the preconditions for plastic. As Ursula Klein and Wolfgang Lefèvre write, "Unlike early seventeenth-century chemists, who justified chemistry, chemical pharmacy, and chemical medicine by emphasizing the power of chemical art and the superiority of chemical preparations over natural materials, and unlike late nineteenth-century chemists who envisioned chemistry as a productive enterprise spurring industrialization and creating a new world of synthetic artifacts, eighteenth-century chemists presented their art and science to the Enlightenment public in terms of nature and natural objects and processes." Klein and Lefèvre, *Materials*, 14.

38 Even when the category of what we now think of as plastics was still in formation, its nature was more "commercial than scientific." Meikle, *American Plastic*, 5.

39 For example, as Meikle details: "Between 1921 and 1937 annual production of coal-tar resins rose from 1.5 million to 141 million pounds. Urea formaldehyde entered government statistics in 1932 when two million pounds were produced; by 1937 production reached twenty-one million. Cellulose acetate, not monitored in 1929, climbed from three million pounds in 1933 to nineteen million in 1937. By the end of the era these materials appeared so prominent that some journalists . . . proclaimed 'the Plastic Age.'" Meikle, *American Plastic*, 64.

40 Meikle, *American Plastic*, 250.

41 Meikle, *American Plastic*, 251.

42 Meikle, *American Plastic*, 250.

43 Meikle, *American Plastic*, 266.

44 Meikle, *American Plastic*, 273.

45 The inaugural meeting of the Society of the Plastics Industry in April 1970 was largely dedicated to how to positively spin plastics away from the growing concern of the public. As noted in their minutes, "the environment received prime attention during the first annual meeting of SPI Member Company Voting Representative in New Orleans where the board of directors unanimously approved a $300,000 program. . . . The assessment, which will fund research and development, legal and public relations activities, will be in addition to regular dues. The program has the following objectives: (1) to begin finding workable technical solutions to the problems of solid waste management; (2) to combat increasing irresponsible or uninformed criticism of the industry as a polluter of the environment, and (3) to communicate to key audiences—customers and government officials, for example—the industry's positive activities in the solid waste management area." Society of the Plastics Industry, *Annual Report*, 1969–70, 6.

46 Society of the Plastics Industry, *Annual Report*, 1959–60, 4.

47 Society of the Plastics Industry, *Annual Report*, 1963–64, 7.

48 During the COVID-19 pandemic, the plastics industry lobbied numerous governments to repeal or delay recently adopted single-use plastics bans. For example, *Mother Jones* reported that "the trade group the Plastics Industry Association requested that the US Department of Health and Human Services endorse the idea that 'single-use plastic products are the most sanitary choice when it comes to many applications,' amid the COVID-19 pandemic, according to *Politico*. That same day, *Mother Jones* found, a conservative nonprofit called the Independent Women's Forum started running ads pressuring Washington state, New York, and California to reverse their bag bans." Leber, "How Big Plastic." Maine, New Hampshire, Oregon, Massachusetts, and the city of San Francisco all delayed or repealed bag bans because of the pandemic, despite little to no evidence to suggest that reusable bags could transmit the virus or that plastic bags are safer. In fact, it was found that SARS-CoV-2 can stay active on plastic from anywhere from three to nine days.

49 *World of Plastics*, 19.

50 Most recently, the plastics industry has seen a vast expansion because of the widespread implementation of fracking, or the extraction of natural gas. In 2019

companies began investing $65 billion to expand plastic production in the United States. The reason is that fracking has made producing plastic radically cheaper, and plastic is becoming an increasingly important source of profit for fossil fuel companies. Carpenter, "Toxic Consequences."

51 Boetzkes, *Plastic Capitalism*. In this book Boetzkes makes the argument that the cycles of wasting are central to late-stage capitalism, which understands waste itself as a mode of profit generation. She differentiates this capitalization of waste from other systems of excess, such as those practiced by Indigenous peoples in potlach ceremonies, and the philosophy of Georges Bataille, who embraced the excess of sunlight as fundamental to a different politics of surplus and waste.

52 Hawkins, "Made to Be Wasted," 50.

53 Boetzkes, *Plastic Capitalism*, 185.

54 Boetzkes argues that, following Bataille, we might reconsider energy expenditure through a mode of the ethical that distinguishes between the closed system of consumption and an "absolute release of heterogeneous energy that transgresses all limits and meaning." Boetzkes, *Plastic Capitalism*, 17.

55 Hounshell, "Howard E. Simmons Jr.," 38.

56 Whyte, "White Allies."

57 Hounshell, "Fourth Interview," 3, my emphasis.

58 Mirzoeff, "Visualizing," 226.

59 Westermann, "Material Politics," 69.

60 Hawkins, "Governed by Plastic."

61 Fenichell, *Plastics*, 311.

62 Meikle, *American Plastic*, 268.

63 Hounshell, "William Franta," 24–25.

64 Lerner, "Teflon Toxin." The *Intercept* did an entire series on DuPont and Teflon that exhibits the best in chemical journalism. For more on this story, see Rich, "Lawyer." Todd Haynes then adapted this article into a feature-length movie, *Dark Waters* (2019).

