

Breathing Late Industrialism

CHLOE AHMANN¹
CORNELL UNIVERSITY

ALISON KENNER²
DREXEL UNIVERSITY

Abstract

Breakdown, trespass, seepage, degradation: this is late industrialism. Over the past decade, the term has become synonymous with collapse, describing everything from crumbling infrastructure to outmoded paradigms. But the “late” in “late industrial” carries radical potential, too. It points toward the possibility of another world taking shape within the wreckage as people retrofit broken systems, build flexible coalitions, and work creatively with time. In this collection, we train our eyes on these refashionings, asking how late industrial systems might be put to life-affirming work. Specifically, we track cases where breath, air, and atmosphere help inaugurate a “phase shift” (Choy and Zee 2015) from breakdown toward worlds otherwise. Breath has sentinel qualities: it can warn of trouble in the air. But it is also an animating force. Taking conceptual cues from this duality, contributors attend to late industrialism as it is sensed and transformed into something vital.

Keywords

late industrialism; breath; air; atmosphere; toxicity; climate change; infrastructure; environmental governance

Deteriorating industrial infrastructure, landscapes dotted with toxic waste ponds, climate instability, incredible imbrication of commercial interest in knowledge production, in legal decisions, in governance at all scales—this is late industrialism...People are struggling to breathe, and more so in some places than others...We need to keep this in mind, catching our breath occasionally as a way to think about the conditions of our times, and the demands they put on us.

– Kim Fortun³

¹ Chloe Ahmann, Email: chloeahmann@cornell.edu

² Alison Kenner, Email: amk438@drexel.edu

³ From Fortun (2014, 326).

At the very moment when the field pauses to catch its breath and take stock of its contributions to scholarly understandings of society, the political refrain “I Can’t Breathe” is the clarion call of a renewed movement for social justice.
– Ruha Benjamin¹

Catching Breath

To “catch one’s breath” is a peculiar phrase. This breath appears out of pace with the breather. It has twisted free and jumped ahead, leaving the sluggish body gasping to keep up. Which makes us curious: how far ahead is this thing, this breath? Is it future? Is it present? And in late industrial environments that leave so many in a haze, how might we follow breath become unstuck?

Breathing Late Industrialism proceeds in the spirit of these questions, beginning with tired 20th century orders and moving toward the lively but elusive forces they have spawned. We argue that late industrialism is a time of exhaustion *and* potential, both captured in the figure of one’s breath. Labored breath can weigh a body down or warn of trouble in the air (especially in a present marked by respiratory distress, as we discuss in detail later on). But it is also an animating force. Taking conceptual cues from this duality, contributors consider cases where trouble is sensed and then made the impetus for vital work. These cases shed light on the radical potential of the “late” in late industrial (also see Shapiro and Kirksey 2017, 489).

To be sure, there *is* trouble in the air. Among late industrialism’s many disintegrations, we count both outmoded infrastructure and exhausted regulatory paradigms—two problems that co-constitute each other. Since Kim Fortun’s inaugural essay on the topic, scholars have tracked how old industrial attachments continue to strain a range of “nested systems” (2012, 452): incessant growth imperatives that fuel high-risk production on infrastructures that are already over-stressed (Landa 2016; Livingston 2019; also see Perrow 1984); ideologies of containment that make it tough to perceive and regulate environmental toxics (Masco 2015; Reno 2016; Pitkanen 2020); a stubborn affection for “production, products, property, and boundaries” that misdirects our scholarly attention (Fortun 2014, 313); and the persistent question of whose epistemologies get to count as scientific knowledge (Babidge 2019; Todd 2018). And, of course, there are the hazy atmospheres that make us pause to catch our breath. These phenomena are not new. The point is that they persist in spite of industrialism’s purported obsolescence. Hence the argument implied by the “late” but denied by the “post”: these problems are inseparable from the order that produced them, even productive of it.

As an analytic, then, late industrialism names the trouble in the air as a predictable outcome of industrial order. But we think it could do more. “Late” suggests another world is

¹ From Benjamin (2016, 146).

² Here, we have in mind Kurt Vonnegut’s signal word for time travel: “Billy Pilgrim has come unstuck in time...” (1969, 29). As we conceive it, breath has a similar capacity. Specifically, it has sentinel qualities (see n15) that point toward a world beyond the strictures of the present.

present *now*, beckoning old structures to catch up. “Late” also describes the end of things. This is the meaning captured in other “lates” (late capitalism, late liberalism), which conjure worlds careening toward implosion. Here, the modifier seems prophetic. It signals we will meet the end of one era and get on with the next before too long.

Despite the large and growing literature on late industrialism, though, the end has sucked up more than its fair share of air. Plug the term into your scholarly search engine of choice and peruse its correlates. Breakdown. Trespass. Seepage. Degradation. This is late industrialism. “Things are falling apart” in a world where people drink from aging pipes and drive over uninspected bridges (Fortun 2012, 449). Experts puzzle over infrastructures out of time (Knowles 2014). Containment ponds are literally bursting at their seams. And it is difficult to breathe (Dillon and Sze 2016; Simmons 2017). In fact, late industrialism is marked by an asthmatic quality that is both figurative and literal. Figurative in the sense that our vital infrastructures fail us; literal in the sense that many choke on the substance meant to give them life (Sloterdijk 2009; Kenner 2018).

