12

Polymeric Thinking: Allison Cobb's *Plastic: An Autobiography*

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As I write, in September of 2020, I am among billions of people across this planet attempting to shelter in place in order to control the spread of the novel coronavirus, SARS-CoV-2. This virus is generally thought to have entered the human population through close contact with bats, perhaps with wildlife-livestock acting as intermediaries. Such contact has been made inevitable by the dramatic expansion of human populations and the consequent encroachment of human settlements into other species' territories. Enacting the increasingly complex entanglements of human and more-than-human realms and revealing the high costs of often only partially anticipated anthropogenic transformations of the planetary environment, the current global pandemic is a phenomenon distinctly of the Anthropocene. In this context, the approach to autobiography that Allison Cobb takes in her hybrid text *Plastic: An Autobiography* (Nightboat Books, 2021) makes powerful sense.[1] For, unlike most Western autobiographies, hers is not the story of individual development within an exclusively human society. Implicit in its organization and contents is the recognition that a person can no longer imagine her/his/their life story as the tale of a relatively autonomous, self-determining being. Instead, as Cobb's title and her methods indicate, we in the twenty-first century—a period I have elsewhere dubbed the self-conscious Anthropocene[2]—must understand our life stories and our identities as inextricable from the histories of the objects and species around us, and also inextricable from human technology, which is bound up in military and imperial histories as well as changing environmental conditions. The life stories of even the most privileged and protected humans are intertwined with the movements of vulnerable refugee populations, with the suffering of oppressed groups, and with the adaptability or non-adaptability of more-than-human species. We need to understand our lives as thoroughly entangled with those of the creatures whose environmental conditions humans have in recent decades so drastically altered, and

with the substances as well as the machines that humans in the industrial age have invented. Among the most crucially influential, toxic, persistent, and pervasive of those substances is plastic. Whether we understand Cobb's title to mean that she traces the life of plastic from an inside perspective or that the story of her life *is* the story of plastic (or if both meanings seem operative), the invention of plastic, its current production, its consequences as waste, and a particular plastic car part are central to Cobb's "autobiography."

Plastic, especially plastic's polymeric form, possesses figurative as well as literal significance in this book. Polymers, a category that includes DNA and cellulose and many non-synthetic materials as well as synthetic ones, are large molecules made of chains of small molecules (monomers). Their forms may be branching, unbranched, or cross-linked, but they always involve covalently bonded chains or networks. Their architecture as extended chains developed from multiple units that bond together provides, I contend, a model for thinking about literary form, about the nature of the self, about social relations and responsibilities, and about ethics more generally. While attending to the damaging environmental entanglements of plastics Cobb tracks, this essay will focus on exploring the affordances of what I am calling *polymeric thinking*—thinking that's alert to or reaches for extending chains of connections that are demonstrated and advocated in this unconventional, particularly timely autobiography.

Polymeric form

Cobb's achronological work is composed of seventy-four titled sections of prose which sometimes shift to short-lined free verse. (Several titles, such as "Work," "Joy," "Zero," and "Desire," repeat.) These are gathered under three numbered headings—"I. THE THING," "II. REFUSE," and "III. THE LIVES," framed by an introductory section titled "GIFT: THE THING" and a coda, "LEGACY: 'THAT'S YOURS.'" The text is followed by notes containing scholarly citations as well as a "Selected Bibliography" with more than 150 entries. My assertion above that plastic is "central" to *Plastic: An Autobiography* may not be exactly apt, for the book lacks the single core and defined perimeter the term may imply. Even a synonym like "integral" may suggest a structure more neatly bounded than this autobiography. Ranging surprisingly in subject matter, it frequently shifts unexpectedly to a new focus or suddenly returns to an earlier one. While the book feels shapely—its shape depending in part on frequent returns to some apprehension of plastic—we are invited to understand this text as a fragment of something perhaps infinitely extending, part

of an always expandable network of "kaleidescopically interwoven" connections.[3]

Even Allison Cobb herself, at least as the self is usually understood, may not be "central" to this disjunctive autobiography, which reveals nothing of her education or professional development and depicts little of her personal life. Instead, because she is the daughter of a physicist who spent his career at Los Alamos National Laboratory, where the atomic bomb was developed, her recounting foregrounds the bomb's development, a tale that is inextricable from the life stories of Jewish refugee mathematicians and physicists such as Stan Ulam and Edward Teller. Developed partly through branching research into the military and technological past, her story also incorporates histories of others who were not part of the Manhattan Project, including Jiro Horikoshi, who designed the Zero fighter plane; American PBY pilot Elwyn Christman, who was shot down by a Japanese Zero; William Perkin, who produced in the mid nineteenth-century a fashionable purple dye from coal tar; and August Kekulé, who at about the same time intuited in a vision the ring shape of the benzene molecule, the bonding ability of which is crucial to the creation of plastic.

Plastic: An Autobiography does not open by dramatizing some foundational event in Allison Cobb's life; nor does it start by depicting an obviously foundational moment in the history of plastic. Instead, it recreates a moment from Stan Ulam's autobiography when he tells his wife that he "*found a way to make it work.*"[4] How better to convey an expansive interdependence essential to one's identity than to begin one's autobiography with a scene taken from another person's autobiography—in fact, a scene that was added as a postscript by that person's wife, making it her story as well? The moment with which Cobb opens occurred in 1951, decades before her birth. It is the history-changing day when Ulam figures out how to make "the Super"—the hydrogen bomb—work.[5] Cobb's curiosity in this section focuses less on the discovery than on the mathematician's eyes, which he turned toward his wife as he reported his breakthrough—eyes his wife says stared "unseeing" out the window. Only much later in Cobb's book, after intermittent sections have fleshed out Ulam's history in Lwów, New York City, Madison, and Los Alamos in the years before, during, and immediately following World War II, does the reader learn that what Ulam discerned that day depended on a new plastic, polyethylene, to ensure the hydrogen bomb would ignite. That is, not until the penultimate entry of "REFUSE" is the critical link between the developing technologies of plastic and of nuclear weapons apparent. (Only later, too, will the reader recognize seeing and not-seeing as a recurring thematic motif in Cobb's book.)

