

MCKAY JENKINS

what's gotten

STAYING HEALTHY IN A TOXIC WORLD

into us?

"A Silent Spring for the human body."
—RICHARD PRESTON, author of *The Hot Zone*



ALSO BY MCKAY JENKINS

Bloody Falls of the Coppermine

The Last Ridge

The White Death

The Peter Matthiessen Reader (editor)

The South in Black and White

WHAT'S
GOTTEN
INTO US?

**Staying
Healthy
in a
Toxic
World**

McKay Jenkins



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FOR KATHERINE, STEEDMAN, AND ANNALISA

WITH LOVE, DEVOTION, AND GRATITUDE

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Prologue

On a crisp fall afternoon a couple of years ago, I went in for a routine two-year checkup with my internist. Everything seemed to be fine: My home life was happy and nurturing. I had never smoked. I ate right, got plenty of rest, and had been a dedicated runner and cyclist my entire adult life. Save for the usual aches and pains, nothing had ever been wrong with my body, and as long as I was smart about it, I figured, I'd still be riding my Fausto Coppi racing bike well into my eighties.

My only complaint, I told my doctor, was a faint tightness in my hip that I had felt off and on for two years—and odd, sharp twinges between my left thigh, knee, and shin that occasionally accompanied it. Sometimes the skin on my leg itched. Sometimes it burned. Sometimes the ligaments in my knee hurt. I'd consulted with a dermatologist months before but had gotten no answers. Were these symptoms related? My internist was perplexed. Perhaps it was an “overuse injury,” he said, something I'd developed from too much running in the woods or riding the rural roads near my home. Like anyone who has tried to stay in shape through their postcollege years, I was familiar with such aches and pains. As the years went by, fewer and fewer were the days when I *didn't* feel some minor muscle or joint ache after even a light workout. I was getting older, and so was the machinery.

My internist looked me over and agreed that my pains were probably related to exercise and he suggested I see an orthopedist at a nearby sports medicine clinic. I called and got an appointment that very morning. I walked into the orthopedist's office ready for a quick diagnosis and a pat on the head. “Someone as fit as you can expect to have occasional ligament stress,” I expected him to say. “Here's the name of a physical therapist. Go get a massage, and check in with me on your seventy-fifth birthday.”

This is not what he said.

After hearing my description of the pain, the orthopedist rotated my hip and knee a couple of times. He seemed puzzled. This didn't seem like a joint problem, and in any case the pain in my knee was probably “referred” pain radiating from my hip. He suggested I get an MRI to help him see a bit more clearly what was going on with my soft tissue.

Okay, I thought: people get MRIs all the time. Especially athletes. They'd probably just find a slight tear in some connective tissue, I'd buy a new pair of running shoes, and away I'd go. Worst case? A little minor surgery to fix an abraded tendon. I got an appointment that afternoon, spent forty-five unpleasant minutes inside a clanging metal tube, and went home to wait for the results—which, given the routine nature of the exam, I figured would take a few days, or even weeks.

I was standing in my living room when the phone rang just a few hours later. This was an awfully quick turnaround, I thought, looking at the caller ID. These lab techs must be having

a pretty light day at the office. But when I picked up the phone and heard the orthopedist's voice, I knew even before he spoke that something was amiss.

Hello, Mr. Jenkins, he said, then paused. You have a suspicious mass in your abdomen, he said. It's growing inside your left hip. Here is the number for an oncologist. You need to call him right away.

What can you say about such moments? I remember hanging up the phone. I remember looking at my wife, Katherine, and looking at my children putting together a puzzle on the floor in the next room. My son was four, my daughter not yet eighteen months. I fell apart.

Far worse than my fears for myself were my worries about my kids. How would they grow up by without a father? Trying to protect them from the initial shock of the news, Katherine and I took turns taking our cell phones outside to talk to doctors and loved ones. Standing in the yard, trying to set up a date for a CT scan, I would look through the living room window to see my kids playing together. I imagined the same scene, with me gone. I felt like a ghost.

Katherine and I passed the next three weeks in a kind of silent panic. We spent anxious hours on the Internet, blindly researching what this thing was that was growing between my hip and my belly. This was a very bad idea. We called every doctor we knew.

I held it together enough to keep teaching my classes at the University of Delaware, which is about an hour north of our home in Baltimore. One day, when I returned to my office after a morning class, there was a message on my phone. It was from Katherine. I found an oncologist, she said, but you need to get here fast; he's really busy and has only one opening this week. I ran into my classroom, scrawled "Class canceled" on the blackboard, and dashed off to my car.

When I got to the hospital, Katherine was already there, waiting in the parking lot. We hugged, and went inside. I was short of breath. A nurse escorted us into an examination room, and a few minutes later, the oncologist strode in with my MRI images under his arm. He slapped them up on a backlit screen. You see this? he asked. That's your hip. Now, see that round thing next to it? That's not supposed to be there.

He reached over to the examination table and began scribbling diagrams on a sheet of sanitary paper. He sketched out what he thought was going on. Although he couldn't be certain without further tests, the tumor was likely a soft-tissue sarcoma, an ugly cancer of the fibers connecting my hip to the muscles and nerve tissues of my left leg. The prognosis depended on how big the tumor was, where precisely it was growing, exactly how aggressive it was. I could get a biopsy of the tumor, which would provide a look at its cellular profile, but there was always the risk of a biopsy needle inadvertently spreading malignant cells outside the tumor itself. What to do?

At worst, this was, well, very bad. At best, a surgeon could cut out the tumor, but might be compelled to sever my femoral nerve, the trunk line that connects the nerves in the leg to the spine. Which meant I would probably never run or ride my bike again. And then I'd have to remain vigilant to see if the cancer returned. The doctor ripped off the sheet of sanitary paper, now four feet long, and handed it to me.

As he continued to speak, I felt myself leaving my body. My mouth continued to move, but the rest of me was floating, looking in from the outside. I saw myself shake hands with the

doctor. I saw Katherine take my hand and lead me outside. It wasn't until we made it back to the parking lot and I dialed my brother on my cell phone that I returned to my body. "Brian, it's McKay," I said. "I just came from a doctor's office. I have cancer." The floodgates opened.