65 Carrington, "Scientists."

66 Against these technological solutions, Samantha MacBride's extensive work on recycling has many constructive solutions for plastic pollution. As she identifies, the risks associated with plastics include the harm to workers and those living in nearby communities in the production phase; the potential release of toxins when plastics are used or disposed, especially if heated or incinerated; the risk to wildlife when ingested or entangled; the heterogeneity of plastic waste, including its imbrication with other materials (as in coffee cups where plastic is used to line cardboard), making it difficult, if not impossible, to reuse or recycle these composite and diverse materials; and the questions of global justice raised by exporting waste, mainly to Asia. MacBride argues that from a design standpoint what is needed is to reduce the range of different types of plastics, to eliminate potentially hazardous plastics (in particular polymers containing chlorine or styrenes) and endocrine disrupting plasticizers, and to "promote truly compostable alternatives in tandem

with systems for collecting and carrying out composting." MacBride, *Recycling Reconsidered*, 183. However, she cautions that we cannot rely on industry or consumer choice to fulfill these strategies, despite the efforts of some niche companies. She argues that what we need so we can actually address plastic pollution and waste are "source reduction mandated through bans or product fees for the most toxic and difficult-to-recycle forms of plastic, along with methods of recycling preferably regionally scaled." MacBride, *Recycling Reconsidered*, 211. These strategies can only be fulfilled at the level of policy, with activists monitoring whether or not the policies are being implemented and holding companies and governments to account.

67 Other examples, such as Mango Materials, are laudable but still operate within the logics of capitalism by understanding waste as a commodity. Mango Materials makes plastics from industry or pollutant sources of methane, such as abandoned coal mines and wastewater treatment plants. Van der Hoeven, "Gas Fermentation." Their fully biodegradable plastics are being made to make clothing where the bio-polyester can be mixed with natural fibers (http://mangomaterials.com/applications/). This is an interesting development as fibers from clothing are one of the most difficult plastic pollution problems to solve. In 2014 55.2 million tons (122 billion pounds) of polyester and other synthetic fibers were sold. That same year 5.2 million tons of cellulosic fibers, including rayon and viscose, were sold. This is in comparison to the natural fiber industry (consisting primarily of wool, cotton, linen, and silk) that had a demand of 25.4 million tons ("Man-Made Fibers"). Synthetic fibers are particularly challenging as a material because they shed directly into drains, flowing into water treatment plants that are not equipped to stop them going into larger waterways. As a result, a huge amount of plastic waste accumulates in the oceans through the everyday washing of synthetic clothes, where the fibers are consumed by animals and accumulate persistent organic pollutants and other industrial toxins. Finding biodegradeable substitutes would be a welcome measure in this industry.

68 Malabou, *Ontology of the Accident*, 7.

69 Michael, "Process and Plasticity," 33.

70 The group Precious Plastic is perhaps an exception to this as the group's members try to advance domestic recycling to create "craft plastic." However, despite the novel approach and good intentions, this effort does not address the underlying issues of either plastic matter or plastic's relations to questions of colonialism, consumption, or capitalism. For more information on Precious Plastic, see https://preciousplastic.com/.

CHAPTER 2. SYNTHETIC UNIVERSALITY

1 For an excellent analysis of the importance of local knowledge within scientific practices, see Jazvac, "Noni Knows."

2 Corcoran, Moore, and Jazvac, "Anthropogenic Marker," 6.

3 Robertson, "Plastiglomerate" [2016].

4 As Robertson notes, on Kamilo Beach and the adjacent coastline "as much

as 90 percent of the garbage accumulated in the area is plastic." Robertson, "Plastiglomerate" [2016].

5 Gabrys, "Speculating," 54.

6 Robertson, "Plastiglomerate" [2018], 59, my emphasis.

7 Ranjan Ghosh, "The Plastic Controversy," *Critical Inquiry* blog, February 4, 2021, https://critinq.wordpress.com/2021/02/04/the-plastic-controversy/.

8 The golden spike is the colloquial name for the Global Boundary Stratotype Section and Point (GSSP). The GSSP defines the lower boundary of a stage on the geological time scale. Scientists made recommendations for the Anthropocene to be officially recognized as an epoch in August 2016 but have yet to decide on the boundary marker. However, the preferred date for the GSSP, or golden spike, of the Working Group on the Anthropocene is around 1950, which includes the proliferation of plastic. Revkin, "Researchers"; and "Provisional Recommendations."

9 The term *natureculture* describes the fundamental inseparability of nature and culture. It was introduced by Donna Haraway to describe entangled multispecies histories in her book *The Companion Species Manifesto*, 3.

10 Zalasiewicz et al., "Geologic Cycle," 6.

11 Zalasiewicz et al., "Geologic Cycle," 15.

12 Hird, "Waste," 107.

13 Povinelli, *Geontologies*, 59.

14 In her book *Braiding Sweetgrass*, Robin Wall Kimmerer carefully lays out the ways in which reciprocity, the taking and giving of thanks between plants and people, allows each to flourish. She gives the example of sweetgrass that if not tended or picked begins to die off. The principles of the Honourable Harvest that she articulates provide for human and more-than-human modes of flourishing, together.