As this example suggests, the interconnections among the book's multiple story threads, reaching across time and space, are not always immediately evident, though they are real. The book's form, as I understand it, echoes the molecular structure of plastic. Cobb herself, attempting to map the book's themes and connections early in her work on it, "tried to make the map look something like a complex molecule."[6] Apparently, her map wasn't much of a success: "I have no skill for drawing," she writes.[7] Nonetheless, the book's form can readily be understood as *polymeric*, enacting the material as well as the social entanglements of our time, as it requires the reader to trace the sometimes subtle or unexpected chains linking its units—that is, to engage in polymeric reading. The author's prior tracing of these chains yielded the substance of the book, but her tracking process was far from linear; importantly, her representation remains true to the nonlinear complexity of both her investigations and the histories they expose. Hence the book's many-stranded structure, more weaving than collage, in which sometimes surprisingly interrelated narratives or topics disappear and resurface in irregular patterns.[8] The form dramatizes entanglement.

Environmentalists and environmentally inclined writers have often sentimentalized interconnectedness within the biosphere and sweetened the science of those interrelations, ecology.[9] Plastic, however, puts the brakes on such idealizing impulses, and often the interconnections Cobb reveals are deeply disturbing. While her narrative is shadowed always by the development (and the testing or deployment) of the atomic and hydrogen bombs, the primary object Cobb traces through the book is a piece of trash that blew into her yard: a black plastic car part that she determines, after considerable effort, comes from the fender of an early Honda Odyssey. This part has been designed to cover over the ugliness of "the car's raw metal underbelly, which betrays its brute machine birth and pierces the illusion of speed and ease the shining surfaces impart,"[10] and its polymerically expanded story is not a pretty one.

Contemplating the curved shape of this large plastic car part, "folded in half like a wing at its narrowest point," Cobb sees the image of "an albatross carcass bursting with plastic."[11] She is recalling a particular young bird, dead of starvation, from whose stomach the photographer Susan Middleton extracted—and then photographed—more than five hundred pieces of plastic that had been fed unwittingly to the chick in the fish eggs and other food gathered by its parents from the Pacific. Its fate is a common one among young albatross for whom adults, flying on the longest wings of any birds, forage far over the ocean. The accumulation of plastic waste in the environment, and particularly its

incorporation into ocean gyres, has meant its dangerous integration into food chains. While part of her would prefer to turn away from her vision of plastic's interconnections in the biosphere and be numb to its horrors, the persistence of this disturbing image of plastic's deadly entanglements hooks into her and pushes Cobb to follow their course. By the time she writes the book, she has grasped its inseparability from herself: "Me and this car part, its dirty carapace curled around me. There is no gap between us, no other 'out there' to access, by microscope or imaginative vision. Here we are. Together. And the industrial chemicals we share, the resonating molecules of our bodies."[12]

Among the plastic fragments in the albatross's belly, the earliest datable is a Bakelite fragment from the equipment, perhaps a bombsight, of World War II bomber squadron VP-101, a fact that leads Cobb to the story of Elwyn Christman (1915–1945), who flew—and died—in that squadron. In Cobb's polymeric work, the terrible violence of modern warfare is multiply interconnected with the development of plastic. The hydrogen bomb, for which the crucial part, as noted above, was plastic, provides one profound example. Radar technology, so important to the Allies' bombing campaigns, provides another: that technology depended on the development of insulating polyethylene, while carrying radar on airplanes required lightweight polyethylene cables. Moreover, radar, which dispensed with the need for a bomber to see his target and enabled continuous attacks regardless of cloud cover, "cemented the strategy of terror bombing cities, an approach for which the atomic bomb turned out to be the ultimate weapon."[13]

Pursuing the origins of her plastic car part as well as a better understanding of the impact of plastic production on human lives eventually leads Cobb to make several trips to areas of Texas and Louisiana where plastics are currently manufactured and to the communities, primarily communities of color, that are being razed to make way for today's vast production plants or being sickened by the chemicals the plants discharge. These often impoverished "sacrifice communit[ies]"[14] are the human equivalent of the albatross, Shed Bird, poisoned in capitalism's "global networks of consumption, waste, and pollution."[15] Much of the third section of the book, "THE LIVES," explores these issues of human environmental injustice, tracking what Cobb learns as she becomes involved with the environmental activists of Freeport, a town of 12,000 people on the Texas Gulf Coast, 65 percent Latinx and 11 percent Black, surrounded by nearly a dozen industrial plants. Among those plants is the complex of Dow Chemical, "the world's leading supplier of polyethelene," identified by the local chamber of commerce as "the world's largest integrated chemical manufacturing site":[16]

The Dow plant is called a "cracker." It takes molecules of ethane from natural gas and heats them to high temperatures, "cracking" them apart to form ethylene for plastic. It was the first in a $150 billion boom of chemical plants along the Gulf Coast, as companies looked to profit from transforming the oil and gas freed by fracking into products for the global economy.

