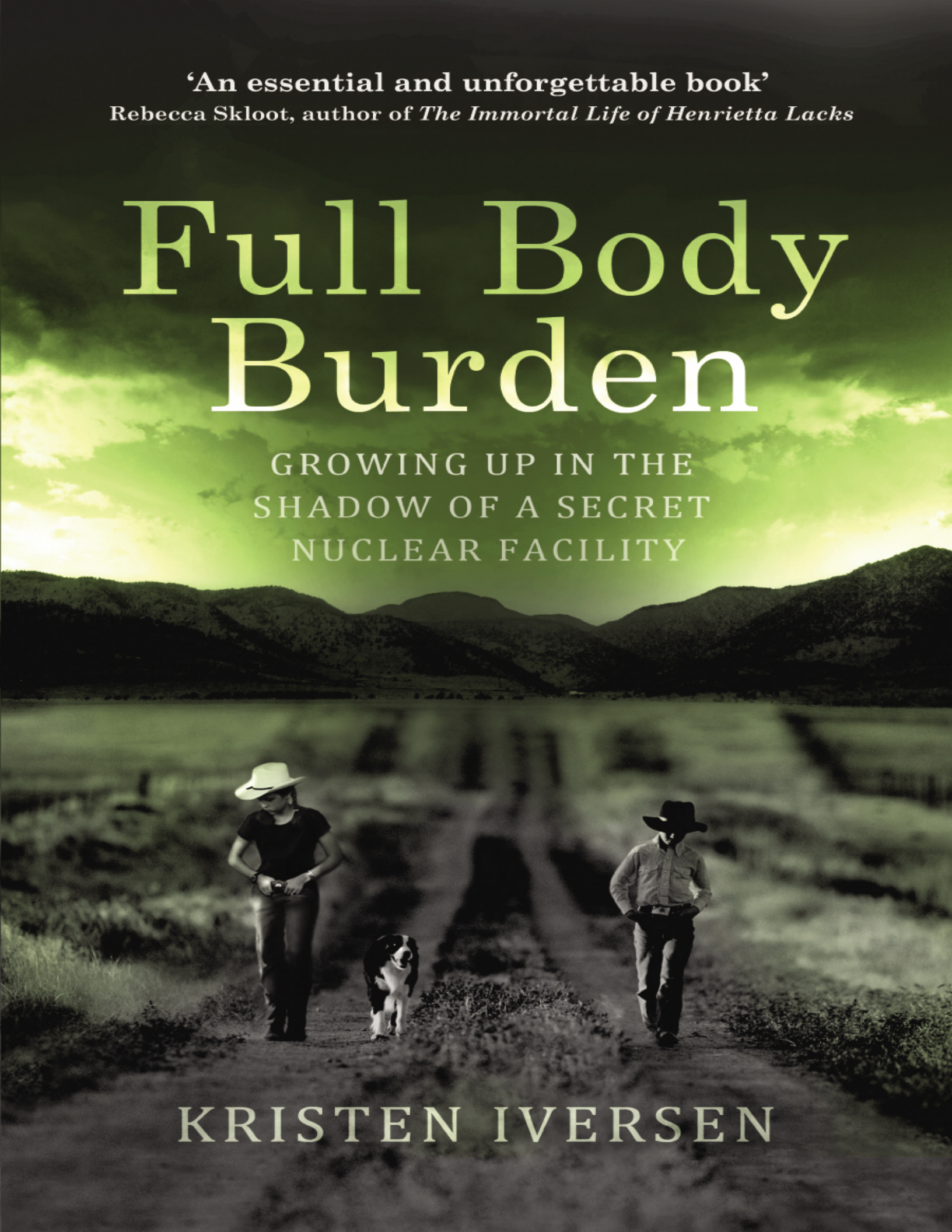


‘An essential and unforgettable book’
Rebecca Skloot, author of *The Immortal Life of Henrietta Lacks*

Full Body Burden

GROWING UP IN THE
SHADOW OF A SECRET
NUCLEAR FACILITY

A black and white photograph of a woman, a man, and a dog walking away on a dirt road towards mountains. The woman on the left wears a light-colored hat and a dark shirt. The man on the right wears a dark hat and a light-colored shirt. A black and white dog is walking between them. The background shows a dirt road leading into a valley with mountains in the distance under a cloudy sky.