15 Povinelli, *Geontologies*, 20–21.

16 Kimmerer, *Braiding Sweetgrass*, 62.

17 Sylvia Wynter's philosophical project provides a sustained and brilliant critique of Man as the signifier of the human. Wynter, "Unsettling." For her, Man can be divided into Man1 and Man2. Man1, or homo politicus, emerged from the Renaissance as a movement toward secularization and the rational political subject. Man2, homo oeconomicus, is formulated through the colonial episteme of social Darwinism, which divided people into the selected and dysselected. Through each of these figures of Man, she shows the ways in which Enlightenment thought and the practices of Western science are intimately bound to how humanity is divided between those who are properly considered human and those who are not. The reemergence of Man as a standard phrase in relation to Anthropocene discourses is an indication of this universalism that is built on the hierarchy of the world's population. In a more generous reading, this nomenclature in relation to the Anthropocene could also be understood as a form of indictment, laying the blame for the plundering of the earth with those who do indeed bear most of the responsibility.

18 Lawrence, "Plastic," 110.

19 The concept of the standing reserve comes from Martin Heidegger, who describes the ways in which modern technology veils the relationship to the world. He

writes, "The revealing that rules throughout modern technology has the character of a setting-upon, in the sense of a challenging-forth." Heidegger, *Basic Writings*, 321. This happens through the storing up of energy that is unlocked in modern technology, and through this process, relations with the world are obscured.

20 AirCarbon is a company that is manufacturing plastic nurdles (or preproduction plastic) made through carbon sequestration. So it is literally creating plastic out of thin air.

21 Bensaude-Vincent, "Plastics," 44.

22 Barad, "Quantum Entanglements," 261, emphasis in original.

23 Boetzkes and Pendakis, "Visions."

24 Von Uexküll, *Foray*. In this seminal biosemiotics analysis, Uexküll makes the argument that a world is composed through the sense perceptions of each species, which correspond but do not directly overlap with other species. In this way, each species become attuned to the other beings that they are dependent on and the ones that will harm them.

25 Leslie, *Synthetic Worlds*, 14.

26 Harrison, *Dominion*, 32.

27 James Baldwin uses this phrase to emphasize whiteness as a social construct as a way to leverage power. Baldwin, "On Being 'White.'"

28 Shotwell, *Against Purity*, 38–39.

29 Harrison, *Dominion*, 32.

30 Liboiron, *Pollution*.

31 Plastic also significantly contributes to waste colonialism. The announcement by China that, as of December 31, 2017, it had stopped accepting the world's trash, was met by uproar across the so-called developed world. The ban covers twenty-four types of foreign waste, including textiles, mixed paper shipments, and low-grade polyethylene terephthalate. It also imposes strict standards to avoid contaminated and hazardous waste. The ban "disrupted a global supply chain" of seven million tonnes of scrap plastic, mainly from Europe and the United States, imported into China every year. Stanway, "China's Plastic Recyclers." Over the years, China and Hong Kong have become the world's refuse site: "China has imported 106 million tonnes of plastic waste, making up 45.1 per cent of all imports worldwide, processing garbage from 43 countries on top of its own. China and Hong Kong have collectively taken in 72.4 per cent of all plastic waste." Braithwaite, "Millions." Countries including Canada, the European Union, Australia, and the United States are now scrambling to find alternative places to either recycle or dump their plastics. In the wake of the ban, recycling companies are moving from China to Malaysia, Thailand, South Korea, and Vietnam. However, many of these other countries don't want to deal with the West's waste either, especially because they don't have the infrastructure to process all this plastic. As a result, Thailand is tightening regulations and raising import taxes, and Malaysia also temporarily suspended new import permit applications in mid-May 2018. Other countries are returning waste already sent by the West. For example, President Duterte of the Philippines threatened that his country would go to war with Canada if the Canadian government did not

remove Canada's garbage. In a scramble to get rid of excess waste, there has been an "illegal plastic pollution trade across the world since 2018," according to INTERPOL. Since 2018, there has been a significant increase in illegal plastic waste fires and landfills in Europe and Asia. "INTERPOL Report Alerts to Sharp Rise in Plastic Waste Crime," INTERPOL, August 27, 2020, https://www.interpol.int/en/News-and-Events/News/2020/INTERPOL-report-alerts-to-sharp-rise-in-plastic-waste-crime.

32 Robertson, "Plastiglomerate" [2018], 59.

33 Robertson, "Plastiglomerate" [2018], 63.

34 Leslie, *Synthetic Worlds*, 9, emphasis added.

35 Barthes, *Mythologies*, 97.

36 Boetzkes and Pendakis, "Visions."

37 Haraway and Kenney, "Anthropocene," 259.

38 On the relation between the Anthropocene and the plantation system, see Haraway et al., "Anthropologists," and Mirzoeff, "It's Not the Anthropocene."

39 See Davis and Todd, "On the Importance of a Date"; Whyte, "Is it Déjà Vu?"; and Eyal Weizman and Fazal Sheikh, *The Conflict Shoreline*.

40 For the necessity of thinking the Anthropocene in relation to Indigenous and Black knowledges and the ongoing colonialism that is at the heart of the Anthropocene, see Davis and Todd, "On the Importance of a Date," and Yusoff, *Billion Black Anthropocenes*.