The "cash cow" among those products, Cobb notes, is single-use plastic, the source of nearly inconceivable amounts of plastic waste piling up in landfills, accumulating in oceans, and washing onto beaches and shores.[17]

The most common chemical air pollutant in Freeport, Texas is ethylene, from which polyethylene is manufactured. Interacting with sunlight and other materials in the air, ethylene produces smog that consists mostly of ozone. Freeport's ozone levels have never met federal standards, and the asthma widely suffered in the population is only one of its health effects. An assessment by the Texas Department of Health of cancer levels in Freeport between 2000 and 2015 found that "[t]he number of all-age liver and intrahepatic bile duct, lung, nasopharynx/nose/nasal cavity and middle ear, and stomach cancers was above the range expected."[18] Dioxin, another toxic byproduct of plastic production, contributes to "cancer, heart disease, diabetes, endometriosis, early menopause, reduced testosterone and thyroid hormones, skin, tooth, and nail abnormalities, damage to the immune system."[19] It harms the central nervous system of developing fetuses. Cobb does not concern herself with the valuable uses of plastic, but with the multiple levels of harm to human and nonhuman bodies that have resulted from plastic's proliferation and its environmental entanglements.

From trans-corporeality to the extended polymeric self

In her books *Bodily Natures* (2010) and *Exposed* (2016), environmental humanities scholar Stacy Alaimo develops a concept of trans-corporeality, applicable to issues of environmental health and environmental justice, "that traces the material interchanges across human bodies, animal bodies, and the wider material world."[20] Material interactions that preoccupy Allison Cobb, such as the absorption by human and animal bodies of carcinogenic or endocrine-disrupting chemicals leached from plastics into the environment or ingested in water and food, or the absorption of nuclear radiation released by the deployment or testing of atomic weapons, are among those interchanges. Alaimo observes that, "[a]lthough trans-corporeality as the transit between body and environment is exceedingly local, tracing a toxic substance from production to consumption often reveals global networks of social injustice, lax regulations, and environmental degradation."[21] Cobb's tracing of plastic, prompted by a particular Honda part, nicely demonstrates Alaimo's point. Indeed, given that trans-corporeality is a "sense of the human as perpetually interconnected with the flows of substances and the agencies of environments," and that tracing trans-corporeal interchanges "reveals the permeability of the human, dissolving the outline of the subject,"[22] it's clear the term captures important dimensions of Cobb's orientation in *Plastic: An Autobiography*.

Some of Cobb's explicit meditations on the redefined nature of the self in our plastic-saturated world align strikingly with Alaimo's concept. One of these is the section "White Whale," where Cobb admits to having identified her title before knowing what it meant, and where she narrates a turning point in her thinking about the autobiography. This turning point occurs before the plastic car part enters her life and shortly after a beach clean-up expedition to Kamilo Point, Hawaii, where, encountering first-hand the plastic debris that washes up "twenty-four hundred miles from the closest continent," she is overwhelmed by the scale of the project she has taken on.[23] Not taking into account that the tale of plastic was already (trans-corporeally) her own, Cobb despairingly imagines she would need to travel to see all the plastic in the world in order to tell its story from the inside. Given that plastic, in addition to being constantly produced, is "impervious to flame, corrosion, electricity, water, decay, or other destructive force," its amounts are continually growing.[24] She thinks that in order to write *Plastic: An Autobiography* she would have to visit "every junk beach on the planet" where plastic accumulated, descend by submersible into sea canyons and beneath ice floes to witness the plastic collecting in the sea's depths, and even somehow become microscopic in order to slide as a tiny particle of plastic into the gut of a lugworm in beach sand. Feeling "incapable" of writing the book, she finds herself "paralyzed." Then, stepping outside her own door and picking up a weathered plastic ring that her dog seems to have chewed, she understands that she is already in it, that particles from that ring have made their way into the soil of her yard and will be incorporated into the peas she will grow and eat: "In there, along with whatever molecules make a pea, there might be a few broken free from the plastic bits, and whatever else has washed this coast in its sixty years as suburban tract: particles of soot from car exhaust, bits of mercury fallen with rain drops, asbestos slivers from the house shingles." Realizing that the plastic inside lugworms is already inside her, so that effectively she is inside the worm and the worm inside her, "sloshing molecules

back and forth," she rejects her earlier fantasies of "piloting around, the watcher peering out from her safe suit of self."[25] Cobb is determined to strip off that suit of bounded selfhood, which is more like the emperor's new clothes: a socially shared delusion. This section fits neatly with Alaimo's conceptualization of trans-corporeality, focusing as it does on bodily permeability, on the body's absorption of materials in the environment, and on a radical opening of the allegedly discrete self into a network of material agencies.

Yet Cobb's recounting of another turning point, when her twenty-year partnership with her wife unravels, reveals differences between Cobb's thinking and Alaimo's, as Cobb explores an expanding sense of relationality that seems to me better interpreted through the metaphor of the polymer than through metaphors of porosity. In this section, "Seed," Cobb announces, "The basic unit of existence is not the individual, but the relationship." She attributes this notion to the physicist Karen Barad—whose concept of agential realism has influenced many of those, including Alaimo, who are exploring new materialist thinking—and immediately quotes a passage from Barad's *Meeting the Universe Halfway*: "To be entangled is not simply to be intertwined with another, as in the joining of separate entities, but to lack an independent, self-contained existence . . . Individuals do not preexist their interactions; rather, individuals emerge through and as part of their intra-relating."[26]

Announcing that "All that exists is merging and overlapping phenomena," Cobb begins to define (polymerically) how she herself exists, starting with bodily connections but including relations that are also immaterial.

> I am of this: my mother, in cell and bone and breath. How could I not be? One nervous system takes shape enfolded within another. I am plastic blister pack, calculus, computer. I am nuclear weapon, and car part, and war. I am—deeply—of my father.
>
> I am of Jen also, this "we" out of twenty years twined together. But something happened. Our entanglement started to fray and falter. Loss. Jen and I began to split.
>
> And then I was—what?[27]

What makes this autobiography so compelling is a capaciousness evident in this passage: The writing pursues Cobb's interest in what is—or comes to be—materially part of cell and bone and nervous system, including not just one's genetic heritage but also chemicals or nuclear radiation absorbed into human or animal bodies from anthropogenic materials released into the environment. Her interest in these bodily conditions draws her into environmental justice concerns involving the

lives of those most directly affected by plastic production. Yet she is no less invested in emotional connections and in interconnections across time and space that are far less directly material—including Cobb's intangible connections to centuries-old mathematical disciplines like calculus, to Stan Ulam and Jiro Horikoshi, and including semantic links between words' current meanings and their etymological roots. This range of relationality is more readily captured in the figure of the polymer—of extending chains of linked entities—than in conceptions based in the permeable body.

