

MICHELLE MURPHY

□□□ Sick Building
□□□ Syndrome and
the Problem of
Uncertainty □□□□
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Environmental Politics, Technoscience, and Women Workers



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Environmental Politics, Technoscience,
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To Matt

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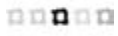

Introduction

Take a deep breath and hold it. Do you know that when you breathe in your lungs absorb billions upon billions of air molecules? Now breathe out.

Breathe in. Along with air, each lungful you inhale contains the detritus from our indoor environments: fibers, vapors, tiny airborne insects and their excrement, viruses, bacteria, and fungi. Breathe out.

Breathe in. Do you realize that chemical fumes from the objects around you escape into the air, are drawn into your lungs, dissolve across your alveoli membranes and into your blood? Breathe out.

Breathe in. The air you just inhaled has already passed through ducts encrusted with a grimy, gray, microbe-infested fuzz of debris, hair, dust, and fiber particles released by decaying building materials. Breathe out.—Classroom exercise from the Environmental Protection Agency designed to teach children about indoor air; paraphrase of Tchudi, “Lesson Plan on Indoor Air Quality” (1993)

 **Imagine an office building** at the end of the twentieth century.  One worker typing at a desk rubs an eye. Working in a nearby  cubicle, a second blows a congested nose. Standing at the photocopier, a third passes a lozenge to a fourth. A fifth begins to feel dizzy as a coworker's perfume wafts by. A sixth, a seventh—a crowd of complaints begins to form.

Dispersed in far-flung corners of a building, these workers in the information economy at the end of the twentieth century may never have thought twice about their irritations. But sometimes they began talking to each other. Latent connections may already have been in place: maybe they were neighbors, or parishioners in the same church, or ate at the same table during lunch. Perhaps a first worker complained about an aspect of their work environment, and others chimed in—Me too, me three! Complaint comparison became a conversational buzz at breaks—

Me four, me five! Repetitions accumulated, and someone began asking questions, gathering in others: Do you feel unwell, too? Perhaps repetitions were recorded in a notebook, turned into signs that together gained new weight. Irritations absorbed into the crowd became symptoms, a collective pattern. Compelled by the din of complaints, other workers might also ask themselves questions about their own bodies. One can easily imagine prying open a ventilation grate and peering inside.

Suddenly a threshold was passed, and now many noticed that they felt unwell. A threshold was passed, and what yesterday had gone by without remark was today intolerable. The multitude continued to grow, giving work in the office building a new rhythm. Workers, mostly women, staged meetings, collected signatures, filed grievances, conducted informal surveys. What had been unconnected, diverse bodily occurrences cohered into an event. Individual symptoms joined the crowd of similarities and became linked in a chain of repetition: in the building . . . in the building . . . in the building. At other buildings, in other cities, strangely similar chains of events occurred. Though many miles apart, they heard news of each other through short newspaper articles or on tv. Workers in one building pointed to workers in other buildings. The crowd, linked by symptoms, declared an occupational health problem. A name circulated, under which all these differences coalesced: *sick building syndrome*.

Becoming Sick Building Syndrome

Before 1980, sick building syndrome did not exist. In order to become “sick,” a certain kind of office building had to come into existence. In the 1970s, office buildings became architecturally “airtight” for the sake of energy efficiency, while internally they were arranged in “open” floor plans. Work inside was governed according to novel, cybernetics-inspired techniques of design and administration. New kinds of materials—plastics, solvents, adhesives, synthetic carpet, particle board, dry wall, acoustic tiles, and so on—made up the surfaces that in turn housed computers, printers, and fax machines that were mechanically kept cool and dry. Air-conditioned and carpeted, office buildings stood in striking contrast to the treacherous factories, pitiless sweatshops, and deadly

mines of industrial work. Office buildings, constructed to house the vast extension of information work in booming postwar America, relied on a middle-class ambiance to delimit them as different from industrial workplaces, even if wages for many were comparable.

Sick building syndrome was a problem only possible in conditions of relative privilege and luxury that characterized Reagan-era America. It captured those minor health complaints only foregrounded when larger dangers receded. It expressed an expectation of comfort and safety as conditions of daily life for the beneficiaries of the privileges of race and class. At the same time, sick building syndrome expressed the sense that privilege was imperfect, even threatened. Chemical dangers could not be cordoned off to out-of-the-way neighborhoods or distant countries; on the contrary, they lurked nearby in the most unexpected places. The very materials and technologies of postwar comfort and success might themselves be sources of subtle and stealthy chemical exposure. Even the most innocuous products could contribute to the constant background of chemical stimuli.