41 As Myra Hird writes, "While animal metabolism is defined by consumption (animals must consume already-made organic matter), bacteria evolved earth's metabolic production economy: phototrophs convert solar energy; chemotrophs convert chemical energy; lithotrophs gain electrons from elements (such as hydrogen and sulfur) or simple organic compounds (such as water and hydrogen sulphide); and organotrophs convert complex organic substances (such as proteins in dead biomass and carbohydrates in grasses and grans) (Smil 2002). In short, bacteria provided (and continue to provide) the environment in which different kinds of living organisms can exist." Hird, "Indifferent Globality," 59.

42 *Oxford English Dictionary*, "metabolism."

43 Landecker, "Metabolism," 204.

44 Landecker, "Metabolism," 217.

45 A recent study showed that photochemical reactions can oxidize polystyrene back into carbon dioxide and organic carbon after decades or centuries, rather than millennia. The rates increased when certain additives were present and with warmer temperatures. Ward et al., "Sunlight."

46 Hardt, "Plastic | Money," 89.

47 Wark, *Molecular Red*, xiii.

48 As Wark writes, "The Anthropocene is a series of metabolic rifts, where one molecule after another is extracted by labor and technique to make things for humans, but the waste products don't return so that the cycle can renew itself." She notes that these problems are global in scope. Wark, *Molecular Red*, xi–xxii. She goes on to cite John Bellamy Foster, who also includes ocean acidification, stratospheric ozone depletion, nitrogen and phosphorous cycles, freshwater shortages, loss of

biodiversity, and accumulated chemical pollution as all part of the metabolic rifts of the Anthropocene.

49 Leslie, *Synthetic Worlds*, 9.

50 Povinelli, *Geontologies*, 4.

51 Sheldon, "Queer Universal."

52 Yusoff, "Geologic Life," 780.

53 Yusoff, "Geologic Life," 784.

54 Moore, *Capitalism*, 13.

55 Moore, *Capitalism*, 25.

56 Moore, *Capitalism*, 1.

57 Yusoff, "Geologic Life," 789.

58 Povinelli has written extensively about the difficulty of maintaining a distinct boundary between life and nonlife, the ways in which this binary is undermined both through contemporary scientific differences and through epistemological differences between Aboriginal and non-Aboriginal peoples. See Povinelli, "Can Rocks Die? Life and Death inside the Carbon Imaginary," in *Geontologies*, 30–56.

59 For more on best practices in interdisciplinary art and science collaborations, see the eight steps proposed by Belontz et al., "Embracing." These include passionate interest in the shared topic; beginning with a workshop to explore possible avenues for working together; identifying the problem to be addressed from numerous angles; sustaining involvement and cooperation by having clearly defined roles; using funding as a basis of support; involving all researchers in shaping the project throughout, not replicating the siloing that happens through disciplinary expertise; collaborating with larger networks and training students; and generating a broad range of outcomes. These methodologies are adopted to avoid the problems that often arise in art and science collaboration, where, for example, art is used merely to illustrate a scientific discovery after the fact, or artists draw on science in sometimes inaccurate ways. By integrating art and science collaboration from the very beginning of a project, the project can benefit from both sets of methodologies and insights.

60 This collaboration evolved into the Synthetic Collective (https://syntheticcollective.org) and includes core members Kirsty Robertson, Kelly Wood, Heather Davis, Tegan Moore, Sara Belontz, Lorena Rios Mendoza, Kathleen Hill, and Ian Arturo, in addition to Kelly Jazvac and Patricia Corcoran.

61 Bürger, *Theory*, 51–54.

62 Ukeles, "Manifesto for Maintainance Art."

63 Phillips, "Making," 170.

64 Robertson, "Plastiglomerate," 63.

65 De Wolff, "Material Lessons."

CHAPTER 3. PLASTIC MEDIA

1 *Extractivism* is the term now commonly used, emerging from Latin American scholarship, to describe the commodification of the earth. As Acosta defines it, "Extractivism is a mode of accumulation that started to be established on a

massive scale 500 years ago. The world economy—the capitalist system—began to be structured with the conquest and colonisation of the Americas, Africa and Asia." Extractivism, in other words, describes both an ideology and an economic system built on the understanding that the world, and all its beings, are inherently commodifiable, violently turned into "things" operating as a standing reserve for the accumulation of profit and power in the hands of a few. It describes the mutual entwinements of colonialism, capitalism, and ecocide. Acosta, "Extractivism," 62.

2 Rogers, "Erasing Mossville."

3 Mitchell, "Report."

4 Geyer, Jambeck, and Law, "Production," 2–3.

5 The production of PVC is one of the most toxic processes associated with plastics. It has been widely known, since at least 1970, to produce a range of cancers. Although many people have called for the outright ban on any chlorine-based plastics production, PVC is still being produced and distributed globally.