Representing polymeric relationality: Cobb and Jiro Horikoshi

To demonstrate how such polymeric relationality functions in the book, let us consider the example of Cobb's entanglements with Jiro Horikoshi (1903–1982), whose story occupies four sections about midway through *Plastic: An Autobiography*. Presumably, the chain that led to her researching his life began with the fragment of plastic from the World War II bombing squadron found by Susan Middleton in Shedbird's stomach; from there, inquiries on a veterans' Listserv led Cobb to the nephew of a man whose journal entries recounted flying in that squadron under the command of Elwyn Christman, who in turn was shot down by the Japanese Zero, an astonishingly light and maneuverable plane designed by Horikoshi.[28] Only a few lines into the first of the sections about Horikoshi's life, titled "Grief," Cobb attributes something she recounts to his autobiography. As she did with the book's opening depiction of Stan Ulam that enfolded his autobiography into hers, Cobb thereby creates an expansion of self through mirroring reflection.

Thematically, Horikoshi's dreaming of flight links him to multiple flyers appearing in Cobb's book, from albatross, to bomber pilots like Christman, to the Al Qaeda suicide bombers of 9/11. Like Ulam and those working on atomic weapons, this aircraft designer was pushing the boundaries of technology for military advances. And, as was true for his American counterparts, much of what his remarkable inventions enabled was utterly horrifying. His first breakthrough in fighter planes, the Type 96, made possible the Rape of Nanking[29]—though bearing no responsibility for the preexisting motivations for that massacre and mass murder (vengeance, xenophobia, etc.). His next design triumph, the nimble long-range fighter aircraft, Type 00, dubbed the Zero, for a while gave Japan a tremendous advantage in the air war. Cobb, while highlighting the links between technological advances and violence or harm, pursues other threads as well. The aircraft's number prompts meditations on zero that extend ideas introduced in

early sections' ruminations on zero (e.g., "ratios cannot be made with zero. Zero consumes all relations"[30]) and on nothing. The etymological roots of the word "nothing" intertwine a negation ("absence, a lack") and an affirmation ("vital force, long life").[31] That no/yes combination captures Cobb's own relation to ongoing environmental degradation, as at once a preference for numbness, "the uniform distanceless" (an allusion to Heidegger on technology in his essay "The Thing") and a desire to touch and be touched by the painful shards of the world.[32] Her meditation on zero in connection with Horikoshi also furthers the book's interest in circular forms, particularly rings in motion, things that bend and come round again—as in the benzene molecule and the recurring figure of oroboros. Horikoshi's character and life story take shape, then, via elaborate entanglement in the intellectual web of this book.

From polymeric thinking to ethical responsibility

One of the most important ideas to emerge from Cobb's pursuit of Horikoshi's story within her own comes from her polymeric investigative reading in the disputed history of the Rape of Nanking. In a "beautiful essay" by Simon Han, she finds the following: "Perhaps in a world that tells us how to feel about our past, a way forward is to ask a different kind of question—not how a scar came to be, but how it hurt. How it continues to."[33] (The emphasis on continuance may bring to mind the endurance of plastic, how "[i]t fails to disappear," further reinforcing concerns with the ongoing character of historical damage.[34]) Han's sentences subsequently become a kind of refrain in *Plastic: An Autobiography*. They resonate powerfully with the kanji, presented at the close of "Remember," used by Japanese speakers to designate what English speakers call "ground zero": three characters that mean "blast / heart / place."[35] For while the English phrase points only to a location, the Japanese one speaks also of a bodily organ that is subject to both physical and emotional wounds. The three kanji descending in dramatic boldface alongside their English translations remind the reader that the scar most salient to Cobb's history comes from atomic weaponry. Inclusion of the word *heart* in the sign system of the bombs' victims may be a reminder, too, of somatic vulnerability, of trans-corporeality. Yet "the way forward" requires an attention to ongoing suffering for which the notion of scarring is more metaphorical than literal.

Cobb does not treat this as an either/or choice. Clearly, she wants her readers to remember the dreadful wounds inflicted on humans and the environment during World War II and in the subsequent Great Acceleration—damage that is in crucial ways material, somatic. Thus, in late sections of the book, Cobb provides often horrifying information about the testing of atomic weapons by the US on Enewetak and Bikini Atoll in the Marshall Islands, about the colossal amounts of radioactivity generated on the land and sea there, and about the US government's treatment of the Marshallese as another sacrifice community. Recognizing harm to bodies and to ecosystems is crucially important to Cobb. At the same time, her book's structure insists that the ways we are consequentially entangled with others are not only material. Its many polymeric threads emerge from her painful awareness that her upbringing, with its experiential and educational privileges—material that might be covered in a more conventional autobiography but is largely elided here—was supported entirely by her father's professional involvement with nuclear weapons. Cobb's sense of transgenerational entanglement in an unfathomably violent and destructive history, which accounts for her incorporating Ulam's fateful discovery and Horikoshi's inventions as parts of her own story, does not depend on the bodily permeability of trans-corporeality. Moreover, the aim of her autobiography is neither self-flagellation nor the denigration of physicists and engineers; nor is it simply to remind readers of the horrifying and lasting material consequences of atomic radiation or plastic production. Simon Han's sentences bring into focus her overriding aim: to move forward from past harm via an ethical understanding of the thoroughness of our interrelation, and of our consequent responsibility for and to one another's pain.