KRISTEN IVERSEN

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About the Book

In the early 1950s, men from the government decide to build a secret nuclear weapons facility at Rocky Flats. Its job will be to refine plutonium and mould it into the triggers at the heart of every one of the country's nuclear weapons. Decades later, it will be branded 'the most contaminated site in America'.

A few miles down the road, Kristen Iversen is enjoying a carefree, outdoor childhood in a sublime setting of desert and mountains. She and her siblings jump streams, ride horses, live a happy outdoors life. But beneath this veneer the family is quietly falling apart. Her father drinks, her mother copes. And in a series of fires, accidents and other catastrophic leaks, Rocky Flats is spewing an invisible cocktail of the most dangerous substances on earth into this pristine landscape. The ground, the air and the water are all alive with radiation.

The years that follow will bring protests, investigations, denials, cover-ups, threats and lies. And then, one after another, people start to fall ill.

Full Body Burden is a brilliant work of investigative journalism and a searing memoir. It is a book about secrets: the small ones families hide from each other and the even more dangerous ones governments hide from us.

About the Author

Kristen Iversen received a Ph.D. in English from the University of Denver. She is Director of the MFA Program in Creative Writing at The University of Memphis and also Editor-in-Chief of *The Pinch*, an award-winning literary journal. Kristen Iversen has two sons and currently lives in Memphis.

*For my family: my siblings, Karin, Karma, and Kurt;
my father; and in loving memory of my mother.
Most of all, this book is for Sean and Nathan,
who have lived with it from the beginning.*

FULL BODY BURDEN

KRISTEN IVERSEN

GROWING UP IN
THE SHADOW
OF A SECRET
NUCLEAR FACILITY



Harvill Secker
London

I suppose my thinking began to be affected soon after atomic science was firmly established. Some of the thoughts that came were so unattractive to me that I rejected them completely, for the old ideas die hard, especially when they are emotionally as well as intellectually dear to one. It was pleasant to believe, for example, that much of Nature was forever beyond the tampering reach of man—he might level the forests and dam the streams, but the clouds and the rain and the wind were God's.

—RACHEL CARSON

BODY BURDEN: THE AMOUNT
OF RADIOACTIVE MATERIAL
PRESENT IN A HUMAN BODY,
WHICH ACTS AS AN INTERNAL
AND ONGOING SOURCE OF
RADIATION



Plutonium trigger at Rocky Flats



IT'S 1963 AND I'm five. I lie across the backseat of the family car, sleeping with my cheek pressed against the vinyl. My mother sits in the front with baby Karin and my father drives, carefully holding his cigarette just at the window's edge. This is how I remember my mother and father: smoking in a cool, elegant way that makes me want to grow up quick so I can smoke, too. It's evening and I'm tired and cranky. The spring day has been spent on a long drive through the Colorado mountains, a Sunday ritual.

We turn the corner to our home on Johnson Court, the square little house my parents bought when my father left his job as an attorney for an insurance company and set up his own law practice. The neighborhood is made up of winding rows of houses that all look like ours: a front door and a picture window facing the street, two windows on each side, and a sliding door in the back that opens to a postage-stamp backyard. We have a view of the mountains and one tree.

"Uh-oh," my mother says.

“Jesus.” My dad stops the car. I scramble to my knees to look.

Our house is smoldering. One side is gone. A fire truck and a police car with streaking red lights stand in the driveway.

My dad jumps out and my mom reaches over and pulls up the parking brake. “Dick,” she says, “I’m taking Kris to the neighbor’s.” My mother is always good in a crisis.