There has been good reason for this focus. We have had some diagnostic work to do. But one of the original promises of “late industrialism” was the push past diagnosis—the invitation to tinker with all these broken systems and “bring forth a future anterior that is not calculable from what we now know, a future that surprises” (Fortun 2012, 450). We think the time has come for a shift in attention from the sluggish, gasping body to breath itself: a lively force. Because late industrialism is not only about breakdown. It is also about retrofitting infrastructure (Howe et al. 2015), “making do” with low-cost tools (Wylie et al. 2017, 401), crowdsourcing elusive data (Allen 2003; Brown and Mikkelsen 1997; Corburn 2005; Ottinger 2017), and working creatively with time (Ahmann 2018). Late industrial environments may be marked by the degradation of old systems, but they are hardly inert ruins. They are alive with residues (Boudia et al. 2018) that can stir people into new, sometimes sublime engagements with the world around them (Shapiro 2015). And those residues can themselves breed “alterlives.” Alterlives, as Michelle Murphy describes them, are lives irreversibly altered by petrochemical world orders, but lives that are not over. They are *still breathing*, still “open to alteration” within the mess of chemical, colonial, and racialized violence (Murphy 2017, 500; Tsing 2015). Following Black and Indigenous studies scholars who have flagged the problems of overemphasizing damage (see, especially, Tuck 2009; Sharpe 2016; Hartman 2019), we begin with the mess but do not end there. After all, for many living in the contemporary moment, late industrialism is more than a set of problems. It is also the context, and sometimes the model, for efforts to live otherwise.

Consider another “late” as a comparison: Marx’s vision of late capitalism (shorn, if possible, of its deterministic airs). Marx saw revolutionary potential in the intensity of its contradictions. Capital’s thirst for expansion, he and Engels threatened in the *Manifesto* (1848), would condition its demise. More important for our purposes, Marx predicted the revolution would emerge in the factory, when workers reclaimed the machines. So, too, perhaps, with late industrialism. Here we have a system unable to contain its contradictions (Blanchette 2020). But in its fraying edges, people are already finding infrastructures and discursive frameworks to claim as their own and recombine.

Authors in this collection train their eyes on these creative retrofits, asking how late industrial systems might be put to life-affirming work. And they call on STS to step up its engagement with such work, concretizing what it means to live this moment's contradictions by marshalling our collective expertise in knowledge, power, infrastructure, innovation, and design. Moving from Rust Belt cities to tribal lands, from carpeted classrooms to air-conditioned passageways, they track social, political, and epistemological projects that exceed industrialism's technoscientific frameworks, even while those projects work with its machinery. Along the way, breath, air, and atmosphere serve as concrete problems and as concept guides. In the articles that follow this introductory essay, we meet activists who fight "bad air" by building "atmospheric coalitions" (Ahmann, this thematic collection), breathers who find solace in "respiratory publics" (Nguyen, this thematic collection), citizens who politicize ambient pollution by stretching the limits of municipal reporting (Kenner, this thematic collection), mothers who agitate for safer indoor air (Grandia, this thematic collection), and Indigenous communities whose efforts give lie to industrial dichotomies like nature and culture (Zahara, this thematic collection), earth and sky (Grant, this thematic collection). In every case, late industrial breakdown appears, but it is just half of the story. The other half comes in the form of what Timothy Choy and Jerry Zee call a "phase shift," that curious capacity of atmospheric things to wrestle free and take shape otherwise (2015, 213). In the process of attuning to the latter, *Breathing Late Industrialism* follows the lead of late industrial subjects who know there is more to the present than disintegration. It seems we have some catching up to do. But STS scholars are poised to do this work. In the coming pages, we detail why.

Hazy by Design

Before moving toward the potential that inheres in the "late," it behooves us to acknowledge the exhaustion. In Fortun's (2012, 2014) framing, late industrialism describes a world in shambles that we can't clean up because our tools are hamstrung by outmoded paradigms. The term thus conjures up leaky ponds, looming clouds (Blanchette 2019; Zee 2020), sick buildings (Murphy 2006), aging infrastructure, and milieus of abandonment (Mah 2012; Walley 2013) alongside abject failures of environmental governance and gaping holes in regulatory science (Hess 2016). But it may be more accurate to talk about these comings-apart as scenes in the disintegration of a fantasy (Berlant 2011), rather than the breakdown of an actually wholesome industrial order. The fantasy is that relentless growth could ever be achieved without mass violence (Livingston 2019). To date, the analytic purchase of the "late" has come in dispensing with such fantasies and locating the source of breakdown squarely in the system: violence has always been endemic to industrialism, manifest in "the starkly differential distribution of entanglement" with its chemical debris (Roberts 2017, 596).⁴ The fact that these differences map onto uneven geographies of racial

⁴ Though we see this as one of the key insights of "late industrialism" as an analytic, not everyone we cite invokes the term. What these scholars do share is an understanding that industrialism is not over; it is inseparable from a range of ongoing violences.

capitalism and colonial extraction (Agard-Jones 2013; Graeter 2020) should remind us that harm is built into the machine (Braun 2014; Benjamin 2016). Industrialism has been hazy *by design*. By hazy, we mean to draw attention to the thickness of air in industrialized places, but not only. There is also a “conceptual haze,” that “cumulative effect of relation, mind, and politics that makes it difficult to see the conditions of our times” (Fortun 2014, 325).