6 Rogers, "Erasing Mossville."

7 Morris, "Life."

8 Sharpe, *In the Wake*, 104.

9 Formosa Plastics, a Taiwan-based company, plans to build a nearly one-thousand-hectare plastics factory known as the Sunshine Project along the west bank of the Mississippi River at a cost of $9.4 billion. This was enabled by a "competitive incentive package that would include a $12 million performance-based grant to offset infrastructure costs" from the State of Louisiana (https://www.formosaenergy.com/formosa-chemical-manufacturing-complex). The proposed plastics factory will produce ethylene glycol, polyethylene, and polypropylene for the manufacture of eco grocery bags, N95 masks, car casings, ropes, drainage pipes, artificial turf, large playground equipment, polyester fibers, and antifreeze, according to its website (http://www.sunshineprojectla.com/).

10 Lavigne, "Request."

11 Fortunately, at the time of writing, the advocacy and organizing of RISE St. James has been making a significant impact, as a motion in district court in late 2020 suspended the company's air permits citing concerns over environmental racism. This is a deeply significant ruling, disrupting the ways that environmental racism has gone unchecked in the region for so long. It is hard not to read this ruling outside the ongoing work of local environmental justice advocates coupled with the Black Lives Matter uprising in the summer of 2020. Mitchell, "Judge Delays Crucial Permit."

12 Morris, "Environmental Racism."

13 Writing in relation to lead poisoning, the queer theorist Mel Chen argues, "Black children are constructed as more proximate to lead itself, as naturalized to lead, new ground to the newest figure. A racial construction of blacks as already unruly, violent, contaminated, and mentally deficient lies inherent in the current neoliberal economy." Chen, *Animacies*, 270.

14 See especially Jackson, "On Becoming Human: An Introduction," in Jackson, *Becoming Human*, 1–44.

15 Ferreira da Silva, "Toward a Black Feminist Poethics," 82.

16 Sharpe writes, "Emancipation did not make free Black life free; it continues to hold us in that singularity. The brutality was not singular; it was the singularity of antiblackness." Sharpe, *In the Wake*, 106.

17 Ferreira da Silva writes that white people's self-actualization depends on Black fungibility. Here, we can read the production of plastic as a mode of white self-actualization, engaged in anti-Black acts of dispossession and dissemination of ill-health. Ferreira da Silva, "1 (life)."

18 Claude Shannon and Warren Weaver describe five elements of transmission of information: an information source, a transmitter, a channel, a receiver, and a destination. These describe the process of encoding and decoding of a particular message as it is communicated across distances. Shannon and Weaver, *Mathematical Theory*.

19 Williams, *Television*, 17.

20 Hall, "Encoding, Decoding."

21 Fenichell, *Plastic*, 63.

22 LeMenager, *Living Oil*, 6.

23 On transoceanic cables, see Starosielski, *Undersea Network*, for a detailed examination of the conflictual role of cables as the central relays of the internet. For a critical appraisal of the use of oil and other potential toxic materials in digital technologies, see Cubitt, *Finite Media*, especially 35–46, the section on oil in relation to energy and media production.

24 Peters, *Marvelous Clouds*, 37.

25 Quoted in Peters, *Marvelous Clouds*, 2.

26 Peters, *Marvelous Clouds*, 2.

27 Peters, *Marvelous Clouds*, 47.

28 For a sustained engagement with the division between life and nonlife, and the messy and indistinct boundaries between the two, see Povinelli, *Geontologies*, especially "Can Rocks Die? Life and Death inside the Carbon Imaginary."

29 Barthes, *Camera Lucida*, 80.

30 In the 2019 census, 39.8 percent of the city's residents identified as Black, 47.9 percent as white, and 19.2 percent as Hispanic or Latino origin. The median household income was $35,590. https://www.census.gov/quickfacts/rochestercitynewyork. In the 1980 census, only 8 percent of the population identified as Black and 2 percent as "Spanish in origin." US Department of Commerce, Bureau of the Census. General Population Characteristics New York. 1980 Census of Population. https://www2.census.gov/prod2/decennial/documents/1980/1980censusofpopu80134unse_bw.pdf.

31 Povinelli, "Fires, Fogs, Winds."

32 Hanley, "Eastman Kodak."

33 Niman, "Kodak's Toxic Moments."

34 In their decolonial feminist analysis of endocrine-disrupting chemicals (EDCs) in Aamjiwnaang First Nation, Reena Shadaan and Michelle Murphy organize their

critique not around chemicals and bodies but around Land and bodies, privileging Anishinaabek and Haudenosaunee teachings. They write, "We use capital L 'Land' in this paper to indicate an understanding of land that is not commensurate with territory or earth, but rather includes nonhumans, ancestors, future generations and 'all our relations' stretching both backward and forward in time." Shadaan and Murphy, "Endocrine-Disrupting Chemicals (EDCs)," 24. Land points to both philosophy and governance of Anishinaabek, Haudenosaunee, and other Indigenous peoples of the lower Great Lakes region and how those were actively and deliberately disrupted through settler colonialism. Pollution can be understood within this framework as the continued dispossession of Land.

35 Shadaan and Murphy, "Endocrine-Disrupting Chemicals (EDCs)," 10.

36 Niman, "Kodak's Toxic Moments."

37 Barthes, *Camera Lucida*, 14.

38 Barthes's reading of photography examines the conditions and constraints of inheritance, how someone is shaped by the loss of a loved one. My appropriation of his work in the context of Rochester involves an anamorphic transposition that brings to light the qualities of transmission that are also present in the photograph.