At mid century, glass-box architecture was accompanied by rhapsodic optimism. Yet during the 1970s, a resurgent feminism and a newly articulated environmentalism spawned an office-workers movement that made occupational health, and particularly chemical exposures, one of its concerns. Office workers gathered complaints about their workplace with simple photocopied questionnaires. Surveys collected the many ways relatively privileged people understood their health as a reaction to possibly hidden chemical dangers in their daily environment. Bodies signaled the possible presence of hazards through common, minor ailments such as headaches and rarer, serious diseases such as cancer. The new physical space of office buildings, combined with anxiety over the buildup of tiny toxic hazards, led to protests that in turn triggered government investigations of office buildings.

Occupational health investigators who traditionally investigated factories or acute chemical spills—engineers, toxicologists, and industrial hygienists—were now called on to inspect nonindustrial, seemingly comfortable office buildings. Once in office buildings, their equipment almost never registered a chemical exposure. No overpopulous molecule, no errant fume, no physical cause could be found. To make matters more complicated, complaining office workers did not even share a common disease, which could then be tracked to an offending germ.

Instead, investigators were confronted with a messy litany of runny noses, scratchy rashes, endless fatigue, burning inhalations, and queasy stomachs. In the early 1980s, these occupational health events acquired the name *sick building syndrome*.

What exactly the name referred to, or if it even referred to anything, was highly contested. In the absence of a definitive cause, some experts claimed that women, who made up the vast majority of office workers, were experiencing “mass hysteria” triggered by stress and facilitated by a feminine coping style or even by menstrual irregularities. Workers’ compensation administrators and health insurance companies, in turn, balked at covering a health problem that could not be made to fit traditional explanations. Despite such hesitation, worker protests kept repeating and proliferating during the 1990s, making sick buildings one of the most common types of occupational health investigations in the United States during that decade. A new kind of chemical exposure—indoor pollution—had been identified, not from a discovery in a medical laboratory or clinic but from changes in the ways ordinary people created knowledge about and experienced their everyday environment.¹ Yet not everyone believed that indoor pollution was a real menace. Some scientists, environmentalists, and doctors, bolstered by representatives from chemical manufacturers, held that slight exposures emanating from the commodities of daily life were not a significant worry. In contrast, other scientists, doctors, and activists, joined by experts sponsored by the tobacco industry, held that indoor pollution was in fact a significant worry, perhaps even more so than industrial pollution. They argued that tiny exposures accumulated in otherwise unremarkable interiors and that these exposures, in their sheer multitude, were impossible to untangle from their specific sources. Thus no single product or company could be blamed. Vapors seeped from the abundant and ubiquitous accoutrements of comfortable postwar culture. Was it the new carpet at work? Or the particle board cabinets at home?

As a history of the inside of ordinary office buildings in the twentieth century written at the opening of the twenty-first, this book seeks to capture the ways relatively privileged twentieth-century Americans resided in a world filled with possible chemical exposure. Indoor exposures were possible because the material landscape of privilege had changed in the twentieth century. Yet, unlike the nineteenth century, indoor spaces were no longer filled with smoke and soot from heating,

lighting, and cooking flames; they were no longer coated with lead-based paints, no longer lacking in basic plumbing that could flush away organic waste. Of course, even before the twentieth century the objects and materials that formed and populated interiors could emit potentially toxic molecules. In fact, in many ways the indoors had dramatically improved. So why in the late twentieth century did indoor chemical exposures become a serious environmental health concern? Indoor pollution became not just materially present but also a perceptible, definable, knowable object that both experts and laypeople sought to detect and alter.

Historians of medicine have paid important and considerable attention to how microbes have become objects of fear, management, and regulation since the advent of germ theory, shaping the habits of popular culture as well as the practice of medicine for over a century.² We understand far less about how chemical exposures similarly came to populate the twentieth-century world as cultural objects of attention and practice. Sick building syndrome exemplifies the ways exposures became part of everyday American life.