Let’s begin with the chemical haze, which burdens some breathers more than others (Choy 2016). We work in the United States, where air pollution is demonstrably worse in Black, brown, and working-class communities, and where these disparities shave years off people’s lives. One need only consider the phrase “sacrifice zone” to be reminded that these inequities are not a sign of system failure (Lerner 2010). Originally used to describe huge swaths of Indigenous land irradiated by the US nuclear regime in the name of national security (see, e.g., Kuletz 1998; Masco 2006), the phrase implies that prosperity for some hinges on others’ exposure to a “normative and necessary” violence (Simmons 2017). Evidence that this is more than symbolic can be found in many forms. Take the infamous “Cerrell” report, commissioned in the 1980s by the California Waste Management Board to paint “a demographic picture of the types of communities...least likely” to resist nuisance projects like incinerators (Cerrell Associates 1984, 11).⁷ Or consider urban land use policies dating back to the early 20th century, which sought to mitigate industry’s public health impacts by concentrating plants in peripheral sites. Though designed to ensure “fresh, clean air” in residential centers (Power 1988, 639), zoning produced the opposite for the overwhelmingly poor and minority groups made to live outside those centers.⁸ And these violences compound: any policy “derived from past siting practices perpetuates...environmental injustice” by marking some neighborhoods as “dumping grounds,” scholar-activist Robert Bullard writes (1990, 143).

These are just a few of the injustices advanced by industrial structures and the “permission-to-pollute” systems that govern them (Shadaan and Murphy 2020; also see Beck 1992)—systems concerned less with *whether* than *where* (and, thus, *to whom*) pollution happens. As long as there has been industry, there have been efforts to protect those who enjoy its prosperity from the harm that it incites. The premise of containment that underpins these efforts is part of what Fortun terms industrialism’s language ideology: an “essentialist, functionalist logic that privileges what goes on inside bodies, products, and fencelines” while discounting what escapes (2014, 313). It is a “capital-intensive” dream, but it exceeds the corporation (Fortun 2014, 313). Indeed, the logic repeats itself in the extraordinarily disaggregated nature of our regulatory regimes and the many ways that corporate interests shape government science. This has been one of the great ironies of late industrial environmental governance: trying to get a handle on the haze using tools wrought from the same system that made it. One such tool is risk analysis, a process that bends the complex realities of toxic exposure into technical puzzles,

⁷ The answer: low-income, rural, or otherwise “remote” towns where few boast a college degree.

⁸ We say “made” because the history of zoning is inextricable from the history of racial segregation. On this, see Rubin 1999; Silver 1997; Ducre and Moore 2011. Or heed Kaya Williams’s reminder that logics of public safety (and public health, for that matter) often “presume the public as white [and] safety as a right that inheres in white bodies,” while risk “inheres timelessly in bodies that are black, brown, and poor” (2017, 38).

designed to assess harm one chemical at a time (Boyd 2012; Liboiron et al. 2018). Premised on the fiction of containment, this tool cannot capture how toxics interact, migrate across space, or persist over many generations (Nash 2006; Hepler-Smith 2019). These relations simply fall outside the paradigm.

Of course, toxics *do* interact. Heavy metals and pesticides, for example, are known to have synergistic effects on the body (Singh et al. 2017). Toxics *do* migrate, breaching the hermetic seal of the factory fence, disobeying zoning maps, and flouting border lines (Beck 1992). And toxics *do* persist. They persist in bodies well past the event of exposure (Nixon 2011; Walley 2013; Masco 2015; Ahmann 2018) and in land years after factories cease production (Little 2014; Dillon 2014). But most of these problems evade official oversight. To take just the issue of land: though some formerly industrial sites are registered as contaminated brownfields, as many as 90 percent have been subsumed into 21st century landscapes with little recognition of their prior lives (Frickel and Elliot 2018). Retired lead smelters exemplify this problem. More than 400 of these “ghost factories” haunt US neighborhoods, where unremediated toxics quietly permeate the present, hiding in plain sight (Young and Eisler 2012; Eckel et al. 2001).

Whether tucked away on the urban periphery, compartmentalized into obscurity, or lost to institutional forgetting, then, industrial pollution has long been held apart from the main event of industrial production. This makes it possible to imagine pollution as an “externality” whose ties to production can be muddled or denied. Pedaling uncertainty about the sources and effects of toxic exposure is an old corporate strategy, one that Javier Auyero and Debra Swistun call a “labor of confusion” (2008; also see Murphy 2006; Proctor and Schiebinger 2008; Goldstein and Hall 2015; Dumit 2017; Kinchy and Schaffer 2018; Little 2018). Tactics range from overwhelming stakeholders with data (Vera et al. 2019) to raising doubt about assessment methods (Oreskes and Conway 2010) to privately funded corporate “counterscience” (Benson and Kirsch 2010, 465). These tactics work, again, because we have a regulatory system designed *within* the conditions of industrial order and ill-equipped to register distributed causality. They also work because agencies like the US EPA are specifically charged with balancing environmental risk against the corporate bottom line (Jasanoff 1990). Even programs designed to democratize data in service of environmental justice often duplicate these logics (Shapiro et al. 2017). The Toxic Release Inventory (TRI), established in the wake of the 1984 Bhopal disaster, offers one example. TRI was supposed to help communities get a handle on the chemical haze by tracking industrial emissions. But it has not escaped the conceptual haze. Shortly after the tool’s introduction, activists noted “phantom reductions,” or reductions achieved by changes in reporting requirements and analytic methods (Poje and Horowitz 1990; also see Marchi and Hamilton 2006). Polluters have also managed to “delist” chemicals by producing doubt about the solidity of regulatory science.⁷

⁷ This happens on the state level, too. One recent example comes from California, where DuPont successfully lobbied for chlorsulfuron to be delisted as a reproductive toxic after 15 years due to a paucity of “scientifically valid testing.” See <https://oehha.ca.gov/proposition-65/cnrn/chemical-delisted-effective-june-6-2014-known-state-california-cause>.