Alaimo and Barad both speak to the ethical implications of the versions of interconnected being in which they are invested. Alaimo writes, "trans-corporeality as an ethical practice requires not only that citizens seek out information . . . about risks to their own health but also that they seek out information about how their own bodily existence—their consumption of food, fuel, and specific consumer products—affects other people, other animals, habitats, and ecosystems."[36] Barad closes her massive volume with a grand and powerful plea for an ethics appropriate to our essential intra-relatedness, worth quoting in full:

> If we hold on to the belief that the world is made of individual entities, it's hard to see how even our best, most well-intentioned calculations for right action can avoid tearing holes in the delicate tissue structure of entanglements that the lifeblood of the world runs through. Intra-acting responsibly as part of the world means taking account of the entangled phenomena that are intrinsic to the world's vitality and being responsive to the possibilities that might help us flourish. Meeting each moment, being alive to the possibilities of becoming, is an ethical call, an invitation that

is written into the very matter of all being and becoming. We need to meet the universe halfway, to take responsibility for the role that we play in the world's differential becoming.[37]

Cobb, too, seeks an ethical enactment of the ways in which we are bound to others—to people and actions from the past as well as to human and more-than-human beings in the present. She states directly what she has come to understand: "by remembering across generations and without refusal our pained entanglements, and by being responsible, answerable to that pain, we can carry each other into a past that might make a living future."[38] This is the most hopeful potential affordance of polymeric thinking and a polymeric understanding of the self.

Perhaps paradoxically, in limited ways both Cobb's father and Horikoshi begin to model such a taking of responsibility, by acknowledging harm in which they have been directly, or through chains of relations, implicated. Her father, who arrived in Los Alamos a quarter century after bombs were dropped on Hiroshima and Nagasaki, "spent most of his career at Los Alamos in nonproliferation, working to stop the spread of nuclear weapons," even serving as Director of Threat Reduction.[39] Horikoshi revealed in his 1970 book about the development of the Zero fighter how he had wished to include "at least a paragraph of protest" in a solicited essay in praise of the kamikazes that he reluctantly produced in 1945; at the time his muted objections to the focusing of human ingenuity on the development of weapons were registered in his statement: "We have reached the limits of human intelligence and have selfishly tried all kinds of methods to make effective adjustments to our limited human and material resources so that new arms could emerge."[40]

While such steps aimed at preventing repetition of past errors represent a beginning, they are insufficient means of confronting how, in Han's terms, the scar hurt and continues to hurt. With the help of her Japanese friend Yukiyo Kawano, Cobb comes to appreciate authentic apology as a fuller resource for confronting past suffering in which one is complicit and for facing the ongoing damage. Apology has an important place in Japanese culture, a form of politeness that grows from empathy and respect;[41] Cobb does not try to unravel its cultural significance, but through interactions with Yukiyo, a third-generation *hibakusha* (survivor of either of the atomic bombings) whose maternal grandfather also probably fought in the Battle of Nanjing, she comes to take very seriously the ethical force of apology in a world of relational entanglements. Apology is particularly powerful, for both the entity making and the entity receiving it, when it becomes a "way of being."[42]

Prompted by Yukiyo first to consider the possibility that a particular white poet in Portland, working on a project "regarding the poisoning of the Willamette River," might apologize "to the river, to the Chinook salmon, to native communities, to all harmed by white colonizers" and then the possibility that Cobb herself, if she were performing in Los Alamos, might apologize "to all those displaced and harmed by the nuclear lab," Cobb initially resists. She thinks of the impossible scale of the apology she would have to give "for everyone harmed all around the world by nuclear radiation, to all beings."[43] That perception of impossibility echoes the moment when she had felt paralyzed by the scale of what she imagined she would have to be responsible for in narrating the autobiography of plastic. And the resolution on this occasion similarly involves a kind of scaling down via a response to what is immediately present. In this case it's an apology she finds herself making specifically to one link in that vast chain of irradiated beings:

> "Yukiyo," I said, "I'm sorry. Your family has suffered so much from nuclear weapons and war. You've lost your mother, your uncle, your aunt, and had such hurt and fear in your family, and in your own life." Yukiyo—she looked in pain. Tears came up in her eyes and spilled down her cheeks. I put a hand on her arm, tears came up in me also. I didn't know fully what to say. I fumbled—it's not as clear as I'm writing it here—but the words came out, from my body, my heart and my guts, not my head. I felt it all through me, that state. The state of being sorry. It hurt, because it required really seeing Yukiyo, and knowing and feeling how she has suffered. It required seeing myself also, or feeling myself, and the harm my privilege carries. It felt like release, like something broke free in me.[44]

It's worth observing that there is a "myself" in the passage that is a particular privileged individual, just as there is a defined Yukiyo with a distinct family history. The self is not dissolved in this perspective but exists in a state of polymeric entanglement, analogous to a monomer molecule—one that can react with other molecules—bonded with others in a polymeric chain. If we think of autobiography as necessarily a document of memory, the point seems to be that if the writing is to be ethical, the memory it relies on must expand across time and space beyond the merely personal. Cobb's autobiography has to remember her painful multigenerational nuclear entanglements as well as her participation in the "consume-and-dispose violence" of plastic.[45]

Not seeing the self as isolated yields an expanded sense of agency, which means that responsibility, too, is not neatly bounded. In "Wind," Cobb presents a sharp critique of the romanticized vision

of Horikoshi's life created in Miyazaki's 2013 feature film *The Wind Rises*, because of its avoidance of responsibility. The animated movie features "gorgeous dream sequences of Horikoshi flying fantastical airplanes that resemble birds or sea creatures." It transforms the obsessively dedicated engineer often hobbled by ill health into a heroic, if dreamy, figure. One of his invented exploits, in which he rescues a young girl and her governess from the burning city of Kanto, carrying the governess on his back, might bring to mind Aeneas rescuing Anchises and Ascanius from burning Troy. Yet, Cobb notes, for a hero he is also rendered "strangely passive"; "[t]hroughout the movie, the plane designers are depicted as lovers of knowledge and beauty swept along by impersonal forces." Aircraft are presented as "destined to become tools for slaughter and destruction."[46] Repeatedly in the movie rising wind is used to signal the fate governing human destiny. Cobb's critique is largely implicit, but clear: the responsibility for what Horikoshi's airplanes did lies with people and the choices they make, not with their machines or some controlling fate.[47]