To this day, the ride home has remained indelible. Once-generic landmarks still vibrate with the terror I felt that day: the gas station where I stopped to call my friend Wes. The curb by our home where I called my friend Tom. Rather than relieving my anxiety, each telling made the story more concrete. This was really happening. But how? This was not a grinding descent into illness; it was a bolt from the blue. I did not feel sick, and never had. My mind raced. How could I possibly have cancer?

Beyond the panic, of course, was a question. Where had this thing, this "suspicious mass" come from? No one seemed to know. Not my primary care doctor, not my orthopedist, not even my oncologist. In medicine, cause and effect are not always clear.

After weeks of scrambling and using every connection I could muster, I found a slot on the schedule of a renowned surgeon at a New York medical center. Katherine and I drove north, dropped our kids off at their aunt and uncle's apartment, and went to the hospital.

In the morning hours before my operation, I sat on a couch in a waiting room in a light blue surgical gown. I wore headphones, listening to the Dalai Lama offering counsel about facing one's own death. Life is a series of transitions, he said. Dying is one of them. It is vitally important to remain clear-eyed during these times, to see things Just As They Are.

Okay, I thought. I will do my best. But seeing things clearly is not always so easy. Especially when it comes to understanding illness and its root causes.

At some point, I looked up to see the outstretched right palms of a pair of researchers, a man and a woman in their twenties, clipboards at their sides and kind, self-conscious expressions on their faces. I took off my headphones and we shook hands. We'd like to ask you a few questions before you go into surgery, they said. Sure, I said. I was feeling strangely serene and, I confess, a bit melodramatic: If I'm going to die, I thought, the least I can do is be a model for others. Go out gracefully. Make the Dalai Lama proud.

The researchers sat down on a couch across from Katherine and me, placed their clipboards on their laps, and began probing. The first questions were pretty standard: What ethnic group best describes you? Um, white. How far did you make it in school? I have a PhD, I said. How many packs of cigarettes have you smoked per day, on average? None, I said. Ever. The researchers nodded, and scribbled. How much alcohol? A couple of beers a week, I said. I managed a wan smile. Please don't tell me I have a tumor because I drink beer.

Then the questions changed, from ones I had been asked by doctors dozens of times before to ones I had never been asked in my life.

How much exposure had I had to toxic chemicals and other contaminants? In my life? asked. This seemed like an odd question. What kind of chemicals do you mean? The researcher began reading from a list, which turned out to be long. Some things I had heard of, many others I had not. Metal filings? Asbestos dust? Cutting oils? I didn't think so. What's cutting oil? How about gasoline exhaust? Asphalt? Foam insulation? Natural gas fumes?

Where was this going?

I was not a machinist, or a car mechanic, or a building contractor. The words kept coming

Vinyl chloride? I wasn't sure. What was that? How about plastics? Are you kidding? Everything is made of plastic. Dry-cleaning agents? I shot a glance at Katherine and managed a smile; I was not exactly known for my natty attire, and I hadn't darkened a dry cleaner's door in years. On and on it went. Detergents or fumes from plastic meat wrap? Benzene or other solvents? Formaldehyde? Varnishes? Adhesives? Lacquers? Glues? Acrylic or oil paints? Inks or dyes? Tanning solutions? Cotton textiles? Fiberglass? Bug killers or pesticides? Weed killers or herbicides? Heat-transfer fluids? Hydraulic lubricants? Electric fluids? Flame retardants?

By now I had begun to feel distinctly uncomfortable. Not about my history of "industrial" exposures, which were nonexistent, but about the myriad, and mostly invisible, chemicals that the researchers seemed to be curious about. What was a flame retardant, exactly, and how in the real world would I know if I had been exposed to one? I had never used pesticides, but Loraine knows there were plenty in my neighborhood.

The questions shifted again.

We'd like to ask you about your job history, they said. What had I done before I became a professor? Well, I thought, I hadn't exactly been working in a chlorine plant. Before teaching English, I spent a decade writing for newspapers. I'd spent a lot of college summers waiting tables in restaurants and, before that, washing dishes. Oh, wait—there was that one summer after college when I worked in a garage, pumping gas and changing people's oil. Could that have been it? And was that the point of all these questions? To find a single cause of the tumor? If so, why would they be so interested in what I had done for work thirty years before?

Again, the researchers changed their tack. Now we'd like to ask you about the places you've lived, they said. If my employment history seemed fairly benign, I had spent a lot of time living in big, industrial cities. Again, going backward in time: Baltimore, Philadelphia, central New Jersey, Atlanta, Seattle, Annapolis, Manhattan, western Massachusetts, suburban New York.

Any cancer in my family history? My paternal grandfather had died of prostate cancer at an advanced age, I said. My mother had had malignant melanomas removed from her skin. I had, thus far, showed signs of neither.

Had I ever lived within a mile of any kind of waste incinerator, either at a city dump or a hospital? Not that I knew of. I had never worked in an industrial plant; wasn't that where all these chemicals were concentrated? A decade earlier, I had built a couple of canoes, but I had done all my fibreglassing outdoors. I had painted a bedroom or two. Who hadn't? Yet the longer the questioning went on, the more I began to realize that I didn't have the faintest idea about how many of these chemicals I had come into contact with over the years. After all, just because I had never worked in a factory did not mean that I hadn't been exposed to the products these factories made. But once chemicals were turned into products, they stayed put. Didn't they?

The researchers, to be fair, were not there to talk about these larger questions. They were there to ask their questions, and when they were finished, they stood up to leave. The young guy gave me a parting look that seemed slightly melancholy, and they said good-bye.

A couple of hours later, a doctor led me into the operating room, and I lay down on the table. How in God's name did I end up here, I wondered. The room was remarkably cool. Around me, a dozen faces in blue hats and masks scurried around, tending to monitors and swinging trays of instruments at my bedside. How you doin'? asked a man who introduced himself as my anesthesiologist. Fine, I said, but I could use a beer right about now.

I'll give you something better than that, he said, hooking me up to an IV. Do me a favor and count backward from twenty, would you?

I made it to nineteen.

A moment later, it seemed, I awoke. My eyes felt fuzzy, and blurred by bright overhead lights. Where was I? I blinked. There, at the foot of my bed, stood Katherine and my surgeon. Both were beaming. Something must have gone well, I thought. You're a lucky man, the doctor said. The tumor was as big as an orange, but it turned out to be growing out of a nerve cell rather than a muscle cell. We sent a slice of it down to the lab; it turned out to be benign. Of a hundred cases like this, about four turn out this way. Not only that, we managed to peel the tumor off your femoral nerve. Once you recover, you can get back to running and riding your bike. You're a very lucky man.