The historical scholarship concerning chemical exposures has tended to concentrate on the production of industrial pollution, tracking the uneven distribution of environmental hazards across class and race lines. The history of nonindustrial pollution in comparison, for which there is almost no scholarship, brings into focus how chemical exposures and environmental hazards were also gendered. Office buildings in the twentieth century were deeply gendered spaces: they had become sites for the articulation of a gendered division of labor and a landscape of privilege in which most menial office work was designated a kind of “women’s work.” Unlike the experts called to investigate their unrest, the bulk of low-status office workers were women with aspirations of benefiting from the privilege and safety of nonindustrial work. Beginning in the 1970s and throughout the 1980s—the decades when sick building syndrome erupted—office workers could draw on resurgent feminisms to challenge this gendered division of labor. Thus, protests over the environmental conditions in nonindustrial workplaces happened contemporaneously with accusations of gender oppression and clashes over women’s appropriate place.

In debates between experts over the reality of sick building syndrome, the fact that women made up the majority of complainants opened up the

possibility of using the diagnosis of hysteria to explain worker unrest. For complainants themselves, practices of feminist organizing, as well as gendered performances of health care and detailed empathetic attention, could be drawn on to produce counter-narratives that argued for the reality of oppressive and unsafe conditions. Whether in ventilation engineering, office management, or worker activism, gender was a generative ingredient in the physical arrangements of the built environment, in the kinds of authority marshaled in debates, and in the explanations used to argue for the existence or nonexistence of chemical injury. This book highlights the versatile and volatile work of gender in twentieth-century practices of rendering environmental health hazards perceptible and knowable. In the 1980s, gender and chemical exposures both generated controversy and uncertainty.

Sick building syndrome was a postmodern health problem, in form as well as time. Not only did it emerge in the information workplaces of the late twentieth century, its definitions encapsulated a conundrum that was postmodern in form: What are we to make of an object with no essence? As a syndrome, it was recognized only as a constellation of symptoms, not by an underlying mechanism.³ A typical definition of sick building syndrome depicted it as a *diversity* of ill health effects, mostly minor and associated with a building, for which *no specific cause* was found. Difference expressed itself in workers' health complaints and in each building's complex conditions. Though many investigators and labor activists hoped that a cause would someday be found, sick building syndrome came to be defined formally through its very lack of causal explanation. In fact, once a specific exposure was detected, an episode was no longer diagnosed as a sick building.

Sick building syndrome was thus a doubly troublesome phenomenon to affirm: it was found in spaces expected to be safe, even comfortable, and it was nonspecific and multiple both in its cause and expression. The words "sick building" signaled a confusion of boundaries between buildings and the bodies in them—how can a building be sick?—and an attempt to make sense of complexity by making buildings the unit of analysis. It was the mantra "in the building . . . in the building," repeated in cities across the country, that lent sick building syndrome its coherence.

Most discussions in the late twentieth century of sick buildings, and transient or low-level exposures more generally, were caught in a debate

about the very existence of these events: Were they real or not? Did a toxic exposure occur or not? The controversies around the “reality” of sick buildings provided me, as a historian, with an opportunity to study how laypeople and experts have struggled to prove or disprove an environmental health problem. In this book, I do not employ history to judge in favor of one side or the other. Nor do I set out to explain sick building syndrome as the history of an idea. Such analyses can too easily be interpreted as arguing that indoor chemical exposures were and are not “real.” They can be too easily used against current claims of chemical injury, too easily plugged into antilabor arguments that assert sick building syndrome was simply a phantasm of illness, that it was only the medicalization of labor problems by disgruntled and hysterical women. Writing about the historicity of chemical exposures in the recent past is treacherous when one’s arguments are always in danger of being re-framed as affirming the unreality of exposures.

In this book, then, I take a step back from this controversy by using sick building syndrome as an entry point into historicizing the practices by which chemical exposures were granted or not granted existence. That is, I am concerned with how exposures were *materialized*.⁴ Though an empirical study of the past, this is not a straightforward chronological account of the rise of sick building syndrome; instead it is a juxtaposition of histories, each delineating how an expert or lay tradition made chemical exposures perceptible or imperceptible, existent or nonexistent. Instead of resolving the factualness or fallacy of any given case of exposure, I am concerned with historicizing the techniques through which “exposure,” as an effect between buildings and bodies, became a phenomenon people could say, feel, and do something about. Moreover, I want to understand the history of how chemical exposures were not only materialized but materialized as *uncertain* events. How were exposures imbued with uncertainty? This book treats these as historical questions that necessitate thinking about the historical ontology of exposures.