Throughout the book, her presentation of individuals' choices is compassionate. Her narration makes clear that many of those most directly responsible for the atom bomb had suffered terrible losses due to Hitler; a Jew like Ulam, many of whose family members had been murdered by the Nazis, had good reason to fear Axis victory and devote himself to developing the awful weapon to defeat them. "Fear drove them," Cobb observes of the refugee scientists.[48] But that understanding does not prevent her from taking issue with Ulam's retrospective attempt in his own autobiography to avoid moral responsibility by separating his theoretical work on the bomb from the political contexts and historical consequences with which it is in fact entangled.[49] The authentic apology that she learns from Yukiyo to value acknowledges agency and takes responsibility, and the more it encompasses, the more it registers the thoroughness and sweep of an agent's entanglement in the lives of other beings.

Honda and Dow Chemical offer no apologies. Far from it; instead, they enact the "hierarchy of values in global capital: stuff comes first; consumers—the people who buy the stuff and keep profit flowing—come second. The lives of those who might interrupt this flow have negative value. They are obstacles for removal."[50] To expand ports for commerce, Dow and other chemical companies force land sales, breaking communities already rendered vulnerable by long histories of racial oppression; they use their wealth and power to avoid restrictions on pollution to air and water, and to avoid responsibility for the lives and bodies they damage. These corporations do

everything they can to generate among consumers a sense of endless unsatisfied desire so that the public will consume (and discard) more and more plastic products. But even as Cobb reveals their consequential abuses, she discourages adoption, at least by middle-class readers, of a sense of righteous removal from corporate wrongdoings. This is a crucial contribution of polymeric awareness; it requires recognition that our entanglements extend in every direction. We Western consumers cannot understand ourselves as apart from Dow Chemical any more than we exist apart from the albatross that is its victim; if we are white, we cannot imagine ourselves disentangled from the violent structure of white supremacy that allows companies like Dow readily to sacrifice poor Black and brown lives.

The important question, of course, concerns our collective course for the future. Partly through her interactions with African American activists, for whom mere words like "I'm sorry" coming from a privileged white woman like Cobb are meaningless, she comes to understand apology as "a long-term commitment, an ongoing relationship," with three key components: regret, responsibility, and remedy. She recognizes that the kind of apology needed in our "white supremacist, heteropatriarchal culture, built and organized around the notion that certain lives are disposable" will require cultural transformation "from the root."[51] When at the book's end the tour leader at the Honda plant refuses to take back the plastic car part, telling Cobb's partner's daughter, "That's yours," the woman speaks a polymeric truth.[52] Of course, it is most definitely Honda's as well, even if Honda refuses to acknowledge that responsibility, but the plastic in our world affects all of us in our polymeric entanglement and becomes a massive responsibility we must all embrace.

Polymeric thinking doesn't in itself provide answers to the problems we face, but it does provide appropriate frameworks for understanding them and for seeking solutions. The implications of this vision—of a perceptual lens that brings into focus the thorough entanglement of the present and future with the past, of the violence of war with patterns of capitalist consumption, of industrial development with racial inequities, of human bodies with those of other species, and of all living bodies with the anthropogenic chemicals and radiation strewn through the environment—go well beyond literary form or genre. As new materialist scholars in the environmental humanities have recognized, an understanding that humans exist interactively with the nonhuman realm denies human exceptionalism and undercuts arrogant pretenses to human mastery and control. A polymeric understanding of the self as more defined by its interrelations and thereby more expansive than has been previously recognized in Western thought

may enhance our ability to grasp the realities of our environmental situation. It's a disconcerting irony that plastic polymers, even as they litter and poison our material world, suggest a fruitful ontology and an appropriate ethics for our environmentally precarious time.

Trans-generational remembrance

Having begun this essay positioning myself, I will end it, oroboros fashion, by doing so again and at somewhat greater length. For what I have not yet acknowledged is that, like Allison Cobb, I am a daughter of Los Alamos, although I never lived there. Like Cobb's father, mine earned a doctorate in high-energy physics. His degree was supervised by J. Robert Oppenheimer at UC Berkeley in the late 1930s. I believe he was working at Columbia in 1941 when Cobb describes Edward Teller and Enrico Fermi there, strolling in Manhattan and considering the possibility of an atomic bomb that could ignite thermonuclear fusion.[53] Later in the war, my father joined the scientists at Los Alamos working on the bomb. He died of cancer at age fifty-nine when I was eighteen, and though I recall his deep loyalty to Oppenheimer (who, I've been told, charmed me as a child by blowing smoke rings), I don't remember him ever talking about his time at Los Alamos. My father was a modest person, and it may have been he who led me to think of him as occupying a lowly position there, similar to the women who served as computers, working with pencil and slide rule—always in his jacket's inside breast pocket—to produce endless calculations on pads of lined paper. Allison Cobb herself, when I wrote her acknowledging this connection between us, tracked down his badge photo at the Lab and informed me that he was, at least briefly, a leader at the Lab working on the hydrodynamic lenses for the plutonium bomb. I knew him as someone, like her own father, invested in nuclear nonproliferation. Yet I have always carried, as an albatross around my neck, a burdensome awareness of entanglement in atomic warfare and the nightmarish possibility of its future recurrence.