And so I was.

As joyful as my outcome had been, I was left feeling somehow bereft. Had this whole thing been bad luck? Where had this tumor, this navel orange, come from? It wasn't until I answered the hospital questionnaire that I had ever even considered the vast arrays of chemicals I had been exposed to over the years. Was it possible that the questions constituted a trail of bread crumbs that could lead me to some answers? Suddenly, these questions began to take on a whole new sense of urgency.

From the moment I thought I had cancer to the moment I learned I didn't—an extremely long month, as it turned out—I felt like I had been initiated into a vast secret society, one whose members had been stamped with a disease whose origins were utterly and maddeningly opaque—to themselves, and frequently even to their doctors. Colleagues, friends, students, family members I hadn't heard from in years—everyone, it seemed, had had a brush with cancer or was intimately connected to someone who had. In the four years that have passed since my surgery, cancer has burned its way through a swath of my family and friends. My beloved aunt Julie recently passed from a combination of breast cancer, bone marrow cancer, and Parkinson's disease. My friend Scott, still in his forties, just learned that he has pancreatic cancer. Like me, he has small children. So do Leah and Suzie and Susanna, young women who have both recently suffered terrible bouts with breast cancer. My cousin's husband, Phil, died of a brain tumor before his fortieth birthday. He left a wife and a young daughter. And on and on and on.

What is going on here?

I used to think that serious illness was something rare, something that touched only the unlucky, those who drew the short stick. No longer. Now it had begun to seem like the world was filled with two kinds of people: those who had received their diagnosis and those who had yet to receive it. My brother Denny, a surgeon, has a dry expression for this: We're all pre-op. Every one of us.

No one goes through a cancer scare without experiencing a kind of awakening. Here's what mine looked like: I went from being a passive observer of other people's suffering to feeling an intimate desire to prevent that suffering. I wanted to know if there were root causes. I wanted to try to see things just as they are, how they came to be that way, and what I could do to protect myself and my children. This book is the result.

To begin with, it's worth thinking about what a relatively short time we've been swimming in synthetic chemicals. In 1992, seven years after the *Titanic* was discovered by a French-American team off the coast of Newfoundland, the French government sought out the few survivors and their heirs to try to return some of the bounty—pince-nez spectacles, hairpins, ivory combs—that divers had discovered on the sunken ship. But what caught my eye about this story was a comment made by Charles Josselin, secretary of the French merchant marine.

“What most struck me,” Mr. Josselin said, “is that in such a long list of day-to-day objects there was nothing made of plastic.”

Not a single piece of plastic on the grandest luxury liner of the day. And this was less than ninety years ago.

The Synthetic Century, let us say, has been full of grand achievements and equally grand consequences, many of them unintended. In 1918, a scientist named Fritz Haber won the Nobel Prize for figuring out how to make synthetic nitrogen, a key component of soil, and thus “improving the standards of agriculture and the well-being of mankind.” But during World War I, his technology also helped Germany make bombs from synthetic nitrate and later, poison chlorine and phosgene gas. In World War II, Hitler used another one of Haber's compounds, Zyklon B, in Nazi concentration camps. After the wars, synthetic fertilizers paved the way for the explosion of industrial-scale agribusiness, which has, in turn, created great wealth but also unprecedented levels of pollution, monoculture, and processed foods.

In his book *The Omnivore's Dilemma*, Michael Pollan outlines the way our industrial food chain floats on an ocean of cheap oil. This is also true of our vast array of consumer products. Although coal companies in the mid-1800s were processing coal gas for lighting and synthesizing other products like dyes, this was but a baby step compared to what happened a hundred years later. Since World War II, Big Oil and, more recently, Big Coal and Big Natural Gas, have supplied our economy not just with energy for our homes and cars but with the very building blocks of our domestic lives: not only our plastics but our fertilizers and pesticides, our furniture, our personal care products, even our clothing. Consider this: in the last twenty-five years, the country's consumption of synthetic chemicals has increased 8,200 percent.

By the end of the Second World War, everything, it seemed, was being made from petrochemicals: fertilizers and pesticides for the farm and garden; plastics for everything from shrink wrap to baby teething rings to car dashboards; treatments for fabrics. “The synthetics are changing life imperceptibly—changing it, in fact, as profoundly as it was ever changed by the machine,” *The New York Times* reported in the spring of 1940. “The gaudy fountain pens and cigarette holders, the lacquers, the well-designed and attractive costume jewelry in the five-and-ten stores, the curtains at the living room's windows, the steering wheels that w

clutch in our cars, the drugs that cure us from some of the more deadly diseases, the dye that outdo the rainbow, the camphor that once came from the trees, the musk that once cost \$700 a pound, the ‘glass’ in the bathroom—all are synthetics. To the man in the street, ‘synthetic’ still means a tricky substitute for something authentic—an unfortunate relic of prohibition when raw and fiery alcohol was inexpertly flavored to produce a potent but unconvincing gin. It is time that we gave synthesis its true meaning—a putting together, control over matter so perfect that men are no longer utterly dependent on animals, plants and the crust of the earth for food, raiment and structural material.”

The trouble with such rapid proliferation of products made from petrochemicals, of course, has been that the production and use of synthetic chemicals has vastly outpaced our ability to monitor their effects on our health and the environment. We learned to love what chemicals could make; we just never bothered to wonder if there could be a downside. By the mid-1970s, there were some 62,000 chemicals in use; today the number is thought to be closer to 80,000. The EPA has a full set of toxicity information for just 7 percent of these chemicals, and the U.S. chemical industry, a \$637-billion-a-year business, is so woefully underregulated that 99 percent of chemicals in use today have never been tested for their effects on human health. Fewer than 3 percent of these chemicals have ever been tested for carcinogenicity. Far fewer (or none) have been assessed for their effect on things like the human endocrine system or reproductive health. In recent years, as we shall see, the news from these fronts has not been promising.