Historical ontology is a term developed by historians and philosophers of science to describe historical accounts of how objects, such as germs, immune systems, subatomic particles, diseases, and so on, came into being as recognizable objects via historically specific circumstances.⁵ Studies of historical ontology typically hold that what counts as truth is the result of historically specific practices of truth-telling—laboratory

techniques, instruments, methods of observing, modes of calculating, regimes of classification, and so on—and, importantly, that the objects that are apprehended through that truth-telling are also historical.⁶

Examining the history of how objects came into being does not imply a claim that the world only affects us in ways that humans can perceive. Chemical exposures do *not* only happen when we know about them. Instead, attention to historical ontology underlines that it was only in the eighteenth century, when humans found ways to detect and manipulate entities called molecules, that we could assert that molecules had always existed even before we knew about them. Now that we have molecules we need them and do things with them; they are things we cannot live without. Molecules now have atoms, bonds, polymers, and other properties that we study, manipulate, and even manufacture. At the same time, attending to historical ontology allows the possibility that in the future other objects and properties that do not exist for us now may come into being for us, and in doing so perhaps even make the object “molecule” a less useful description for truth-telling. Thus, attending to the historical quality of existence is a way to hold onto the concreteness of things in the world in a given moment, while at the same time allowing for the possibility that other, yet undeveloped, ways of registering, slicing up, and bringing into being the complexity of the world are, were, and will be made possible by new instruments, techniques, social movements, and so on.

This book makes two main arguments about the historical ontology of chemical exposures. First, I argue that exposures were brought into existence in multiple, often conflicting circumstances—the result of not just specific environments but also new arrangements of technologies and practices through which laypeople, scientists, and corporate experts apprehended the health effects of buildings on bodies.⁷ Second, I argue that any given way of materializing chemical exposures as perceptible and real also sets the terms of what was imperceptible and unreal. Indoor chemical exposures, I argue, came into being through multiple histories that did not all agree on the terms by which an exposure could be shown to have happened or not.⁸

Invisible to our eyes, chemicals wafting from carpet, ink, and adhesive are starring protagonists in the story of sick building syndrome. Environmental historians and historians of science have often debated how best to include nonhuman actors—such as buildings or molecules—in

historical accounts.⁹ Environmental historians have included mosquitoes, prairie grass, weather, geological processes, and microbes as actors that have had important, often deadly, consequences for human history. To grant such actors specific agency in their narratives, environmental historians have tended to turn to contemporary scientific findings in order to characterize their actors' qualities, habits, and consequences. When it comes to chemical exposures, however, contemporary scientific findings, often originating in corporate laboratories, are contested by other communities of experts or by laypeople claiming to suffer chemical injury. The science on chemical exposures is simply unreliable by our contemporary standards of scientific truth. Moreover, no scientific studies exist for a vast number of chemicals used in industry. Thus there is a dual uncertainty when it comes to chemical exposures: first, any incidence of chemical exposure is difficult to pinpoint, even with scientific best efforts, because of the complexity of the phenomenon itself; second, contemporary experts disagree about the import and even the existence of widespread, low-level exposures. This dual uncertainty is thus an important problematic for environmental historians, prompting increased attention to questions of how "unknowing," ignorance, and imperception were not just accidentally but purposefully generated in the history of knowledge practices.¹⁰

Perceptibility and imperceptibility are this book's central concerns. Not only was the ability to register chemical exposures as existent the result of specific historical practices and technologies, but so too was the inability to register them. The history of how objects were rendered perceptible was in the same gesture intrinsically linked to a delineation of what was imperceptible.¹¹ The history of how things come to exist is intrinsically linked to the history of how things come not to exist, or come to exist only with uncertainty or partially. In other words, seeing necessitates the designation of the unseeable, knowing the unknowable, and so on. *Domains of imperceptibility* were the inevitable results of the tangible ways scientists and laypeople came to render chemical exposures measurable, quantifiable, assessable, and knowable in some ways and not others.¹²

Domains of imperceptibility were produced by limits in the capacities of knowledge practices, limits that were inevitable—every discipline of knowledge studies some things and not others; every scientific instrument can detect some things and not others; every experiment includes

some variables and not others. These material limits in knowledge production were and still are at stake in debates over the existence of chemical exposures. By juxtaposing different, sometimes conflicting traditions of knowledge production—toxicology with popular epidemiology, for example—one can throw limits into relief. I have layered and contrasted a select, and by no means exhaustive, set of histories in which scientific disciplines and lay communities rendered chemical exposures as events that one could or could not do something about. I will call the way a discipline or epistemological tradition perceives and does not perceive the world its *regime of perceptibility*.¹³