This is a perennial problem with data-driven solutions to environmental injury: when information systems reproduce the attachments of industrial order, they may well sustain that order well into old age. Work on late industrial legal systems reveals a similar persistence of industrial ideologies in the very measures meant to mitigate their harm. Take Lilian Moncreiff's (2017) writing on environmental law—or, rather, the “cover of law” that corporate interests often claim. Moncreiff shows how environmental laws enacted to control pollution often allow it to run rampant, in part because liberal legal scripts reproduce ideologies of “boundedness” at odds with toxicity. When pollution is too vague, or too diffuse, to meet a legal burden of proof, one enters a no man's land where colossal harms amass without official sanction. And science has grown this no man's land, for reasons glossed above. Not only do scientific methods reproduce industrial dreams of order (Hepler-Smith 2019); the impossibility of scientific “certainty” has also been a boon to companies seeking to foment doubt about the sources and effects of toxic violence (Little 2018). All of this converges to create what Murphy calls a chemical regime of living, one “characterized by the way it allows [industrial] fumes...to be detectable but nonetheless irrelevant to corporate accountability” (2008, 697–8). *Detectable but nonetheless irrelevant*. This is a willful kind of blindness.

So perhaps it is no surprise that late industrial environments leave us in a haze—chemical, legal, epistemological. What STS scholars show is that this haze is constitutive of industrial order, rather than the side effect of systems gone awry. The trick of the “side effect,” as Joseph Masco (2013) puts it, is to “split” a phenomenon into its desired and undesired effects and, so, to depoliticize some harms as lesser forms. As an analytic, late industrialism resists this split by insisting that toxic landscapes and regulatory gaps are *not* the accidental byproducts of industrial prosperity. They are its necessary underside. This is why the “late” carries more punch than the “post”: it tethers breakdown to the order that produced it, refusing the fiction of clean lines. To study late industrialism is to reject the idea that we are living in the twilight of a once-ideal system, struggling to deal with unexpected glitches. Instead, we are living at a moment when industrialism's systemic harms have begun to spill out of our blind spots.

Retooling the Machine

Again: we are *living* at this moment. Things are not just falling apart. Amid the fraying fantasies of industrial order, we find all sorts of experiments in living otherwise. Each one suggests that the lateness of late industrialism might also contain “the earliness of something radically different,” as Nicholas Shapiro and Eben Kirksey put it (2017, 489). All the ethnographies in this collection feature subjects trying to transmute the fraying edges into something else (Pine 2016). Not something unsullied—a false hope if there ever was (Liboiron et al. 2018)—but organized around very different principles. Relation rather than boundedness (Agard-Jones 2013; Todd 2018; Murphy 2017). Flourishing rather than growth (Lyons 2016; Livingston 2019). A “rush of troubled stories” rather than a neatly ordered science (Tsing 2015, 34). This is imperfect work, tinkering with industrialism's tools to cobble together a new house (Lorde 1984), but work worth following because it suggests that people are not overcome by degradation. They are figuring out

what it means to live “*within and against the worlds*” that technoscience made, often both at the same time (Murphy 2017, 500; emphasis added). Here, we take inspiration from scholarly and political projects that see our irrevocably hazy world for what it is without ignoring all the ways people are working through its binds (also see Langwick 2018).

Scholars at the intersection of STS and anthropology have been particularly attentive to life lived through these contradictions. In Jason Pine’s writing on methamphetamines, we meet alchemists who make late industrial matter matter differently (Barad 2003). “Meth cooking is late industrial alchemy,” Pine argues, because it melts everyday consumer products into something that keeps the user from expiring (2016, 302). This is distinct from the old industrial dream of transforming waste into wealth, just to reinvest in the machine (Ahmann 2019). Late industrial alchemists “extract the base elements” of this attritional condition (“Sudafed. Energizer. Drano. Coleman. Walgreens Instant Cold Packs”) to produce an object of desire (Pine 2016, 305–06). To be clear, Pine does not cast meth cooking as an escape: he admits it “leads the way out of workaday failures while lapsing back into them” (2016, 311). But it matters that people in abandoned landscapes chase a high. They seek an opening, not a termination; a stimulant, not a withdrawal. And they do it with the substance of industrial society.

A very different kind of late industrial alchemy can be found in civic science efforts. This is especially true of those that hack industrial infrastructures (like monitoring technologies) to create actionable knowledge while also subverting the norms of modern science (Wylie et al. 2017). People living in toxified landscapes rarely have the luxury of dwelling in cultural critique, though they are frequently critical subjects. So, they sometimes practice what Max Liboiron terms “compromised agency,” reproducing aspects of the power structures that harm them even while they work against those structures’ gravest violence (2017). STS scholars have been active participants in crafting and studying these “make do” technologies. Their work offers reminders that, in a world where late industrial conditions “cultivate a will not to know, not to engage, not to experiment” (Fortun 2012, 459), even fraught experiments are something of a triumph. Consider grassroots efforts to crowdsource as-yet undone science (Ottinger 2017) or participatory air monitoring projects that empower communities to wield their own data in contexts of extreme uncertainty (Matz et al. 2017).¹⁰ These are interventions offered with full knowledge that there is no landing pure after industry. Setting aside that pretense, they sit with the contradiction of building alternatives *with* the instruments of technoscience.