And since these chemicals—and the products they are turned into—are designed not to break down, they have a way of showing up in some strange places. In 1997, Charles Moore, an oceanographer with the Algalita Marine Research Foundation, found himself navigating a patch of the Pacific Ocean so full of garbage that pieces of plastic—bottle caps, bits of shredded bottles—outnumbered plankton by six to one. Much of this garbage is in the form of “nurdles”—little plastic pellets used as the building material in all kinds of consumer goods. Some 5.5 quadrillion—I’ve never written a number that large before—of these nurdles are manufactured every year, and lots of them end up in the ocean. Moore has since estimated the amount of debris that has washed off the coasts of Asia and the western United States to be something on the order of 100 million tons. The Great Pacific Garbage Patch, he says, is now the size of Africa, and has become “a toilet bowl that never flushes.”

I was born in 1963, the year after Rachel Carson published her landmark book *Silent Spring*, first alerting the world to its saturation in industrial chemicals. A biologist and essayist, Carson set out in *Silent Spring* to chronicle just how widespread, and how dangerous, synthetic chemicals had become. Man had learned enough about chemicals to create enormously potent products, she warned, but had failed to imagine the consequences of their widespread use. “Can anyone believe it is possible to lay down such a barrage of poisons on the surface of the earth without making it unfit for life?” she asked.

Carson’s stories, gleaned from newspaper accounts and scientific journals, were ominous and told with unblinking directness: In Florida, two children find an empty bag of the insecticide parathion and use it to repair a swing. Both die soon afterward. A chemist checking the toxicity of parathion tests it on himself by swallowing less than a hundredth of

an ounce. Paralysis sets in so quickly he doesn't have time to reach for an antidote, and he dies. At the time Carson wrote, 7 million pounds of parathion were being applied every year in the United States; the amount used in California alone, one scientist said, was enough to provide a lethal dose for ten times the world's population.

Carson's book was savaged by the chemical industry, which reached for rhetoric as dramatic as Carson's own. *Silent Spring's* claims about the dangers of pesticides missed the greater threat, the industry claimed, of "hordes of insects that can denude our forests, sweep over our crop lands, ravage our food supply and leave in their wake a train of destitution and hunger, conveying to an undernourished population the major disease scourges of mankind."

In addition to pesticides, the decade before I was born had ushered in the widespread use of polychlorinated biphenyls, or PCBs, the oily fluids used in everything from electric transformers to window caulk. At that time, researchers tested PCBs for toxicity by dumping them into a bucket of fish. If, after five days, more than half the fish were still alive, the chemicals were considered safe.

In short, the middle decades of the twentieth century were a kind of golden age of synthetic chemicals, a time when DuPont's "better living through chemistry" was considered the coin of the realm. I grew up in Yonkers, New York, where a Sherwin-Williams paint store had a neon sign of a giant can pouring red paint over a blue globe. The sign read: "Cover the Earth." And so we have. By 1940, American companies were already making 300 million pounds of plastic. We wrapped our food in cellophane. We wrapped our legs in nylon. We gave ourselves over to vinyl. Styrofoam. Plexiglas. Polyethylene. Polypropylene. Polyurethane. By 1960, plastic production was up to 6 billion pounds. In 1928, a man named Waldo Semon invented polyvinyl chloride, or PVC. When he died, at the age of one hundred in 1999, worldwide production of PVC, which is used to make everything from clothing to car interiors to children's toys, had reached 44 billion tons a year.

By 2004, the U.S. chemical industry was producing more than 138 billion pounds of seven petrochemicals—ethylene, propylene, butylenes, benzene, toluene, xylenes, and methane—that form the building blocks for tens of thousands of consumer products, from gasoline to rubber to lipstick. Today, industries worldwide generate 300 billion pounds of plastics a year. You've probably come across numbers like these: Americans throw away 100 billion plastic bags a year—the equivalent of dumping nearly 12 million barrels of oil. We throw away 5 billion plastic water bottles a year.

In 1990, the National Academy of Sciences estimated that in the United States alone, toxic flame retardants were added to 600 million square yards of upholstery fabrics each year—enough to cover Washington, D.C., three layers deep. And that's just for sofas and car seats. Every year, some 40 million pounds of the herbicide 2,4-D—a primary constituent of the infamous Agent Orange once used to defoliate forests in Vietnam—are used on lawns and other green spaces in the United States; the product can be purchased without a license in any hardware store.

Every day, the United States produces or imports 42 billion pounds of synthetic chemicals, 90 percent of which are created using oil. Converted to gallons, this volume is the equivalent of 623,000 gasoline tanker trucks, each carrying 8,000 gallons, which, if placed end to end, would reach from San Francisco to Washington, D.C., and back. In the course of a year, this line would circle the earth eighty-six times at the equator. Whether all that stuff ends up

getting turned into consumer products, or burned, or buried, it never disappears. It has to end up somewhere. And it does.

It ends up in us.

Here's the problem: most of the tens of thousands of chemicals that are used commercially have been around for only a few decades, far too short a time for researchers to figure out with any certainty what impact they might have on our health. The human immune system has evolved over millennia to combat naturally occurring bacterial and viral agents. It has had only a few decades to adjust to most man-made contaminants, many of which are chemically similar to substances produced naturally by our own bodies. The effects of this are far from fully understood. "We face an ocean of biologically active synthetic organic compounds," the ecologist Sandra Steingraber writes. "Some interfere with our hormones, some attach to chromosomes, some cripple the immune system, some overstimulate certain enzymes. If we could metabolize them into benign compounds and excrete them, they would be less of a worry. Instead, many accumulate. So they are doubly bad: they are similar enough to react with us, but different enough not to go away easily."

To be sure, the scientific evidence linking toxic chemicals and health problems is still in its early phase. "There's not enough [information] to allow for big generalizations," Dr. Mark Miller, director of the Pediatric Environmental Health Specialty unit at the University of California, San Francisco, has said. "What it does do is show the huge need for this information, both to allow us to put these results in context and also to give us information on what's going on out there over time and over age groups. We're blind to what's going on out there."

In the spring of 2010, a major new study suggested links between toxic chemicals and autism—even if the exposure comes to babies still in utero. "If babies are exposed in the womb or shortly after birth to chemicals that interfere with brain development, the consequences last a lifetime," said the author of the study, Philip Landrigan, a professor of pediatrics at New York's Mount Sinai School of Medicine.