Chemical exposures are contentious events. They involve litigation, blame, neglect, and suffering. Chemical corporations, tobacco companies, manufacturers, and employers, as well as government administrations with antiregulation ideologies, have been deeply invested in producing science that minimizes or denies exposures. Such actors have developed techniques that maintain chemical exposure and their health effects as uncertain, that is, as events that one cannot do something about. Over the course of the twentieth century imperceptibility itself became a quality that could be produced through the design of experiments or monitoring equipment in order to render claims of chemical exposures uncertain. Other groups of laypeople and experts have nonetheless developed their own practices and technologies to produce evidence for the reality of harmful chemical exposures. Through their efforts domains of imperceptibility have become populated with all sorts of qualities, such as multiplicity, nonspecificity, complexity, and so on.

It is possible to track the production of imperceptibility because what was generated as imperceptible in one place could be generated as perceptible elsewhere. It is precisely by tracing the confluence of different histories for apprehending office buildings that I have tried to throw domains of imperceptibility into relief. I show that imperceptibility was not only accidentally and inevitably produced, it was also at times purposefully generated and maintained, particularly, but not exclusively, by industry-sponsored science. In either case, this book suggests regimes of perceptibility actively participated in making chemical exposures the phenomena they are today. In order to throw imperceptibility into relief through juxtaposition, this book makes a second argument about the historical ontology of exposures: objects are many things at once.

Multiplicities and Assemblages

A useful way to begin thinking about the historicity of chemical exposures in ordinary buildings, like the one you may be sitting in right now, is to see them as one of the ways buildings are physically connected to bodies. We can then ask about the buildings themselves. What is an office building? It is a real estate venture, built to maximize the developer's profit. And at the same time, a building has a mechanical physicality; it is a structure of steel and concrete, walls and ventilation ducts that mechanically delivers an indoor atmosphere. It is a structure for efficiently organizing the work of late capitalism, giving material form to economy, and dividing people into function and rank. Its potted plants, logos, and design are symbols of a company's prestige. Office buildings are repetitious, using the same mass-produced elements over and over, so that one becomes disoriented in a built space that seems to be the same no matter what the particularities of its location. Once an office building is launched into the world, it becomes its own unique hive of activity, bringing people together, spawning meetings, hierarchies, friendships, and sexual encounters both wanted and unwanted, worn out in one area and neglected in another. There is this office building I work in, and the one I used to work in, and the one next door, and . . . and. . . . In short, office buildings, like all objects, are multiplicities composed of many histories, of "ands," that link in ways intended and unintended, drawing out some attributes and not others, thereby setting the conditions of possibility for buildings.¹⁴

The multiplicitous building connects with the bodies inside in myriad ways: guiding movement through space, indicating appropriate behaviors, demarcating privilege, segregating by race and gender. The first refinement of my question, then, is how did buildings, in all their concrete multiplicity, affect the health of bodies? Not just any bodies, but the bodies of women office workers in the late twentieth century, who numerically predominated in the grunt labor of American information work. Which is not to say that they were only laboring bodies; they were also gendered and raced bodies dressed in middle-class clothes, differentiating themselves from factory workers. Which is not to say bodies were only social; they were also organic, composed of flesh and bone, organ systems, biochemical cycles, and immunological reactions, an organic body deciphered and anatomized by the practice of biomedicine,

that in turn drew on instruments, laboratories, and clinical practices to apprehend and monitor sickness and health. All of this is to say that bodies, like buildings, can concretely be many things at once—they are also multiplicities. Instead of a simple *is*, they are made possible by *ands*: woman and worker and flesh and . . . and . . . and. . . . Put simply, objects are constituted through their manifold material relationships, and these relationships have different histories.¹⁵ This is not to say that a sum total of *ands* can add up to a full understanding of a building. Multiplicities are not like the interlocking pieces of a jigsaw puzzle, which fit together to reveal a single picture. Histories may overlap and contradict each other, have varying intensities, durations, and stabilities. Instead of asking, What *is* a building? I will be asking, What are its *ands*? What did its historical relations make possible?