And sometimes they work to stretch those tools’ capacities. Take efforts to make sensory knowledge legible within existing paradigms—paradigms that “know” toxicity through disembodied data. Not just any sensing, argues Nerea Calvillo: “sensing as monitoring is not enough” (2018, 375). Instead, Calvillo calls for a more holistic *attunement*: attunement to unquantifiable atmospheric conditions and the infrastructures that produce them. And attunement drawn from many different publics as they coalesce into a “swarm” (Connolly 2017),

¹⁰ Or consider how activists sometimes seize on the politics of eventfulness to fight toxic projects—despite knowing the limitations of the spectacle when it comes to addressing what Rob Nixon (2011) calls slow violence (Ahmann 2018).

from NGOs to neighborhood associations. Focusing on an air-monitoring scandal in Madrid, Calvillo shows how residents' sensing practices created a "regime of perceptibility" adjacent to official ones (also see Murphy 2006). Here, what mattered was not whether the average air was quantitatively toxic but instead how it felt and how it moved from place to place. The difference Calvillo notes between official "sensors" and public processes of "sensing" comes through in Christy Spackman's work as well. Writing on a chemical spill in West Virginia that the public sensed but official "sensory information streams" did not (2020, 430), Spackman documents how olfactory knowledge gradually got folded into local regulation. Not on its own terms: the contextual experience of smell first had to travel through sensory science regimes that rendered it abstract. But there are ways to make that context part of the machine—including hiring locals "as experts...trained through experience, attuned to sensation" (Spackman 2020, 434).¹¹

There are infrastructures within that need retooling, too, as the machinery of breath itself has changed (Kenner 2018; Kenner et al. 2019; Garnett 2020). Transformations in asthma care offer one example. Alison Kenner studies asthmatics in the US who engage breath as an epistemological register. Breath has this capacity because it works as a mnemonic (Allen 2020), organizing ties between body and place. As air circulates from environment through lungs and back again, breathers calibrate how much to let in, how much to keep out, how to slow the body down, how to direct the machine. This work is vital—especially for those unable afford the rising cost of asthma medication (Kenner Forthcoming). In a world where one cannot help but take in violent matter, Kenner shows, people hone techniques that help them to repattern respiration.

Scholars of late industrialism have also begun to attune in such a way. We have begun to grapple with what it feels like to exhale the coming apart of one world and draw in the coming together of another. Timothy Choy and Jerry Zee (2015) invite this when they call for attention to "conditions of suspension." In the chemical sciences, suspension names a temporary aggregation. It is a fickle whole whose parts will soon disperse into new forms. Taken literally, suspension is an apt word for the haze kicked up by industrial disintegration. But taken as a mode of ethnographic attention, suspension is an invitation to look past the moment of breakdown and toward what people do with the remains. *Breathing Late Industrialism* works on both levels at once. We attend to the materiality of air and breath in the long aftermath of industry and to efforts to build alternatives using the tools at hand. Indeed, we find that it is often something in the air that prompts people to agitate for change. Recall that breath has expectant qualities—that it is a prescient thing. It can warn that something stinging, harmful, or lovely is forthcoming.

What do breathers then do with these indications?

¹¹ In a different setting, Alex Nading (2019) writes about grievance mechanisms as a way of bringing context—and not just isolated facts—into the machine of corporate social responsibility.

From Breakdown to Breathing

The pollution and the chemicals, they have been here 150 years. I have been here for a half century. I don't know how long asthma has been in my system, but in 2016 the doctor didn't even know if I was going to make it or not. They told my family to pray...
 – Kilynn Johnson²²

Breathlessness brought Kilynn Johnson to the hospital—eventually. Johnson grew up in a neighborhood called Grays Ferry, which borders the now-closed Philadelphia Energy Solutions refinery (PES), and struggled with disordered breathing her whole life.²³ Like many in the predominantly Black community, Johnson's family lived in the refinery's midst for generations. PES processed fossil fuel in the background for more than 150 years while kids played in nearby parks. It produced a haze so familiar that it “seemed like part of the landscape” (Villarosa 2020). Johnson did not notice the refinery as a child, when her asthma could be managed by taking breaks from games with friends. But in 2015, things escalated.

After what felt like a severe asthma attack, 46-year-old Johnson found herself in the hospital, where doctors diagnosed her with gallbladder cancer. It was a rare diagnosis, especially for a woman Johnson's age. But Johnson was not alone: conversations with neighbors revealed that many more had died of rare diseases. As she grappled with this discovery, Johnson's mind traveled across the way to the refinery. She started to suspect that PES was part of the equation.

Fast-forward four years, to June 2019, when an explosion at PES released more than 5,000 pounds of hydrofluoric acid. Reports indicate that the explosion was predictable, given wear and tear on the 150-year-old plant. But those reports came in too late. The morning of the accident, debris covered nearby areas while sirens blared, belatedly, that something was not right. Locals were ordered to stay put. Hours later, with thick smoke still blanketing the streets and a noxious odor hanging in the air, public health officials announced there was no “immediate danger.” Residents like Johnson, drawing on basic sensory knowledge, were less confident. Johnson did what she could, shutting all her windows and trading worried calls with neighbors. But by afternoon, she was struggling to catch her breath. That evening, Johnson landed in the hospital, again, with a breathing mask strapped tightly to her face.