Mrs. Hauschild is waiting at her door. She takes a pair of pajamas from her daughter’s room—we’re almost the same age—and she beds me down in the basement in a sleeping bag. “She’ll be fine here,” Mrs. Hauschild says. “She doesn’t need to see all that commotion.” She suggests they both have a drink and a cigarette. My mother nods.

“Someone must have left the lamp on in Kris’s bedroom,” my mother says as they walk up the stairs. “The drapes caught on fire.”

I repeat these words in my head until I come to believe I set the fire myself. I can still picture my bedside lamp, the brass switch, the round orange globe always warm to the touch.

Years later—decades, in fact—my father laughs when I tell him this story. “You didn’t cause that fire, Kris,” he says. “Your mother and I did. We had been sitting and talking in the living room, having a drink together, and we left a burning cigarette in the ashtray. Neither of us noticed. The drapes in the living room caught fire first.” The flames never reached my room.

This is how I want to remember my parents: still talking to each other, even when the world was tumbling down around their ears.

WE RENT a basement apartment for a month and then move back to our rebuilt house. Nothing is ever said about the fire. Nothing is ever said about dark or sad or upsetting events, and anything that involves liquor is definitely not

discussed. My parents are elegant drinkers. My mother can make a Manhattan with just the right splash of whiskey and vermouth. My father takes his bourbon straight on ice. After dinner, once my mother has tucked us into bed, my parents make cocktails and play cribbage to determine who has to do the dishes. From my bedroom I can hear my mother's soft laugh. Sometimes there's a stack of unwashed plates in the sink when we leave for school in the morning.

Soon another baby is born: my sister Karma. This is not a hippie name, despite the fact that we live close to Boulder. My mother insists on naming her daughters after her Norwegian heritage: Kristen, Karin, Karma.

At the top of the hill behind our house stands the Arvada cemetery. The year 1863 is etched in a stone marker at the entrance. The cemetery works like a magnet. As soon as our mother puts us out into the yard for the afternoon—just like the kids and grandkids on the family farm back in Iowa, who were expected to fend for themselves for the day—Karin and I scramble over the fence and head for the hill. We are our own secret club, and Karma joins us as soon as she is old enough to toddle along. Sometimes the other neighbor girls—Paula, Susie, and Kathy—are allowed into the club as temporary members. We trek across the field behind the row of backyards and through the old apple orchard and get up to the creek, where we balance a flat plank across the shallow, sluggish water and tiptoe across. Water spiders dance across the surface and tiny minnows scatter when we push our toes into the muddy bottom.

At the crest of the hill stand row after row of headstones. Some are tall, others flat against the ground. Some have the names of children or images of their faces etched in the stone, and we stay away from those. We run up and down the rows, shrieking and gathering up the plastic flowers. We pile all our flowers in the middle and sit in a circle around them. We look down the hill to our house

and imagine our mother, big and round, lying on her bed and waiting for the next baby, a boy at last, she's sure of it. A little farther, we can see the Arvada Villa Pizza Parlor and the Arvada Beauty Academy. Between our neighborhood and the long dark line of mountains stands a single white water tower, all by itself. The Rocky Flats water tower. There is a hidden factory there.

That hidden factory is the Rocky Flats Nuclear Weapons Plant, a foundry that smelts plutonium, purifies it, and shapes it into plutonium "triggers" for nuclear bombs. The plant also recycles fissionable material from outmoded bombs. A largely blue-collar link in the U.S. government's nuclear bomb network, Rocky Flats is the only plant in the country that produces these triggers—small, spherical explosives that provide an atomic bomb's chain reaction. The triggers form the heart of every nuclear weapon made in America. From 1952 to 1989, Rocky Flats manufactures¹ more than seventy thousand plutonium triggers, at a cost of nearly \$4 million apiece. Each one contains enough breathable particles of plutonium to kill every person on earth.