Buildings and bodies were often connected. A building was built with bodies in mind; it became a prosthesis of the body, extending its functions. The body, in turn, became a mobile part of the building; it was vulnerable without the shelter of the building, which supplied the milieu that organized its movements. Buildings and bodies were caught up in one another, sharing themselves in each other's conditions of possibilities, tracing each other's contours.¹⁶ They were in a relationship of mutual presupposition, a mutual capture in which they altered one another. Each was an integral element in the chains of "ands" that made up the other. A building is derelict without bodies inhabiting it. It is very difficult to be a body without the shelter of a building.

I use the term *assemblage* to describe the historically specific patterns through which buildings and bodies were connected, or assembled, to each other and to the objects and practices around them.¹⁷ I define "assemblage" as an arrangement of discourses, objects, practices, and subject positions that work together within a particular discipline or knowledge tradition. It is not the list of elements that make an assemblage consequential, it is what they made possible by the ways they articulated each other.¹⁸ In describing the assemblages within different traditions of knowledge production, I have tried to attend to how arrangements of words, things, practices and people drew out and made perceptible specific qualities, capacities, and possibilities for buildings and bodies. In other words, how an assemblage created a regime of perceptibility.

To get at a given assemblage, I have "cracked open" the archive of

technical guides, minutes of meetings, questionnaires, instruments, and body parts that made up a scientific discipline or lay epistemological tradition. By cracking open, I am looking for an abstract regularity to the way objects, subjects, practices, and words articulated each other. What I am trying to describe by writing about assemblages are historical *regularities*.¹⁹ Regularities are not simply a set of objects or phrases that appear often in the historical record. What I am calling regularities are not hidden, though historical actors may not necessarily recognize them. Regularities are the pattern of arrangement that is repeated, congealed, and constitutive of a scientific discipline or epistemological tradition. I use the abstraction of the assemblage as a means to investigate these congealed conditions of possibility for an archive, what was and was not sayable, perceivable, doable, natural, possible, and so on about buildings and chemical exposures in a particular historical circumstance. To get at these regularities, I examined archives belonging to ventilation engineering, feminist labor activism, and toxicology (to name a few examples) and sought to describe the assemblage of practices, technologies, and words that governed what was historically possible.

I find the idea of the assemblage a very useful concept to talk about the historically specific ways chemical exposures were apprehended, that is, became events that one could or could not say something and do something about. When I used the concept of assemblage, it became clearer to me that objects existed by virtue of their historically specific and yet very tangible and material circumstances. Assemblages are formed of organic and inorganic objects, technologies, bodies, and architecture, and not just of words. In this way, I wish to convey that chemical exposures in the twentieth century were materialized as events with particular kinds of qualities—and not others—by virtue of concrete technical and social arrangements. I therefore use the concept of the assemblage to describe the material and yet relational way things came to matter. An assemblage materializes an object by placing it in a specific social and technical constellation, making it perceptible, outlining form, drawing out possibilities and investing meanings by virtue of its linkages, effects, and relationships. Or conversely, by ordering an object in an assemblage, that object could be disinvested of qualities, capacities, and possibilities, thereby becoming dematerialized, even deemed nonexistent.

Buildings and bodies were called into being in as many ways as there were assemblages that seized them. A building could be part of both an

assemblage of ventilation systems, engineers, and standardization, *and* an assemblage of office work, workers, and occupational health problems. A body could be part of both an assemblage of doctors, insurance companies, and diseases, *and* an assemblage of feminism, consciousness-raising, and personal experience. This is what makes them multiplicities. When I traced any given assemblage by following its history and asking how it works, I found out that each element itself already had many other histories running through it. Our interior landscapes are embedded in a multitude of histories that do not necessarily sit well with each other. Objects or qualities vital in one assemblage may not be relevant in another. One assemblage may bring into being what another disavows or simply does not register. It is precisely by understanding sick buildings as materialized in the encounter of disciplinarily specific assemblages (from engineering, management, toxicology, feminism, popular epidemiology, cybernetics, etc.) that I hope to better understand not only how chemical exposures became part of everyday privileged American culture, but also how chemical exposures became quintessentially uncertain events.

Office workers, thus, did not magically make sick building syndrome out of thin air—poof, now there is an object where before there was nothing.²⁰ It is not so easy to materialize a new object. First, despite what we might wish, the world is not passive and cannot be made to work in whatever way we might hope. Objects were successfully materialized when they captured some of the potentialities and possibilities in our world. Moreover, once materialized, objects were not neutral. They resisted in the manner with which they had already become present. Thus, materializations are always *rematerializations*.²¹ Such rematerialization can sometimes be a form of resistance, not in the sense of liberation but in the sense of maintaining or producing possibilities counter to or cutting across dominant ways of apprehending reality.²² Or an encounter can result in a dematerialization, in which what is done in one assemblage is actively undone in another.