Residents would later learn that the explosion was only the most visible harm coming from the refinery. An investigation revealed that PES had been emitting 21 times the federal limit of benzene, a carcinogen, since well before the accident. Investigators further alleged that regulators knew of these releases but did not stop them, and did not inform locals about the substance of the haze. *Detectable but nonetheless irrelevant*. It took the fast disaster of 2019 to shed

²² Quoted in Villarosa 2020.

²³ Kenner lived within two miles of PES for several years, and commuted past Grays Ferry almost daily. We mention this to underscore the difference between living next door and living in proximity to a source of toxic emissions, as well as the difference between a few years and a few decades.

light on PES's slower, layered harms (Nixon 2011; Fortun et al. 2017), all of them typically late industrial: The fumes. The denial. The location of the plant. The failure to intervene. The persistence of harm over many years. The mismatch between what is sensed and what is officially acknowledged. The fact that having evidence in hand did not compel a change.

As we were writing this introduction, we encountered a story about the PES explosion (Villarosa 2020). We were struck by how fully it captured late industrial breakdown. But we were also struck by a second story that unfolded in between the tale of PES's failures: the story of a woman learning to heed breath's prescient warnings. Childhood asthma told Johnson to take breaks from the park. She sought the root of things following her cancer diagnosis. After the all-clear that followed the PES explosion, she sensed the air around her home still posed a present danger. And, eventually, Johnson joined forces with environmental justice organization Philly Thrive, fighting to close the plant for good. The group is organized around a securing "right to breathe," an intentionally capacious platform that encompasses the "connected crisis" of climate change, poverty, and racism. Pushing against the impulse to compartmentalize these problems, the group calls for the unmaking of "a system that prioritizes profit and extraction over Black lives," starting with the refinery. But not ending there.¹⁴ This is one moment, and one site, where people are working to draw the earliness of something vital from the scene of degradation.

And there are others. As all of the contributions to this collection show, breathing can be a starting point for interventions: an injunction to turn from breakdown toward life-affirming work. To be sure, air in these times comes infused with danger. It threatens all of us, if unequally—along familiar lines of structural violence (Choy 2016; Górska 2016; Allen 2020). Many struggle to catch their breath because their throats shrink up, closing passage to toxics that would otherwise pour into the body. For others, breath is a sentinel, warning of exposure through coughing, wheezing, and throat irritation.¹⁵ Breath is thus an infrastructure rife with contradictions. It gives life at the same time it erodes life (Zee 2015, 56). It threatens and it warns. And it can be counted on in ways environmental rules cannot, enabling care in the absence of regulation (Kenner 2018). Breath can also enliven calls for justice. The connection between asthma and air pollution, for example, has been at the core of environmental justice work for decades (Sze 2006; Brown 2007; Mitman 2007; Whitmarsh 2008). Speech, song, and laughter—all critical to social movements—happen in the space between air and apparatus, as people project their desires for new worlds (Tremblay 2019). "To aspire is to breathe," Sara Ahmed reminds, and "with breath comes imagination" (2017, 211; Sharpe 2016, 108–114).

¹⁴ Here, we are reminded of the concept of "unmaking" as articulated by Sefanit Habtom and Megan Scribe (2020), who call it "a desire for worlds in which Black, Indigenous, and Black-Indigenous peoples can breathe and live full lives." Their thinking stems from Tiffany Lethabo King's call to "end this world" and "remake reality and its relations on more just terms" (2019, 209).

¹⁵ Smell (Spackman 2020) and taste (Diedrich 2006) can be sentinels, too. Andrea Diedrich (2006) specifically notes how government agencies and utility companies have long positioned water consumers as sentinels of quality issues because they are attuned to local smells and tastes. This sensory expertise makes it possible for them to detect quality differences that might otherwise go unnoticed.

Alongside a growing field of STS and STS-adjacent scholars (McCormack 2008; Sloterdijk 2009; Stewart 2011; Choy 2011, 2016; Choy and Zee 2015; Howe 2014, 2015, 2019; Masco 2015; Shapiro 2015; Zee 2015; Simmons 2017; Calvillo 2018; Kenner 2018; Vine 2019), we see breath, air, and atmosphere as creative media for thinking about late industrial politics as they emerge, mix, move, and settle into place. Atmospheric things, like breath, demand this creativity because they are notoriously “hard to substantiate, to weigh, to find” with the outmoded paradigms we use to grasp at them (Choy 2018, 55). New ways of being with air are needed. With this in mind, our authors offer six ways into—and through—the haze.

Victoria Nguyen begins our search for breathing space in Beijing, where the breakneck speed of China’s development is felt as an “acrid fog” and where denizens seek refuge in a range of conditioned air-spaces (also see Sloterdijk 2009; Zee 2015). An imperfect kind of refuge, to be sure. As Nguyen writes, access to protected air is unevenly distributed and, even for the privileged, the “externalities of China’s extraordinary growth” are not easily contained. In this late industrial environment, where every breath threatens exposure, people withdraw as best they can—but not into individuated units. Air pollution in Beijing is not only an “agent of segregation.” Instead, Nguyen tracks how efforts to avoid bad air foment “respiratory publics,” assemblies of breathers who share experiences of air pollution and render it sensible through quotidian practices: posting snapshots of smog on social media, slipping masks onto historic statues, finding each other in insulated passageways. Note the hack: breathers transform architectures of partition into infrastructures of connection. Note, too, how they nurture collective sensibilities that do not depend on government air monitors or data visualizations. By sharing in the everydayness of exposure in Beijing, breathers give social form to air and cultivate capacities for the communal management of its amorphous dangers.