39 Moten, *In the Break*, 196.

40 Moten, *In the Break*, 198, emphasis in original.

41 Murphy, "Distributed Reproduction."

42 Gordon, *Ghostly Matters*, xvi.

43 Todd, "Fish, Kin and Hope," 104.

44 Tuck and Ree, "Glossary," 641.

45 Tuck and Ree, "Glossary," 642.

46 Shapiro, "Attuning," 381.

47 Shapiro, "Attuning," 381.

48 The term *fiction of comfort* comes from Rachel Lee. Lee writes in full, "My claim here is that this border-wall thinking [that separates warfare chemical exposure from everyday domestic industrial chemical exposure] not only fundamentally misunderstands the actions of chemical toxicants as they wend their way through ecological systems—through soil, surface and ground water, air and bioaccumulation in nonhuman and human species dwelling in those spaces"—but, more importantly, that it offers a fiction of comfort for elite subjects of the Global North. That fiction of comfort involves, first, imagining themselves geographically protected from the toxicant spillovers and secondary contaminations that will occur only over "there" (in foreign territory) and not also "here" (in the homeland). Second, it provides further psychic "cover": for these same elite subjects not to feel morally culpable because no intentional war (by the sovereign nation to which one holds allegiance) has been declared against either the people or habitats that have been so fouled. Lee, "Lattice," 2.

49 Gordon, *Ghostly Matters*, 8.

50 Gordon, *Ghostly Matters*, 57.

1 I am not sure what material this specific dildo was made of, but common materials for sex toys include hard or soft plastics, often with large amounts of phthalates. More expensive dildos are often made with silicone, which is not a fossil-fuel-derived polymer.

2 Many works cover animals' and other beings' ingesting plastic. For an overview, see Tremlett, "Spanish Sperm Whale Death"; Stephanis et al., "As Main Meal"; Hall et al., "Microplastic Ingestion"; and Zettler, Mincer, and Amaral-Zettle, "Life."

3 Andrady, "Microplastics," and Law et al., "Plastic Accumulation."

4 Seymour, *Strange Natures*, 27.

5 Kin-making outside genetic relations has always happened within Black communities, as family structures were violently plasticized through the institution of slavery. For more on this and the ways that racist systems are also reproductive systems where reproducing white lives requires ongoing sterilization, see Benjamin, "Black AfterLives Matter."

6 Mortimer-Sandilands and Erickson, "Introduction," 37.

7 Although this chapter focuses on questions of bodily adaptation by way of plastic and its additives and the intersection with queer theory, I am not addressing plastic surgery. Gender reassignment surgery can be an important part of transitioning for trans people. However, I do not address plastic surgery here for two reasons. The first is that there is very little plastic involved in plastic surgery. Most plastic surgery is done with existing tissues, such as skin and cartilage. Another common material used for plastic surgery is silicone, a material often derived from silica rather than from fossil fuels. Sometimes, Gore-Tex or Med-Por are used as fillers in plastic surgery, and certainly they would fall under the definition of plastic that I employ in this book, but this is the least common type of material in plastic surgery. Second, the discussions of plastic surgery open up a series of conversations that are outside the scope of this chapter.

8 Jambeck et al., "Plastic Waste Inputs."

9 On microbeads in cosmetics and toothpaste, see Hoffman and Turner, "Microbeads." On washing synthetic clothes, see Youngstead, "Laundry Lint," and Coulombe, "Fleece Clothing."

10 It should be noted, however, that despite the widespread media and activist attention to plastic in the oceans, only 0.1 percent of plastics produced are thought to have ended up there. For a breakdown of the numbers, see Ritchie and Roser, "Plastic Pollution."

11 Moore and Phillips, *Plastic Ocean*.

12 Zettler, Mincer, and Amaral-Zettle, "Life."

13 Quoted in Helmreich, *Alien Ocean*, 1–2.

14 Helmreich, *Alien Ocean*, 5.

15 However, there are still many things that we do not understand about the lifespan of plastics. Recently, researchers at the Woods Hole Oceanographic Institution discovered that sunlight can biodegrade plastics in centuries or potentially decades.

Ward et al., "Sunlight." Additionally, Odile Madden, a material engineer and the head of the Museum Conservation Institute at the Smithsonian, has been working on the problem of a number of World War II–era model planes that have spontaneously and violently broken apart. The planes, which were used to help inform the public about the difference between allied forces and potential threats, have begun to crack with such force that pieces of plastic can be found about two feet away from the models. To date, the reason why this is happening is unknown.

16 Bacteria in the guts of wax worms can degrade polyethylene. Yang et al., "Evidence"; Harshvardhan and Jha, "Biodegradation"; and Subrahmaniyan and Mathieu, "Polyethylene."

17 This was determined by changes in the strength and topography of the polyethylene, as well as by changes in the chemical structure and molecular weight of the material. Yang et al., "Evidence," 13777.