Rocky Flats' largest output, however, is radioactive and toxic waste. In all the decades of nuclear weapons production, the nuclear weapons industry produces waste with too little thought to the future or the environment. The creation of each gram of plutonium² produces radioactive waste, virtually all of which remains with us to the present day.

But no one in our community knows what goes on at Rocky Flats. This is a secret operation³, not subject to any laws of the state.

The wind blows, as it always does. I imagine the bones of pioneers and cowboys beneath our feet. The chill of evening begins to creep up the hill; the air turns cold when the sun dips.

“Let’s go!” Karin yells, and we jump to our feet and roll and tumble down the hill. We bounce across the plank and race across the field, full speed, before the sun sets and the ghosts come out.

IN THE beginning, Rocky Flats is called Project Apple. In 1951, years before I’m born, a group of men from the Atomic Energy Commission (AEC) meet in an old hotel off the beaten track in Denver. No press, no publicity. Their job is to find a site to build a secret bomb factory that will carry out the work that first began with the Manhattan Project, the covert military endeavor that developed the first atomic bomb during World War II.

Until now, all nuclear bombs in the United States have been custom-built at the weapons research and design laboratory at Los Alamos, New Mexico, with materials supplied from the plutonium production facility at the Hanford site in eastern Washington State and the uranium enrichment facility at Oak Ridge, Tennessee. But with the heightening Cold War—a high state of military tension and political conflict with the Soviet Union and its allies that will continue for decades—the United States wants to mass-produce nuclear weapons. They need a roll-up-your-sleeves, get-down-to-business, high-production bomb factory. An assembly line.

AEC officials choose a site on a high, windy plateau not far from the growing cities of Arvada, Boulder, and Denver—cities that can provide workers and housing. Landowners are forced to sell their land to the government, and construction on Project Apple begins immediately.

A few months later, the *Denver Post* breaks the news of the new plant with the headline THERE IS GOOD NEWS TODAY: AEC TO BUILD \$45 MILLION A-PLANT NEAR DENVER. Announcement of the plant⁴ catches everyone by surprise, including state and city officials, and the news breaks like a thunderbolt over the community. Though owned by the AEC, the plant

will be operated by Dow Chemical, a private contractor that will be indemnified against any accident or mishap. The Rocky Flats Nuclear Weapons Plant will become⁵ the workhorse of an AEC complex of weapons facilities that eventually includes thirteen sites from Nevada to Kansas to South Carolina. Each AEC facility will be involved in its own particular aspect of the design, manufacture, testing, and maintenance of weapons for the U.S. nuclear arsenal.

Components and processes will be divided up around the country, but Rocky Flats will be one of two sites designed to produce the fissionable plutonium “pits” at the core of nuclear bombs. (After 1965 it will be the only site.) The whole system depends upon Rocky Flats.

Construction of the plant is rushed.

Few people know the deal is in the works. Not even the governor⁶ has an inkling. Colorado’s top elected officials are not informed⁷ that the plant will be built until after the decision is made and there’s no going back. But Denver welcomes the windfall. No one knows what the factory will produce. No one cares. It means jobs. It means housing. Contractors, the local power plant, and local businesses⁸ all look forward to the “juicy plum” to be known from now on as Rocky Flats.

It’s the Cold War. The bombs dropped on Hiroshima and Nagasaki in 1945 may have ended one war, but they started another. The perceived Soviet threat is an ever-present shadow in American life. The Atomic Energy Act of 1946 creates an impenetrable wall of secrecy around the U.S. nuclear establishment. All government decisions and activities related to the production of nuclear weapons will be completely hidden. Information about nuclear bombs, toxic and radioactive waste, environmental contamination, and known and unknown health risks to workers and local residents is all strictly classified.

And no one asks questions.

An editorial in the *Denver Post* predicts that Rocky Flats will be “a source of satisfaction to all residents who have an abiding faith in Colorado’s destiny and future greatness.” The newspaper reports that workers on the project⁹ will be safer than “downtown office workers who have to cross busy streets on their way to lunch.”