This book tries to show in empirical detail how sick buildings were formed by different, often conflicting, histories that remade and sometimes undid the “reality” of chemical exposures. Sick buildings existed in between office worker protests, feminism, ventilation engineering, toxicology, popular epidemiology, corporate science, and ecology. Many different ways of connecting buildings and bodies seized on seemingly

safe workplaces, and no two seized it in quite the same way. It was at this intersection of making and unmaking that indoor chemical exposures became events about which little could be asserted with certainty. At stake in writing a history of the contested reality of chemical exposures is the historicity of what counts as real, of what did and did not matter. To do this, I have conveyed matter, not in terms of a prior thingness but rather in terms of the processes of history, concrete social and technical arrangements and the effects of power—hence my use of the verb *materialize*. At the same time, and like most historians of science, I insist on the importance of environmental chambers, building materials, molecules, questionnaires, immune systems, and other tangible agents as physical actors in this process.

Sick building syndrome as a topic necessitated thinking about the relationship between history, materiality, and uncertainty. There is a materiality about sickness that is very difficult, and indeed dangerous, to deny. In debates about sick building syndrome in the recent past, medical and environmental experts were the ones most often claiming that sick building syndrome was not real, while workers were more likely to say it was. In order to understand the coming into being of indoor chemical exposures, then, I had to examine lay knowledge practices along with scientific ones. Chemical exposures, moreover, remain notoriously difficult events to prove. The subject itself both provoked questions of materiality and imperceptibility and made them unavoidable.

The chapters that make up this book are about historical regularities, not explanations of specific events. My narratives are abstractions of the regularities I encountered in my empirical research. Yet there is a contradiction buried deep in my methods: I was trying to explain a tangle clearly. In trying to be clear, I fear my narratives are too rigid and simple, leaving out much of the messiness. In trying to diagram the overwhelming histories about buildings and chemical exposures, I have stressed the structure over the confusion. Despite this limitation, I hope that the reader will be able imagine how these other words, objects, and subjects could also be exploded into multiplicities and how they, too, are contentiously rematerialized.

The book nonetheless remains an empirical investigation into the past of an important subject—chemical exposures. I have only gone to such lengths to think about materiality and history because I have taken very seriously the problem of writing a history of the twentieth century's

polluted backdrop and its largely unregistered health effects.²³ It is in this spirit that I have used the terms *assemblages*, *materialization*, and *regimes of perceptibility*, not just as colorful speech but as means of interrogating a problem. I have used the terms as my toolbox, and I try to make them do useful intellectual work. I have no illusion that my methodological toolbox forms an architecture of propositions that finally solves the problem of the relationship between history and materiality or the uncertainty of chemical exposures. A book is also an assemblage, of words, paper, and reader, and I invite you to make use of it as you will.

Map

Though they can be read separately, together the chapters in this book operate as a single argument about the historicity, multiplicity, and imperceptibility of chemical exposures. Each chapter cracks open the practices through which a discipline or epistemological tradition connected buildings and bodies. Most chapters emphasize a disciplinary assemblage of objects, practices, and discourses and the way that assemblage materialized bodies and building and thus rendered chemical exposures perceptible and imperceptible. Some technologies and practices, such as environmental chambers and surveys, reappear in different chapters, so that in reading the book as a whole one might see how these technologies performed differently in various historical circumstances.

Chapter 1 cracks open ventilation engineering and the experiments that set the criteria for the construction of mid-century buildings as machines that provided indoor weather. By examining the assemblage by which ventilation standards were established in the interwar years, I argue that building-machines generated a standardized “comfort” that required a standardized body, while at the same time leaving chemical attributes of the indoor atmosphere as outside of mechanical control, irrelevant to comfort, and imperceptible. How work was organized in office buildings, from Taylorism to cybernetics, is the subject of chapter 2, which examines how distributions of desks, pathways of paper, and the exertion of equipment formed tightly knit material and social assemblages for choreographing the labor of office workers. This chapter outlines the history of the material organization of office work and the ways the exercise of power depended on not only gendered and classed