Today, despite vast sums spent on research and therapies, cancer continues to kill an increasingly devastating numbers. Lung, breast, and colorectal cancers remain among the leading causes of death among women; for men, prostate and liver cancers remain major concerns. One in three women will die of cancer. Among men, the number is one in two. Scientists estimate that roughly 34,000 people die each year from exposure to carcinogens in the workplace or the environment. "We are treating people like experimental animals in a vast and largely uncontrolled study," writes Richard Horton, a physician and the editor of the British medical journal the *Lancet*. "By any common-sense measure, the war on cancer has been lost."

And while cancer seems to strike the loudest bells in our collective consciousness, it is hardly the only danger that can be traced to environmental chemicals. Cognitive development experts say that learning disabilities rose 191 percent between 1977 and 1994. The California Department of Developmental Services says it saw a 210 percent jump in autism rates in the decade following the mid-1990s. One in eight children is born prematurely; nationwide premature births have jumped nearly 30 percent since 1981. Twenty-four million Americans have an autoimmune disease; research indicates that this number has been doubling and tripling around the globe. The University of Kentucky recently reported a link between

trichloroethylene, an industrial solvent known as TCE, and Parkinson's disease. TCE can be found in more than a third of the nation's waterways.

The deeper one looks into the spread of synthetic chemicals, the more fascinating, and frustrating, the story becomes. In 1984, the National Academy of Sciences completed a four-year study of high-volume industrial chemicals and found that 78 percent had not been subjected to even minimal toxicity testing. More than a decade later, the Environmental Defense Fund found "no significant improvement." And these were for chemicals produced or imported at volumes exceeding a million pounds a year, chemicals that were *already* considered environmental or health threats.

The more I began to look into this, the clearer it became that we have spent our lives virtually marinating in toxic chemicals: in the water that comes through our tap; in the plastics we find in our baby toys or use to store our food; in our soaps and shampoos and cosmetics; in the fabrics and dyes in our clothes and our furniture; in the products we use to clean our homes; in the chemicals we spray on our weeds and apply to turn our toilet paper white. Like everyone else, I suppose, I'd had moments in my life—when I used my bare hands to roll out insulation, or breathed in a neighbor's lawn chemicals, or tried to work in an office as the hallways were being painted—when I'd wondered whether the stuff could somehow be "bad" for me. But I never really bothered to think too hard about it. Honestly, I figured, if a product is sitting on a supermarket shelf in the United States at this late date in history, how bad could it be? There was scientific research behind all this stuff, and ethical business practices, and scrupulous government regulation. Wasn't there?

What becomes clear, if you stop to think about it, is that what's gotten into us is not just chemicals but culture. We aren't just saturated with chemicals, after all; we are saturated with products, and marketing, and advertising, and political lobbying. Fifty years ago, it was not uncommon to see advertisements for DDT featuring an aproned housewife in spike heels and a pith helmet aiming a spray gun at two giant cockroaches standing on her kitchen counter. The caption below reads, "Super Ammunition for the Continued Battle on the Home Front." Another ad shows a picture of a different aproned woman standing in a chorus line of dancing farm animals, who sing, "DDT is good for me!" DDT was marketed as the "atomic bomb of the insect world," but also as "benign" for human beings. And we believed it.

Our ignorance is not an accident. We are not meant to know what goes into the products we use every day. The manufacturers of most American-made products tend to keep the ingredients and formulations of their products secret, and rarely mention that individual ingredients might (or do) cause cancer, or impede fetal development, or lead to hormonal imbalances. It seems that the intention in packaging is to make information harder to find, not easier—an imitation of information, not information itself.

Those "ingredients" lists on cleaning products or lawn chemicals—can anyone pronounce those words, let alone figure out why they're there? My dentist keeps a big box of disposable gloves in his examination room. The box says the gloves are made of polyvinyl chloride, which is known to cause leukemia and suspected of playing a role in bone marrow cancer and non-Hodgkin's lymphoma. Sure, the gloves protect him from patients' blood. But do I wear PVC in my mouth? One day, when I looked inside my new Toyota Prius, I found a no

saying that the car's air bags, batteries, and seat belt components may contain perchlorate and that I could find more information on the compound by visiting the website for the California Department of Toxic Substances Control. When I did this, I learned that perchlorate interferes with the thyroid gland and is "becoming a serious threat to human health." So much for driving "green."

Trying to understand a list of ingredients is like trying to understand the super-spud-u disclaimer at the end of a radio commercial for a new drug. What was that the guy said about side effects? If such information is "presented" but is functionally unintelligible, what is the reason for including it? This gesture at providing packaging "information" seems ethical, at best, compromised, at best.

Pick up a can of organic tomato sauce, and you may read that the can is lined with "lead-free enamel." Sounds good, right? But what the can doesn't tell you is that the can is lined with bisphenol A, a plasticizer that has been shown to cause hormone imbalances; the information is available only if you put in a phone call to the company. Should the plastic be listed on the can? Should the presence of bisphenol A affect the "organic" label itself?

Similarly, "spring water" is bottled in a container that is made with phthalates, a plasticizer that may lead to lower sperm counts and that has been shown to leach from bottles into the liquids they contain. Should that water really be considered "pure"?

"Information," such as it is, is hard to come by, harder to understand, and harder still to weigh. Again, this is no accident. Efforts to force companies to list more—and more understandable—information on their products have run up against stark political realities. Chemical companies have contributed \$47 million to federal election campaigns since 1990 and pay \$30 million a year for lobbyists in Washington. The industry uses its clout at both federal and state levels to kill most efforts at increasing what we can know about these toxins. Is it any surprise, then, that most chemicals have never been even minimally scrutinized for their toxicity?

Granted, part of this is our own fault. When we buy a box of "chicken nuggets," part of our brain registers the distance this "food" has traveled since it—or a small part of it, anyway—walked the earth as a living creature. Beyond this, we convince ourselves not to ask too many questions. The same is true for most of the products discussed in this book. We don't want to know about toxic plasticizers, we just want a bottle of water. We don't want to know about threats to our fertility, we just want a tube of lipstick. We don't want to hear about breast cancer, we just want to buy a new couch. And so on.