There are passages in Cobb's book that enfold my own biography. One occurs in the section titled "Lament," where Cobb recounts a reading of ecopoetry she gave at the University of Hawai'i in 2014—a visit, she notes, that "marked [her] place in a long lineage: white settlers imbued with authority to speak as protectors and defenders of the ecologies they helped wreck." As a white ecocritic from a major research university whose father helped develop the atom bomb, I have acquired a comparable guilty authority. So I find it particularly meaningful that Cobb goes on to remind her readers of the range of things that bind us, the no and also the yes:

> The word "complicit" comes from a root that means to fold, or weave together. I stood before students and colleagues in Hawai'i, threaded to them by the violence I carry, in my ancestry, in my body, in my every step and breath. Other threads also tied us together—the care and concern we shared.
>
> "Concern" comes from a root that means to sift or sieve, plus "con," the root for together. To sift or sieve together. It suggests a mixing in which the constituent parts retain their integrity. A weaving that displays each original color. This mix of students, poets, teachers—all of us in this place with our particular heritages, our histories, our unequal suffering, our stakes. It was our care—whose earliest meaning was mourning—that held us there.[54]

Material things bind us as well, and plastic is one of them. Much of the rest of that section of *Plastic: An Autobiography* treats the history of anthropogenic threats to albatross, including the threat posed to albatross and seabirds worldwide by plastic. Linking birds to humans, it ends with information about the environmental impact of plastic on humans:

> A 2020 study found invisible plastic particles suspended in the air and raining down everywhere the researchers looked, so much plastic they kept rechecking their results. They concluded plastic fallout exists in "every nook and cranny" of the planet. Like birds, people eat and breathe it; on average the weight of a credit card in plastic goes into people's bodies each week. Scientists also found plastic particles in placenta that nourishes human fetuses. No one knows what this means for us—we all, the concerned, threaded together.[55]

What Cobb's readers *have* come to know is that remembrance, including the recollection of past harm and suffering and injustice, will be necessary to the generation of a survivable future.

My father is similar to numerous men in Cobb's book in having chosen not to talk about his involvement in war or damaging invention. Her own gentle grandfather, for instance, did not speak of having, in the war, killed at least one Japanese man with just a knife. We may sympathize with their desire to leave painful or morally fraught memories behind, but the polymeric thought that Cobb practices and advocates insists that we will move into a better future only by recognizing the past and its shards in the present. By giving an expansive polymeric form to her autobiography, Allison Cobb is breaking what Miss Jessie of Freeport, Texas calls "the generational curse": "'The older generations didn't talk about their lives,' she said. 'But if you don't know what happened to your mother and your grandmother, and the one before her, and the one before her, how can you change the future?'"[56]

Notes

1. Allison Cobb, *Plastic: An Autobiography* (New York: Nightboat Books, 2021). I was given advance access to the manuscript, for which I wish to thank Stephen Motika, Director and Publisher of Nightboat Books, and Allison Cobb.
2. Disengaged from debates about the dating or validity of the Anthropocene as a geological epoch, the self-conscious Anthropocene names our era of widespread, often anxious awareness of the profound impact industrialized humans are having on planetary systems. It designates a cultural reality, not a stratigraphic one. For elaboration of this concept and explanation of its dating from 2000, see the opening pages of Lynn Keller, *Recomposing Ecopoetics: North American Poetry of the Self-Conscious Anthropocene* (Charlottesville: University of Virginia Press, 2017).
3. Cobb, *Plastic*, "GIFT: THE THING," 4–5. Cobb's having earlier published, through Essay Press, a much shorter version online may itself demonstrate the work's flexible boundaries.
4. Cobb, *Plastic*, "Work," 9.
5. Ibid. 10.
6. Cobb, *Plastic*, "Refusal," 99. The exercise reveals to Cobb her own erasure of women as she has traced "histories of plastic, of the atomic and thermonuclear bombs, World War II airplanes, European canonical writings. White men dominated these accounts" ("Refusal" 100). Anger at silences that she herself had accepted and repeated led her to temporarily abandon the project in order to write the poems of *After We All Died*. The final version of *Plastic: An Autobiography* incorporates extended histories of individual women scientists whose contributions to knowledge have been erased or downplayed—Ida Noddack, Lise Meitner, Mary Tsingou (Menzel)—as well as discussion of the work done at Los Alamos by groups of women, often scientists' wives, acting as computers, crunching numbers on calculators, or programming the digital computer, once it came on line. To my chagrin, few women figure in my own abbreviated analysis here, so that I have repeated the erasure that Cobb, in a deliberate effort to remember women, worked to correct. Later parts of her book delve into activism by people of color whose communities on the Gulf Coast are most directly harmed by plastic production in the United States.
7. Cobb, *Plastic*, "Refusal," 99.
8. Donna Haraway's tentacular thinking may come to mind here; see Donna J. Haraway, *Staying with the Trouble: Making Kin in the Cthulucene* (Durham, NC: Duke University Press, 2016). But while Cobb, like Haraway, would reject notions of the bounded individual or thinking in terms of the human individual plus context, the notion of the polymer seems to me more appropriate than that of the tentacular organism because of Cobb's ties to atomic and molecular science and her focus on the plastics developed with increased human ability to manipulate polymers. Cobb acknowledges what she terms both the no and the yes involved, as polymers are not inherently good or bad, while Haraway wants to advance the tentacular as a solution to the wrong thinking of the past. Later parts of this essay will flesh out additional reasons for the appropriateness of the polymer as explanatory model here.
9. See Dana Phillips, *The Truth of Ecology: Nature, Culture, and Literature in America* (New York: Oxford University Press, 2003) for a sharp critique of ecocriticism's uses of ecology.
10. Cobb, *Plastic*, "Car Part," 29.
11. Cobb, *Plastic*, "GIFT: THE THING," 4.
12. Cobb, *Plastic*, "Desire," 75.
13. Cobb, *Plastic*, "Radar," 137.
14. Cobb, *Plastic*, "Risk Factor," 202.
15. Stacy Alaimo, *Exposed: Environmental Politics and Pleasures in Posthuman Times* (Minneapolis: University of Minnesota Press, 2016), 113.
16. Cobb, *Plastic*, "Freeport," 189.
17. Cobb, *Plastic*, "Lights," 196, 197.
18. Cobb, *Plastic*, "Risk Factor," 161.
19. Cobb, *Plastics*, "Tired," 235–6.
20. Alaimo, *Exposed*, 112.
21. Stacy Alaimo, *Bodily Natures: Science, Environment, and the Material Self* (Bloomington: Indiana University Press, 2010), 15.
22. Alaimo, *Exposed*, 112.
23. Cobb, *Plastic*, "Gyre," 52.
24. Cobb, *Plastic*, "Infinity," 62.
25. Cobb, *Plastic*, "White Whale," 54–5.
26. Cobb, *Plastic*, "Seed," 129. The ellipses appear in Cobb's text.
27. Ibid. 157.
28. Cobb's recounting of the aircraft's development makes clear that, had Allied officials been less arrogant and less racist, they might have anticipated the threat posed by Japanese ingenuity; a retired pilot "repeatedly tried to warn US, British, and Australian officials about the Zero. They ignored his reports. No one believed the Japanese could create such an advanced machine. They concluded the defeats in China must have resulted from lack of skill among Chinese pilots. To Western powers, the Zero remained a blank, invisible" (Cobb, *Plastic*, "Job," 139). Had their sight been less occluded, perhaps Christman and other US airmen would have been spared.
29. The march of Japanese troops into the capital city of Nationalist China, Nanking (or Nanjing), on December 13, 1937 was preceded by aerial bombardment that "emptied the skies of Chinese fighters." For more than a month the Japanese soldiers then "went on a rampage, raping and murdering hundreds of thousands of people" in that city. (Cobb, *Plastic*, "Grief," 128).