The announcement is made simultaneously in Denver, Los Alamos, and Washington, D.C. The plant site in Jefferson County¹⁰ has been chosen for “operational values,” including the fact that the land is nothing but an old rocky cow pasture, “virtual waste land.” Officials from the AEC emphasize¹¹ that no atom bombs or weapons will be built at Rocky Flats, only some unspecified component parts. The plant will not give off “dangerous wastes” or use large quantities of water, gas, and electricity. When questioned further by reporters¹², AEC spokesman Dick Elliott states adamantly, “Atomic bombs will not be built at this plant.”

One small but devastating error escapes notice. The site criteria specifically state that the wind passing over the plant should not blow toward a major population center. But there is a mistake in the engineering report. Engineers base their analysis on wind patterns at Stapleton Airport, on the other side of Denver, where winds come from the south. Rocky Flats is well known for extreme weather conditions—rain, sleet, snow, and especially the prevailing winds, including chinooks that travel down the eastern slope of the Rockies from the west and northwest, directly over Rocky Flats and straight toward Arvada, Westminster, Broomfield, and Denver. Called “snow eaters,” chinook winds occur when the jet stream dips down and hits the fourteeners—the 14,000-foot mountains west of Denver—where they lose their moisture. The winds warm as they race down the lee side of the mountain range, and by the time they reach flat land, they’re hot and often exceed 100 miles per hour. Snow melts overnight. Sometimes chinooks

snap telephone poles, blow out windshields, and overturn vehicles in the area around Rocky Flats.

One employee who notices the error is Jim Stone. An engineer hired to help design Rocky Flats before it opens, Stone is a careful and thorough man. Born during the Depression, he was sent to a Catholic orphanage when his parents couldn't afford to raise him. His path to becoming an engineer has been hard won, and he brings years of experience to his job at Rocky Flats. He warns against the location¹³ of the plant "because Denver is downwind a few miles away." He is ignored.

The name Rocky Flats is taken from the dry, rolling land dotted with sage and pine trees, a name chosen by early homesteaders who raised cattle and hay. Now it will no longer be ranchland. The money is in housing. Jefferson County and the entire Denver area are booming. Just over half a million in 1950, by 1969 the population of the Denver metro area has more than doubled. Jefferson and Boulder counties are two of the fastest-growing counties in the entire country. Thomas Mills, the mayor of Arvada, worries about housing. Rocky Flats plans to hire at least a thousand permanent workers immediately, and unlike in other nuclear towns, such as Los Alamos, workers will not be housed on-site. "The housing situation is rough here."¹⁴ We'll receive the brunt of all that traffic to the plant because we're on the only direct route to it," Mills says. "The city is comprised mostly of small homes. There really is only one large apartment house.... It's going to cause us lots of headaches." By the first week of March 1951, extensive new home construction has begun.

The plant is surrounded by two tiers of barbed-wire fence stretching ten miles around the circumference of the core area. The first tier, three feet high, is to keep cattle out. The second tier, nine feet high, is electrified and patrolled by guards with guns, high-powered binoculars, and, eventually, tanks. With the exception of a two-story

administration building, the plant's buildings are built low to the ground, in ravines cut deep into the soil. The factory is almost completely invisible from the road. By early 1952, things are in full production. By 1957, nearly 1,600 people work at Rocky Flats. Radioactive and toxic waste have to be dealt with from the beginning. Effluence is run through a regular sewage disposal plant and empties into nearby Woman Creek. Solid and liquid waste is packed into¹⁵ fifty-five-gallon drums. Much of what remains is incinerated. What spews from the smokestacks¹⁶ of the production buildings is expected to disperse by the time it reaches the outer limits of the plant boundary.

The product that comes off the factory line at Rocky Flats is a well-kept secret.

By 1969, more than 3,500 people work at the plant. No other nuclear bomb factory has ever been located so close to a large and growing population.