Atmospheric connection appears in Chloe Ahmann’s contribution, too, in this case as an organizing tactic. Ahmann follows activists in late industrial south Baltimore who built a flexible alliance against a proposed incinerator. What made this alliance flexible was participants’ attunement to the atmosphere’s shape-shifting qualities: it is simultaneously here, there, and everywhere; material and metaphorical; shared and differentiated. This capaciousness has made the atmosphere a useful tool for theory work in recent years, but Ahmann’s focus is more practical. She shows how organizers put these different qualities to work to give and take authority within a broad and sometimes fractious coalition, shifting the borders of the project’s “problem-space.” Occasionally, organizers drew on the risk of toxic trespass to call the incinerator “everybody’s problem,” naturalizing “outside” intervention in south Baltimore. At other times, they invoked the materiality of atmospheric difference to give local youth the most important say. In fact, Ahmann argues, “the same actors frequently used the same concept [the atmosphere] to make conflicting arguments about who could claim the issue as their own.” They built an “atmospheric coalition”—one capable of retrofitting late industrial problems (like feckless boundaries) into tactical advantages in the fight for more breathable airspace.

In Liza Grandia’s autoethnographic contribution about a controversy at her daughter’s school, we also meet a cunning coalition: worried mothers fighting toxic carpets. But they face different obstacles to their campaign. From undone science on indoor air quality to gaslighting at

the hands of a schoolboard that portrays them as hysterics, these mothers confront uncertainty in a vivid struggle against the under-studied, under-regulated carpet industry and its supporters in local government who insist: “if labeled ‘green,’ the carpet must be safe.” Grandia and her allies sense this is untrue, but must reckon with the limits of their tools (like air pollution paradigms designed with the outdoors in mind), and with a flood of “doubt, denial, and disavowal” designed to undercut their claims. This is “toxic gaslighting,” a concept Grandia develops to capture the explicitly gendered labor of confusion (Auyero and Swistun 2008) mothers had to overcome. More generally, the term registers chemical violence as a double-harm—first embodied, then evaded. With this essay, Grandia sheds necessary light on the mind-games that allow some late industrial problems to evade scientific scrutiny. But she also offers a tale of intimate activism (Tironi 2018) led by women who gradually manage to “out” the twisted nature of the game.

Despite knowing, and showing, that late industrial environmental governance is hazy by design, the mothers in Grandia’s essay do not fully escape it. They appropriate its tools to persuade the school board that the carpets pose a threat. A parallel retooling emerges in Alison Kenner’s article, set in Philadelphia’s Overton neighborhood. Overton is home to several scrapyards, the kind of overlooked and under-regulated hazard that Scott Frickel and James Elliott call a “site unseen” (2018). Despite official oversight, residents sense their presence—especially on garbage burning days. Kenner details how community calls to regulate the scrapyards led the city to produce a civic engagement app called “Philly 311,” where citizens could report isolated problems (a waste pile here, an odor there). Unfortunately, the platform made things worse by reducing atmospheric hazards into a grid of maintenance problems that could be governed as if they were contained. But residents did not just give up on Philly 311; they reclaimed it to run an environmental reporting project. Conceptualizing this reappropriation as an instance of “civic infrastructuring,” Kenner demonstrates how locals organized, first, to map the app’s blind spots and, second, to spotlight those omissions. In this way, they put late industrialism’s tools to work to teach officials about the constitutive limitations of their data.

Another gap between the atmosphere as felt and as governed emerges in Sonia Grant’s contribution, which brings us to the Greater Chaco region of northwest New Mexico. Here, fracking technologies have produced a “billowing plume” where methane gases mix with other airborne chemicals to give the air a “spectral look,” even on sunny days. Diné residents experience extraction as an atmospheric surround, registering its cumulative effects. But late industrial settler governance fragments this lived experience, severing land and sky and treating emissions from each of the region’s 40,000 wells in isolation. This is another tight coupling: industrial value systems and structures of US settler power. Both squeeze the world into ostensibly commensurable compartments (of regulation, of jurisdiction) at odds with Diné claims. Grant shows how the agencies that manage oil and gas manipulate scale to obscure the cumulative effects of extraction, “parsing aggregate airs in ways that stretch the scope of settler rule.” But she also shows how Diné communities challenge this disaggregation. Moving from debates over emissions assessment, to a court case focused on land management, to a Diné-led community health study, Grant reveals that settler regimes are “only ever partially successful.”

Like the aggregate airs that prevailing regulations fail to comprehend, Diné possess an atmospheric knowledge that evades full capture by the settler state.

Alex Zahara also takes up the tight coupling between industrial ideologies and structures of settler power—this time in the Canadian province of Saskatchewan, home to more than 50,000 Cree, Dakota, Dene, and Métis people. His focus is on wildfire management, specifically the birth of a controversial policy known as “Let-it-Burn,” which supporters say reduces fire suppression costs while restoring “natural” landscapes. Drawing on Indigenous critiques, Zahara suggests that what the policy naturalizes are regimes of settler value. This is not a metaphor. Under “Let-it-Burn,” fires are allowed to spread until they encroach upon “something designated of ‘value’” under settler regulations. This category encompasses things like private property, but not the “ongoingness of life” in forested regions. Recasting this “failure” of recognition as a settler colonial “success,” Zahara shows how Let-it-Burn destroys landscapes just to rebuild them in the image of the Canadian state. This is a direct affront to Indigenous sovereignty snuck in under the guise of “natural” processes. Which is to say: it is a direct affront rendered benign by an appeal to the old industrial division between culture and nature. Depictions of contemporary wildfires as “natural” obscure the fact that forests have been transformed by industrial-colonial developments—developments that have also altered fire. “Breathing fire into landscapes that burn” is therefore a peculiar about-face. Due in part to a century of state-imposed fire suppression that enabled settler expansion into forested regions, the fires that burn today are larger in scale and higher in intensity than ever before. Indigenous relations with the forest have also irrevocably changed. Taking inspiration from Murphy’s conception of “alterlife” and Indigenous efforts to manage these new fires, Zahara takes an unflinching look at what it means to “burn well” in a world where one “cannot simply get out” of violent relations (Murphy 2017).