With so little information, it's easy to see why we have become so complacent. And why we have allowed ourselves to live, albeit uncomfortably, with assurances that these products are "safe." A single exposure to these chemicals never killed anyone, we tell ourselves. This is true. But smoking a single cigarette never killed anyone, either. The trouble with exposure to toxic chemicals, as with exposure to tobacco, is that the impact is cumulative, long-lasting, and, frequently, slow to reveal itself. Flame retardants may be in your mattress, but they are also in your children's pajamas and in the salmon you had for dinner last night. If one exposure to bisphenol A, the plasticizer found in many plastic bottles, is considered "insignificant," how about a hundred exposures? A thousand? How about twenty-five years worth? And what happens when you are exposed to bisphenol A in combination with hundreds of other chemicals over these same twenty-five years?

“The effects don’t just accumulate, they mushroom,” writes Devra Davis, the director of the Center for Environmental Oncology at the University of Pittsburgh Cancer Institute. “Scientists have long known that certain chemicals ... can cause cancer. Now we’re beginning to realize that the total of a person’s exposure to all the little amounts of cancerous agents in the environment may be just as harmful as big doses of a few well-known carcinogens. There’s plenty of evidence that combined pollutants can cause more hard harm together than they do alone.”

More questions: What role will these chemicals have on our pregnancies, or our children? Which of them might affect us in old age? The truth is, we don’t really know. Except for leukemias, most cancers don’t show up until three or four decades after an exposure, and even then they sometimes show up only indirectly. Lung cancer and the myriad other diseases caused by smoking are caused by repeated exposure over a stretch of time. When it comes to how a body will respond to toxins, who can say? By the 1950s, death certificates were already showing a far greater proportion of people dying from cancer than at the turn of the century, and pediatric cancers were becoming commonplace. Women born in the generation just before mine—between 1947 and 1958—have almost three times the rate of breast cancer as their great-grandmothers. Since then, the presence of chemicals in consumer products has vastly increased. For starters, over 5 billion pounds of pesticides had been used worldwide by 2001—one-quarter of them in the United States.

More recently, experts say, breast cancer, on average, robs female victims of twenty years of their lives, which means one million years of women’s lives are lost every year. This was true for Rachel Carson, who died of breast cancer in 1964, at the age fifty-six. She had been diagnosed in 1960, in the middle of her research for *Silent Spring*, and though tumors made her writing hand numb and radiation treatments left her nauseous and weak, she continued working. Eighteen months after *Silent Spring* was published, she died.

So here we are.

Almost fifty years after *Silent Spring*, and the tide of synthetic chemicals is only rising. We are faced, every day, with an overwhelming number of choices as consumers: Do I choose this detergent or that one? This mattress or that one? The chemical lawn-care company or the “green” one? This shouldn’t be so hard. We’re talking about washing our children’s hair. Or cleaning the sink. Or tending a garden. Why has this become so complicated? And on what information do we make our decisions?

That is what this book will try to address. The most important thing, as I have said, is finding the courage to see things clearly. But as I have learned, when it comes to toxic chemicals, seeing things clearly is harder than you might imagine.

In every room of our houses, in every action we take, we are exposed to synthetic chemicals. You hear that virtually every stream in the United States has been found to contain hormones found in oral contraceptives, so you decide tap water isn’t such a great idea. You buy spring water in plastic bottles, only to learn that the bottles leach chemicals into the water; even if the water is clean, the bottles aren’t.

We inhale chemicals in the form of “volatile organic compounds” off-gassing from paints, perfumes, and synthetic upholstery. We put them on our skin, in the form of cosmetic

moisturizing creams, and shampoos. We absorb them in our food and in our drinking water, which is laced not only with agricultural pesticides but with discarded pharmaceutical drugs like antipsychotics and erection enhancers. Once you start to peek behind the curtain, the number of chemicals we expose ourselves to becomes unnerving. If we can even stand to peek, that is. Most of us are so numb or frightened by this saturation that we don't have the courage to ask where all this stuff comes from or what it might do to us—far less, what we might do to pull ourselves out of this stew.

So what actions can we take on our own to protect ourselves from—or, at the very least, limit our exposure to—these toxic chemicals? What can we do around our homes, and our workplaces, and our children's schools? What should we talk to our neighbors about, and our legislators? How can we regain some sense of control over what ends up in our bodies?

Over the years, we have delegated so much knowledge about (and so much responsibility for) our health to “professionals” who grow our food, make (and inspect) our toys, “manage” our lawns, “treat” our water. When even the simplest things are outsourced to people whose interest in the process is professional and, therefore, economic, what surprise is it that shortcuts are taken? When someone at a chemical company says, “We are not aware of the dangers of these chemicals,” who exactly is “we”?

Every choice we make is a bargain with the devil. You go to get your suits dry-cleaned only to learn that dry cleaners rely on perchloroethylene, or perc, a known carcinogen. Are the having crisp creases worth the risk? You want to wash your infant's hair. What could be more benign than baby shampoo? But look closer at the label on the bottle: the baby shampoo contains formaldehyde, which causes cancer and compromises the immune system. Formaldehyde in baby shampoo? Isn't that the stuff they used to preserve dead frogs in high school science classes? In baby shampoo?

How about Christmas trees? Which would you rather have in your living room: a live tree from a tree farm that has been sprayed with pesticides or an artificial tree made with polyvinyl chloride, which is made from petroleum and emits dioxins when burned in a incinerator?

The more alienated we get from the things we use every day, the more confused we get. The more confused we get, the dumber we feel. The dumber we feel, the less confident we are in our decisions. The less confident we are, the more susceptible we become to the suggestion that everything is as it should be, that the experts (the manufacturers, the regulators) are keeping an eye on things. The more we bury our worries under such shaky ground, the more abstracted we become. Ask yourself the simplest possible questions: Where does your drinking water come from, how safe is it to drink, and how do you know? Can you answer these questions with genuine confidence? Now ask yourself the same thing about something less simple, like your eyeliner, or the glue in your plywood, or the rubber duck floating in your child's bathtub. Where do these things come from, how safe are they, and how do we know? And finally, think about this: Even if you have confidence in American regulation, what do you say when you learn that \$675 billion worth of consumer products—everything from pet food contaminated with melamine to children's train sets made with lead paint—are imported from China, where government oversight is, shall we say, rather lax?