18 Arnold, "This Bug."

19 Russell et al., "Biodegradation."

20 Yoshida et al. "Bacterium."

21 Austin et al., "Characterization."

22 Hird, "Indifferent Globality."

23 Agard-Jones, "Spray."

24 Murphy, "Afterlife."

25 Freeman, "Queer Belongings."

26 Freeman, "Queer Belongings," 298. For a more sustained consideration of the place of bacteria within the human body, and a challenge to the understanding of any body as strictly unitary or individual, see Gilbert, Sapp, and Tauber's elaboration of Lynn Margulis's holobiont in "Symbiotic View," and Hird, *Origins*. The edited volume *Making Kin Not Population* makes an incredibly important intervention into the politics of reproduction and making kin from a feminist, anticolonial position under the conditions of ecocide and a rapidly ballooning human population.

27 There is some concern that plastic can accumulate and transmit persistent organic pollutants (POPs) to animals that ingest them; however, the evidence for whether or not biomagnification of POPs can occur through plastic ingestion is unclear. One study analyzed polybrominated diphenyl ethers (PBDEs) in short-tailed shearwaters and found a strong correlation between ingested plastic and the presence of this toxic chemical in the bodies of the birds. Tanaka et al., "Accumulation." However, another study on Northern Fulmars in Norway concluded that although many of the birds did ingest microplastics that had accumulated POPs, the chemicals were not transferred from the plastic but rather absorbed through their usual prey. Herzke et al., "Negligible Impact." More research needs to be done to understand these mechanisms.

28 As Max Liboiron makes clear, plasticizers, including BPA, have been found to cause a host of health problems: "Various plasticizers have been correlated with infertility, recurrent miscarriages, feminization of male fetuses, early-onset puberty, obesity, diabetes, reduced brain development, cancer and neurological disorders such as early onset senility in adults and reduced brain development in children." Liboiron, "Plasticizers," 142.

29 Freinkel, *Plastic*, 93–94.
30 Roberts, *Messengers*, 165.
31 Schug et al., "Endocrine," 208.
32 Schug et al., "Endocrine," 208.
33 As she writes, "The materiality of sex today is in part enacted through the action of endocrine disruptors. But this materiality is always 'burdened' by the material-semiotic histories of endocrinology: its production of sex through material-semiotic practices of transplanting gonads, injecting animals and scientifically studying human bodies and behaviours." Roberts, *Messengers*, 181.
34 Roberts, *Messengers*, 163.
35 For more on the legal ramifications and challenges to tort law posed by EDCs, especially in relation to the Aamjiwnaang First Nation, see Scott, "'Gender-Benders.'"
36 Schug et al., "Endocrine," 211.
37 Colborn, Dumanoski, and Myers, *Our Stolen Future*, 10.
38 Niels Skakkebaek and his colleagues reviewed sixty-one studies from the United States, Europe, India, Nigeria, Hong Kong, Thailand, Brazil, Libya, Peru, and Scandinavia. "According to the data, average human male sperm counts had dropped by almost fifty percent between 1938 and 1990." Colborn, Dumanoski, and Myers, *Our Stolen Future*, 9. However, this study by Colborn, Dumanoski, and Myers has since been disputed, and more research is necessary.
39 This ecoheteronormative conservative backlash is embodied in the rant by the American radio show host Alex Jones, who is particularly concerned about "gay frogs" and how, in his words, "they are putting chemicals in the food and water, where you look at men and women you can't tell what's what most of the time now." This video has been removed by YouTube as the "account has been terminated."
40 Di Chiro, "Polluted Politics?," 210.
41 Ah-King and Hayward, "Toxic Sexes," 7.
42 Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century," in *Simians, Cyborgs and Women*, 151.
43 Liboiron, "Plasticizers," 143.
44 Murphy, "Distributed Reproduction."
45 Haraway, *Modest_Witness*; Seymour, *Strange Natures*; and Sheldon, *Child*.
46 Edelman, *No Future*, 2.
47 Edelman, *No Future*, 3.
48 Sheldon, *Child*, 4, 26.
49 Sheldon, *Child*, 29.
50 Sheldon, *Child*, 36.
51 In some environmental circles, a call to stop reproducing has elicited heated debates. Mullin, "How to Save the Planet?" and Collings, *Stolen Future*. Conceivable Future, an activist support group, calls the climate crisis a reproductive crisis and provides space for people to discuss the perils of having children in a world that is increasingly defined by environmental crisis. Ostrander, "How Do

You Decide?" One environmental movement, the Voluntary Human Extinction Movement (VHEMT), calls for people to abstain from reproduction to speed up the extinction of humanity. The movement does not see this as a form of nihilism but rather as a rational and loving response to the problems of overpopulation and human destruction. What is important to consider in the midst of these debates are the ways in which certain (wealthy and often white) children that are limited in number are consuming the resources that children in poor countries will desperately need and use at much lower rates. In other words, the question is not simply a reproductive issue but rather an issue of distribution of resources and political power. This is the critique that Sophie Lewis articulates in her review of Donna Haraway's book *Staying With the Trouble*. Lewis argues that the call for "making kin not babies" reproduces the policing of racialized and poor women's bodies and fertility. As she writes, "There is no such orthodoxy, no such denial, when it comes to proletarian (especially black and brown people's) fertility rates. These have long been conceptualized as a threat and a problem including within feminism. On the contrary, critical demographers still have to fight hard to bring gross structural inequalities—in *mortality* rates rather than fertility—into the frame at all." Lewis, "Cthulhu." Haraway has responded, in a roundabout manner, by editing the book *Making Kin Not Population*, which takes up these complicated questions of reproduction, including in her own essay in the volume, "Making Kin in the Chthulucene: Reproducing Multispecies Justice."