30. Cobb, *Plastic*, "Zero," 14.
31. Cobb, *Plastic*, "Nothing," 15.
32. Cobb, *Plastic*, "Work," 20.
33. Cobb, *Plastic*, "Grief," 129.
34. Cobb, *Plastic*, "Refuse," 86.
35. Cobb, *Plastic*, "Remember," 131–2.
36. Alaimo, *Exposed*, 127.
37. Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007), 396.
38. Cobb, *Plastic*, "To Live," 150.
39. Cobb, *Plastic*, "The Thinker," 156.
40. Cobb, *Plastic*, "Job," 142.
41. An earlier draft of Cobb's book, which included longer treatment of Horikoshi, told of his making an apology: when an early version of the Zero disintegrated in a 1940 test flight and the pilot was killed, he rushed by train to the airfield and apologized to the director of flight testing.
42. Cobb, *Plastic*, "Sorry," 170.
43. Ibid. 170–1.
44. Cobb, *Plastic*, "Sorry," 171.
45. Cobb, *Plastic*, "GIFT: THE THING," 6.
46. Cobb, *Plastic*, "Wind," 143–4.
47. Concerned with critiquing the use of notions of fate or destiny to absolve leading aircraft designers Caproni and Horikoshi of responsibility for their inventions, Cobb is not here exploring how people's choices may be genuinely constrained by the power of the states in whose interests wars are waged.
48. Cobb, *Plastic*, "Adventure," 89.
49. Cobb, *Plastic*, "Boy," 266.
50. Cobb, *Plastic*, "Heartland," 204.
51. Cobb, *Plastic*, "Life," 239.
52. Cobb, *Plastic*, "LEGACY: 'THAT'S YOURS,'" 294.
53. Cobb, *Plastic*, "Adventure," 91–2.
54. Cobb, *Plastic*, "Lament," 111.
55. Cobb, *Plastic*, "Lament," 115.
56. Cobb, *Plastic*, "Remember," 217.

13

Plastic City: Temporality, Materiality, and Waste in Vanessa Berry's *Mirror Sydney*

Emily Potter and Kirsten Seale

This chapter thinks through the ubiquitous and dynamic life of plastic as it contributes to the imaginary and material landscapes of Australia's largest city, Sydney. Using *Mirror Sydney: An Atlas of Reflections*, a book-length work of "creative cartography" by writer and artist Vanessa Berry, as our guidebook to Sydney,[1] we theorize plastic as a symbolic and material actor whose dissonant temporal presence simultaneously supports and challenges subjective and objective visions of Sydney as progress-oriented and capitalist-efficient. Considered through new materialist terms, plastic brings realities into being by actively informing and shaping human practices and modes of inhabitation. Plastic is the ultimate agent of modernity. In this guise it appears as a "futural form"[2] indexical to and bringing about the world to come. At the same time, plastic also enacts multiple and at times dissonant temporalities and realities that are coexistent rather than linear.[3] It is a material constituent of many of today's disposable commodities, which will inevitably be consumed or thrown away. As deferred trash, plastic is an anachronistic presence in its refusal to integrate into a forward-focused sense of time.

In a similar way, Berry's encounters with tangible artifacts of an urban past that have been thrown away produces a counter-narrative to the hyper-modern story of Sydney as global city. Responding to what she sees as "Sydney's drive towards reinvention,"[4] Berry's concern is to uncover and document the complexity and ephemerality, but also the dense histories, of urban places through practices of wandering, mapping, and narrating localized situations of inhabitation in contemporary Sydney. These situations and Berry's "wandering" of sub/urban places belong to a performative methodology of "subversive mappings"[5] of city space, where dominant or official narratives of place are disrupted through the unpredictable encounters that the urban context affords. Place stories are "found" and recollected through the embodied mobility of the writer moving through