WE BEGIN what we do best as a family: collecting pets. They come and go. Fluffy, a gray tabby who melts in my arms when I rock her on the backyard swing, lasts only a few weeks before a neighbor's dog gets her. Melody is a sweet-natured calico cat who disappears almost as quickly; when my sister Karma sees a photo of a similar-looking cat in a glossy magazine, she tells me that Melody has run off to become a famous cat model. We drive a dachshund to neurosis by chasing him around the house. Fritz is then sent to the home of an elderly couple to recover. He never returns. My mother takes us to the Arvada Pet Store and buys me a green parakeet I name Mr. Tweedybopper. Karin gets a tiny turtle, Tom, in a plastic moat, and Karma gets a pair of hamsters. When they succumb to the various hazards of our household—Mr. Tweedybopper catches a draft, Tom Turtle dehydrates, and the hamsters successfully plot an escape—we visit the pet store again.

My father endures our ever-expanding household with little comment. He spends Saturdays—the only day we see him—mowing the backyard in Bermuda shorts, black socks, and worn penny loafers. My sisters and I dance along behind him in the clipped path, the scent of the grass thick, sweet, and heady. Saturday is also trash day. We help Dad pack up all the household trash and take it out to our incinerator, a cement-block monument in the backyard, blackened from use. We take turns pushing trash in through the trapdoor at the front. Everything goes—cans, paper, plastic, food, coffee grounds. Dad lights a match and we watch the pieces catch and burn and the oily smoke curl up into the sky.

WITH THE birth of my brother, Kurt, the house reaches its limit. My father says he doesn't have room to think, and my mother claims she's losing her mind. Our Sunday drives take us out by Rocky Flats, through empty landscapes of planned housing developments, dirt roads drawn in chalk, and squares of land separated by wooden spikes with fluttering orange ribbons. Bulldozers push piles of earth and dig rows of deep foundations like a vast potter's field. My parents sit up late at night at the kitchen table, looking at blueprints and adding up numbers.

"Guess what, kids," my mom says. "We're moving to a new house."

Our house begins with a deep rectangular pit. My mother drives us out in the station wagon, a long green lizard of a car with no seat belts, so we can watch. No one back then has seat belts; if they do, they don't use them. My father takes pride in not buckling up.

Carpenters arrive in weatherbeaten pickups. The soil is rocky and the workers cuss. We aren't supposed to hear, even if it is in Spanish. There is a lot of pounding. I remember the bones: two-by-fours reaching to the sky, anchored in concrete.

Our skeletal house stands on nearly two acres at the end of a road that dips down to a small hill, where our driveway begins. Not a long driveway, but long enough to set us apart from everyone else. There is no grass or trees, only mud. We look out from the freshly poured concrete of our front porch and see lines of spindly houses: streets laid out for pavement and front yards of raw earth waiting for sod, doors and windows, mortar and bricks. All the pieces ready to be put together. Some families have already moved in with their dogs and tricycles and motorcycles and an occasional horse stabled in the backyard.

The developer calls it Bridledale. My mother calls it heaven. Bridledale represents the golden dream of suburban life and all its postwar promises.

The bills begin to mount and our new house is still not finished. My father spends more time at the office. Some evenings, if he's home from work, we go to the McDonald's near the old bowling alley, where the dry cleaners used to be. Now two shiny arches loom yellow in the sky. "What does this represent?" my dad asks. He never waits for a response. "This represents change," he says. The sign out front shows how many hamburgers have been sold. Millions. *Who eats all those hamburgers?* we wonder. "Out of the car," Dad orders. He's in a hurry. He's always late and he's always in a hurry. The world gallops two steps ahead of him and he never catches up.

We stand at the shiny counter while he orders. Six cheeseburgers. Six Cokes. Six orders of fries. The room is clean and efficient and people stand politely in line. The clerk crisply folds the top of each white bag, and my dad carries them to the car and stacks them together on the front seat, where no one is allowed to sit.

"Can we have just a bite?" Karma asks.

"No."