Finally, Timothy Choy foregrounds the challenges of “breathing together now,” at a time when threats to breath are ubiquitous but far from interchangeable. Reflecting on the confluence of COVID-19, anti-Blackness, settler colonialism, California’s wildfires, and a range of other harms—all of them still hazy, heavy, close—he cautions: “For if there is contiguity by medium established in the varied entanglements with breath, it’s also true that they are profoundly about different matters. They are irreducibly different...and what is at stake in the reconciliations of atmospheric ledgers is often precisely the remainder.” Given these seductive slippages, Choy asks how we (as scholars, as breathers) are to work with the “suppleness” of air and breath as organizing concepts. And he finds tools for doing this work in each of the essays. But ultimately it is an open challenge, as we reflect below: the challenge of mapping a “medium-in-the-making.”

Coda: Chokeholds and Transformations

If pivoting from breakdown to breathing seemed timely when we began work on this collection in late 2017, then it feels belated now. Late industrial environments leave us struggling to catch our breath in far too many ways—and many breathers live that struggle more than us. We write this introductory essay from the thick of a pandemic marked by deadly respiratory symptoms, and made worse by old attachments to growth at any cost. Late industrialism’s contradictions

crowd our newsfeeds, especially in the United States. We see cities opening for business while their COVID-19 numbers surge and we meet people so “essential” that they must be martyred for the cause. It should come as no surprise that it is largely low-income Black and brown Americans who are called to do this deadly “heroic” work (including prison workers fighting California’s fires, which surged while we edited our proofs). The respiratory disease has doubled down on pre-existing conditions: asthma, poverty, xenophobia, anti-Blackness (see Taylor 2020). Frontline communities already burdened with industrial emissions are especially vulnerable. Meanwhile, the federal government has cited the pandemic to roll back regulatory enforcement, a move that will only intensify the problem (Friedman 2020; Nost et al. 2020). On May 25, 2020, all this comprised the backdrop of a hideously ordinary crime, when a white police officer dug his knee into the throat of an asthmatic Black man. “I can’t breathe” echoes on repeat in the wake of George Floyd’s death.

This is breathing late industrialism.

But we also write this essay from a moment resounding with calls to celebrate Black *life*, and amid efforts to transform the challenges of the present into the impetus for vital work. A particularly poignant example comes in the form of the BREATHE Act, a proposition from the Movement for Black Lives to divest from the police and put some of the money toward environmental justice (Mercado 2020). Consider, too, the mutual aid networks grown strong despite our government’s abject failure to protect and cherish life. And think about renewed demands to catch our breath and consider what an abolitionist academy could really look like (Benjamin 2016; Jobson 2020).

This, too, is breathing late industrialism.

It is precisely this pair—the fractured body and the breath twisted free and jumped ahead—that we take up in this collection. We want to understand the disintegrations that mark the late industrial condition without letting them be all-encompassing. What follows is an opening toward this work. One reason to keep the conversation going is to query whether other media, like water and soil, share the capacities we find in air.¹⁶ Another is that this issue reflects some consequential blind spots. The most significant: though several of the papers address structural racism and settler colonialism, as well as BIPOC-led efforts to build a better world, none of them are written by Black or Indigenous authors. As collection editors, we have a responsibility to name this absence, to interrogate the processes that normalize it, and to correct our own erasures. They are not benign. We therefore welcome additions and critical responses, and we commit to work with ESTS’s incoming editorial collective to publish them.¹⁷

In the meantime, we draw energy from the signals all around that, even amid extraordinary collapse, life-affirming work persists. Great potential comes with making lives

¹⁶ Some scholars are already doing this comparative work on elemental media. See, for instance, the collection on “An Elemental Anthropocene” in *Cultural Studies Review* (Neale et al. 2019).

¹⁷ We thank the editorial collective for allowing us to treat this as an open collection and encourage anyone interested in participating to reach out to Aalok Khandekar (estsjournal@gmail.com) with a brief description of your proposed critique or contribution.

worth living in the “late.”⁸ Lives worth living—and breath that might just lead us toward the possible.

Author Biography

Chloe Ahmann is an Assistant Professor of in the Department of Anthropology at Cornell. Her work is set in Baltimore, and considers what efforts to think and enact environmental futures look like from the sedimented space of late industrialism. For more information and links to recent publications, see www.chloeahmann.com.

Author Biography

Alison Kenner is an Associate Professor in the Department of Politics and the Center for Science, Technology, and Society at Drexel University. She is the author of *Breathtaking: Asthma Care in a Time of Climate Change*.

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⁸ On aspiration in the context of another—inseparable—aftermath, see Christina Sharpe’s writing on the work it takes to “keep breath in the Black body” in the “wake” of Atlantic slavery (2016, 109). And consider her rhythmic invocation of Dionne Brand, whose words are like a breath: “You are still alive, like hydrogen, like oxygen” (Brand 2015; quoted in Sharpe 2016, 109).

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