52 Edelman, *No Future*, 3.

53 Edelman, *No Future*, 4.

54 Muñoz, *Cruising Utopia*.

55 I recognize that plastics and EDCs play a small role in the mass extinction events that we are currently living through, which can be properly attributed to loss of habitat, climate change, and overhunting. However, plastic cannot be separated from a petrocapitalist and extractivist logic that, in many ways, subtends these deaths. The chemicals also exacerbate existing threats, as reported in the 2012 study on EDCs by the World Health Organization: "EDCs, which have been increasing in the environment and are of recent concern, are contributing to current population declines in wildlife species. Wildlife populations that are also challenged by other environmental stressors are particularly vulnerable to EDC exposures." Bergman et al., "Impact of Endocrine Disruption," ix.

56 Bagemihl writes that "homosexual behavior occurs in more than 450 different kinds of animals worldwide, and is found in every major geographic region and every major animal group." Bagemihl, *Biological Exuberance*, 12.

57 Klein, "Naomi Klein."

58 Colebrook, "Sexual Indifference," 177.

59 Fan, "New 3D Printed Ovaries."

60 For an account of a radical vision of the possibilities of technological reproduction, see Sophie Lewis, *Full Surrogacy Now: Feminism against Family* (New York: Verso, 2019).

61 Ahuja writes, in a compelling article on queerness, mosquitoes, and the uneven

distribution of extinction, "What if many of those populations who do not, will not, or cannot sexually reproduce are in effect doing what growing swaths of humanity are doing: exercising a phantasmic 'choice' to refuse reproduction against an increasingly precarious world of unemployment, toxicity, and violence? Put simply, the sovereign choice to refuse reproduction may be redundant from the viewpoint of a late-carbon liberalism unwilling to distribute any more social goods and unable to guarantee life support." Ahuja, "Intimate Atmospheres," 376.

62 As Myra Hird writes, "Bacteria cross species barriers (indeed, bacteria cannot be referred to as a species), perform hypersex, pass on pure genes through meiosis, shuffle genes and successfully resist death. . . . Bacteria are not picky, and will avidly exchange genes with just about any living organism anywhere in the world, including the human body." Hird, "Animal Trans," 239.

63 Halberstam, "Anti-Social Turn."

64 Glavin, *Sixth Extinction*, and Kolbert, *Sixth Extinction*.

65 Thinking the "ambiently queer," as Ahuja calls it, "requires thinking askance the human and thinking death, animality, and vulnerability in an age of many extinctions—extinctions of taxonomized species, to be sure, but also more subtle orchestrations of racial precarity and quiet obliterations of histories that could have been. In a time of extinctions, lateral reproduction suggests not some transcendent space of queer negation . . . but a problem of rethinking our casual reproduction of forms of ecological violence that kill quietly, outside the spectacular time of crisis." Ahuja, "Intimate Atmosphere," 372.

66 Rosenberg, "Molecularization."

67 Rosenberg, "Molecularization."

68 It should also be acknowledged that numerous peoples, especially Indigenous and Black peoples, have already lived through the apocalypse. See, for example, Whyte (2016) and Risling Baldy (2014).

69 Chen, *Animacies*, 195.

70 Chen, *Animacies*, 211.

71 Murphy, *Sick Building Syndrome*.

72 She writes, "Imagining human corporeality as trans-corporeality, in which the human is always intermeshed with the more-than-human world, underlines the extent to which the substance of the human is ultimately inseparable from 'the environment.' . . . [B]y underscoring that trans indicates movement across different sites, trans-corporeality also opens up a mobile space that acknowledges the often unpredictable and unwanted actions of human bodies, nonhuman creatures, ecological systems, chemical agents, and other actors." Alaimo, *Bodily Natures*, 2.

73 Chen, *Animacies*, 211.

74 Bagemihl, *Biological Exuberance*, 251.

75 Muñoz, *Cruising Utopia*, 11.

76 Gumbs, *M Archive*, 12.

77 I mean proposition here as the type of proposal that Stengers refers to in "The Cosmopolitical Proposal." She says, "How can we present a proposal intended not to say what is, or what ought to be, but to provoke thought, a proposal that requires

no other verification than the way in which it is able to 'slow down' reasoning and create an opportunity to arouse a slightly different awareness of the problems and situations mobilizing us?" Stengers, "Cosmopolitical Proposal," 994.

78 Murphy, "Afterlife and Decolonial Relations."

79 Chen, *Animacies*, 220.

CONCLUSION. PLASTIC FUTURES

1 Benjamin, "Black AfterLives Matter," 49.

2 For more on the question of ethical or reciprocal relationality, see Arvin, Tuck, and Morrill, "Decolonizing Feminism"; Donald, "Forts"; Konsmo and Recollet, "Meeting the Land(S)"; Todd, "Indigenous Feminist's Take"; and Simpson, *As We Have Always Done*.

3 Jackson, *Becoming Human*, 15.

4 Ferreira da Silva, "Toward a Black Feminist Poethics," 85.

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