As overwhelming as some of the scientific evidence about our consumer products can seem, there can be real liberation in learning to look at things with clear and unblinking eyes.

good part of this has to do with reconnecting with our things. With understanding what things are for, and how they are made, and by whom. I've come to think of this as "Learning to Live Like Your Grandparents Did," provided that your grandparents grew up before World War II. Since the vast majority of toxic synthetic chemicals were developed during or after the war, it stands to reason that people once managed to live reasonably well without them. We're not talking about prehistoric man here. And without meaning to sound nostalgic, I think it's fair to say that, chemically speaking, those were simpler times. It's worth relearning some of what we've forgotten. How to build and furnish and clean our houses. How to care for our lawns. How to feed and clothe and bathe our children.

Strangely enough, you might find that some of these old ways actually feel empowering. We've been bombarded with advertising and marketing ploys for so many years that we have tended to make decisions out of unconscious habit rather than conscious choice. Not only is it increasingly clear that there is physical risk in such habits, there is also a genuine psychological sacrifice. In the moment when we reach unthinkingly for a product, we suspend judgment and even, at times, common sense. When we act unconsciously, we implicitly grant authority—and trust—to what manufacturers have told us, that a product is "safe." But the truth is, whether the product is an apple, a T-bone steak, a can of air freshener, or a mattress, makes no difference: we have no idea what has gone into creating the product, even if someone, somewhere, has assured us that the product is benign. In many, many cases, this is clearly no longer true. And as the physical and psychological distance has grown between us and the products we consume, we have traded an intimate knowledge for a vague and anxious "trust," a feeling that is inevitably accompanied by its darker corollary, fear and loss of control. This does not seem like a fair trade.

In addition to chronicling our addiction to toxic chemicals, then, this book will also offer some thoughts on how we can begin to pull ourselves—and our children—out of this particular soup. As practical as some of the suggestions will be—what kinds of products to buy and which to avoid—they will also implicitly urge that we develop new relationships with our material goods. Rather than mindlessly reaching for a product, we might ... pause, just for a moment, and ask: What do I know about this product? *How* do I know what I know? Who told me? Can I believe what I have been told, what I think I know? A pause at this moment is critical, because it offers the chance to replace mindless action with conscious choice and genuine responsibility. No longer am I automatically, unthinkingly filling my shopping cart. Now I am mindfully choosing this, or choosing that, or choosing nothing at all. There's power in that pause. And reclaiming this power is energizing on both small scales and large—not least because it makes us realize how much we have given up, and how much we have to regain.

To make a point about the saturating presence of toxic chemicals in the environment, field scientists will, on occasion, leave off looking for contaminants in big cities and abandoned industrial sites and travel to some of the world's most remote places. In recent years they have found petrochemicals—and breast cancer—in the bodies of beluga whales in Canada's St. Lawrence River. They have found PCBs—compounds used in electrical transformers that have been banned for thirty years—in the snow atop Aconcagua, the highest mountain in the Andes. They have even found flame retardants in the blubber of seals on Canada's Holman Island, far above the Arctic Circle. Synthetic chemicals, it turns out, circle the globe like the winds.

Despite such evidence—that toxic chemicals are, in essence, everywhere—human health advocates have struggled for decades to convince the public that there may be a link between so-called environmental toxins and individual and community health. After the stir caused by the publication of *Silent Spring* in the early 1960s, it took a full decade for the government to pass, and begin to enforce, pollution controls in factories and hazardous waste dumps. Another thirty years after that, it remains more difficult than ever to convince people that the products they rely on every day—products that are made, after all, with these same toxic chemicals—might in any way be risky to use.

It's important to understand that your body is already full of toxic chemicals. This is true even if, as the saying goes, you were born yesterday. Long before you ever bought a flame retardant couch, or a sheet of plywood, or a can of ant spray, the chances are quite good that you absorbed toxins through your mother's placenta, her breast milk, or both. Given the ubiquity of chemicals in our lives, the accumulation grows from there.

In Maryland, where I live, a lot of attention is paid to the health of oysters, one of many endangered species suffering from toxic runoff in the Chesapeake Bay. Oysters spend their days on the bay floor, filtering water in one end and out the other. Whatever microscopic material is in the water passes through the oyster. Most of it exits; some of it stays inside. These toxins can be measured.

What is becoming clear is that we are all oysters. We are all exposed to all kinds of toxins. Some of these we filter out; others stay inside us.

In recent years, public health groups have come up with a new tactic to make this point: the body burden study. Such studies are not, at least primarily, invested in proving that toxic chemicals are “dangerous.” This work is being done, with increasingly clear results, in scientific laboratories. What the body burden studies do is prove that these chemicals are everywhere—in the environment, in wild and domestic animals, and, with increasing frequency, in our bodies. Proving that toxic chemicals are dangerous hits people in the heads. Proving that people have chemicals *in their bodies* hits people in their guts. For decades, the chemical industry has been able to convince our heads that chemical harm is still

in dispute, that “more research is needed.” The authors of the new body burden studies are betting that the gut is less easily persuaded.

“Our experience with persistent chemicals of the past such as DDT and PCBs has shown what happens when we wait to gather conclusive evidence of a chemical’s harm instead of acting on mounting evidence,” the Public Interest Research Group reported in 2003. “By the time the chemicals were regulated, they had spread across the globe and left a path of damage from which we have yet to recover.”

If lab science aspires to prove chemical harm, body burden studies aspire to show chemical exposure. In Europe, linking harm in the lab with exposure in the community has been enough to prompt radical changes in the way toxic chemicals are regulated. “In a court of law, a person is innocent until proven guilty,” a United Nations report on the persistence of environmental toxins says. “Chemicals suspected of bio-accumulating, persisting in the environment, and harming human beings and animals do not deserve that kind of protection. Unless precautionary action is taken to curtail exposure to these chemicals, millions of people—not to mention millions of other creatures ranging from lake trout to penguins—are likely to suffer terrible harm.” As of three years ago, chemicals in Europe are considered guilty until proven innocent. Here in the United States, it is still the other way around.

When I wanted to find out how ubiquitous synthetic chemicals had become in people, I decided to go to Maine. I wanted to meet some folks whose bodies, I had heard, had recently been tested and found to be full of plasticizers. And mercury. And stain resisters. None of these people worked in a laboratory, and they had not grown up in big industrial cities, or near the chemical corridors of Louisiana, Houston, or Delaware. One was a woman raising young children in rural western Maine. Another was a twenty-eight-year-old woman raised in one of Maine’s remotest corners. A third was an organic farmer.

How did this happen?

Lauralee Raymond grew up in Fort Kent, way up in Aroostook County, near the St. John River, on the Canadian border. This part of Maine is a paradise of rivers and lakes, where moose can seem to outnumber people and canoeists from all over New England ply one of the East Coast’s great remaining wildernesses. Lauralee’s family has lived in the north country for generations: her father’s family is from Acadia, her mother’s from Quebec. Lauralee’s great-grandfather and grandfather were both potato farmers. The family, for a very long time, has been connected to the land.

Ask a Maine native what they consider to be northern Maine, and they are likely to say “Bangor.” But you’d need to continue another four hours north from Bangor to get to Fort Kent. “If you drive through Aroostook County, there’s so much forest, you don’t see houses forever,” Lauralee says. Since Interstate 95 stops two hours south of town, the only way to get to Fort Kent is to follow a winding road cutting through the northern woods. There are moose and deer at every turn, Lauralee says, and if you want a true adventure, drive the road at night.

Surrounded by such a wealth of natural beauty, Lauralee spent most of her childhood outside. She and her friends swam in creeks. They rode their bikes and skied cross-country. Every fall, they got a few extra weeks off to help with the potato harvest—which, for the

kids, meant separating the potatoes from the rocks and the mud. Nowadays the area is known mostly as an Olympic training center for biathletes—who combine cross-country skiing and shooting—and for hosting a qualifying sled-dog race for Alaska's Iditarod.

As she grew older, Lauralee moved downstate to attend Bates College, in central Maine, then settled first outside Augusta and later in Portland, where she now works for a women's and children's policy group. When I met her, she was sitting in a coffee shop that was festooned with signs encouraging customers to support Maine's economy by buying local. Local food. Local music. Local beer. In one corner, a trio of women sat knitting. In another, a woman nursed a child in her lap. This, it turned out, was Lauralee's kind of place. She is cheerful, open-faced, energetic young woman, and fiercely proud of her state's eccentricity, its rural character, and its independence.

But in recent years Lauralee has had this sensibility shaken. She had agreed to meet me at the café to talk about a study in which she had taken part that had made her question a great deal about her ability—and her state's—to exist apart from the corrupting influences of the urbanized world. A couple of years ago, she had participated in a study being conducted by a public health group hoping to draw attention to the growing presence of toxic chemicals in everyday consumer products. Each participant would donate samples of their hair, blood, and urine to a research team from the Harvard School of Public Health and the University of Southern Maine. Once the samples were collected, they would be sent to laboratories in Seattle and Victoria, British Columbia, for chemical analysis. Technicians would test the samples for a spectrum of toxins. The lab would not offer diagnoses; there would be no attempt to link contamination to current or prospective diseases. All the volunteers would learn was what they had lurking in their bodies.

Thirteen people agreed to participate. They came from all walks of life: A furniture store owner. A teacher. A nurse. They were men and women, young and old. Several represented a group that has become a very important constituency for public health advocates: they were women of childbearing age. At twenty-eight, Lauralee Raymond definitely qualified.

Public health advocates hoped that proving the presence of toxic chemicals in a randomly selected group of citizens would cement the notion that toxic chemicals were more than a problem limited to people who lived near Superfund sites, or showed up only in residents of New Jersey. The study's sponsors were interested in research and advocacy in equal measure. If people in Maine were contaminated, the thinking went, people everywhere were probably contaminated, and something ought to be done about it.

Before the test, Lauralee Raymond was confident, even cocky, about the relative purity of her body. She was in her twenties. She was a runner. She ate organic food. She had spent her childhood in one of the most pristine corners of one of the most rural states in the country. If anyone's body was clean, she figured, it would be hers. To make matters more interesting, her mother agreed to be tested as well. When it came to the number of chemicals in their bodies, Lauralee felt certain that youth would be served.

"I went into this as a kind of game, or a competition with my mom," Lauralee said. "I would like, 'Oh my gosh, this will be fascinating, to see how much better health I am in than my mom.' Look, my parents can't even pronounce 'tofu.' I figured, maybe this will get my mom to take better care of herself."

The organizers of the study had told her, and all the participants, that they should be

prepared for a few surprises. Lauralee scoffed.

“I was thinking, like, ‘You don’t need to tell me that. I’m going to be fine. My results will be fine.’ ”

Russell Libby was also raised in a rural part of Maine. He grew up in Sorrento, outside Bangor Harbor. His people were from modest means, mostly farmers or retailers; his grandmother was a drugstore clerk, his father a state trooper. As a kid, Libby worked at a golf course where they used a lot of pesticides, and then worked raking commercial blueberries, where they used still more. Later, he was trained as an economist at Bowdoin College and the University of Maine. Libby has devoted his career to studying agricultural policy. He spent a decade as research director of the state’s Department of Agriculture, and has been involved with the Maine Organic Farmers and Gardeners Association for thirty years, the last fifteen as its executive director.

He is also a published poet. Like Wendell Berry, Libby is given to lines reflecting the pressures he, and his rural state, feel from the industrialized world. One poem, “Worth,” opens with a quote from a vice president of Dow AgroSciences recommending that farmers work a piece of land “for all it’s worth.” The next stanzas raise questions that shift our attention from the economic to the metaphysical:

For how many bluebirds it’s worth?

For how many monarchs?

What price the elusive fireflies?

I pulled the early peas today,

tossing the vines in the compost bin,

then carried the sack of Tartary Buckwheat from the barn,

seed grown by Liz and Chris on their farm,

and sowed it in the same way

farmers have sowed since the beginning,

palm up,

fingers pointing in the direction the seeds are thrown.

And what is that worth?

To hear the seeds meeting the ground,

to look up and see the clouds

that will bring rain tonight or tomorrow,

and know next week the ground will be covered

with pale green, triangle-shaped leaves,

six weeks before the white flowers will carry bees.

I met Libby at the Maine Agricultural Trades Show in the middle of January. The civic center had everything you’d want in an agricultural trade show: Raffles for a new tractor, Maple-sugaring equipment. Sign-up booths for the Sheep Breeders Association and the Beekeepers Association. There were portable sawmills and a man demonstrating the strength of a plastic shovel by jumping on it. This thing is so strong, he was telling a customer, that I

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