"A fry?" Kurt, now a toddler, is sandwiched between his sisters. His hair is shaved close across the top of his head,

a bright blond fuzz.

“No.” Dad smiles. He’s pulled off his tie, and the crisp shirt he put on this morning is crumpled and damp. “Sit tight.”

My mother forbids us to eat any of it until we get home, lest only empty white sacks arrive. It’s ten minutes there and ten minutes back and temptation is strong. My dad has a game on the radio turned up loud, and the four of us sit cheek by jowl in the backseat, fighting over property lines. Occasionally the game is interrupted by the irksome buzz of the Emergency Broadcast System. Dad mutters along with the game, but eventually his hand wanders up over the back of the seat, fingers pacing like spider legs. “Who wants a pinch?” We squeal. The hand descends, waving, searching for an elbow or knee. “Who needs a tickle?”

On the way home we stop at Triangle Liquor, where an amiable man stands at the counter, a black-and-white television flickering behind him. He looks out to the parking lot, counts heads, and adds the right number of cherry suckers to the bag while my dad digs for his wallet. Time is short. We grab as many french fries as we can before he strides out, slides back into the seat, hands out suckers, and tucks the brown paper bag with the big square bottle beneath his seat.

When my mother asks me later if we stopped at the liquor store, I say no. I know the rules. I know what not to say, what subjects are taboo, and what secrets must remain secrets.

PEOPLE COME to see my father with all sorts of problems, and his law practice grows. Divorces. Speeding tickets. Drug charges. DUIs. I think he must be very wise. He works in a small brick office with few windows and comes home only to sleep. His waiting room is filled with overflowing ashtrays and people whose faces are rough and tired. Within walking distance of his office is a Dolly Madison ice

cream parlor and a smoke-filled bar. On Saturdays we go with Dad to work so our mother can get some time to herself. After we spend a couple of hours banging the keys and spinning the ball on his secretary's worn Selectric typewriter, Dad gives us money and the four of us file down the street for chocolate sundaes while he heads to the local bar. Sometimes he just sits at his desk and drinks straight from the bottle in his desk drawer. We finish our ice cream and patiently wait until he tells us to get into the car.

My mother doesn't like my dad to bring clients to the house, but soon some of their possessions begin to appear. A clock, a set of dishes, a car that sputters and burns oil and has to be hauled away. If people can't pay their bills, he takes whatever they can give. Sometimes all they can give is a promise, and that's okay, too.

One day a client drives up in an old truck pulling a shaky, single-stall horse trailer and unloads a tall, ancient sorrel horse named Buster. "Now you kids can learn to ride," my dad declares. Both he and my mother spent their childhood summers on family farms in Iowa. Every family needs a horse, they say. Even in the suburbs. For twenty dollars we can keep Buster in a nearby field until our new house is ready. One of the best things about Bridledale is that we can have horses.

Buster turns out to be a dubious gift, his back so bony and sharp no one can endure sitting on him bareback. We think we're saving him from the glue factory, but he's so far gone that he spends only a couple of weeks in our care before he's loaded back into the shaky trailer and taken away.

But the damage is done. I want a horse now, badly. A real horse. My grandmother in Arizona sends me a collection of tiny white porcelain horses and they prance across the ledge of my windowsill in full equestrian *joie de vivre*. I don't care for dolls or dresses or Easy-Bake Ovens. I

dream of pintos and palominos, Morgans and Thoroughbreds and Tennessee Walkers.

I hear whispered conversation in the kitchen regarding plans for my birthday party. "She still remembers the rocking horse she lost in the fire," my mother says.

There is a long pause.

"I know a man with a horse," my dad says. "A good horse. And he owes me something."

THE BEST way to watch the stars is lying flat on my back, in the backyard on our big trampoline cool with dew. Our house is far enough out from the city that the night sky is as black as soot and the stars shimmer in tiny pinpricks, with the veil of the Milky Way spiderwebbing across the sky. Sometimes the moon is nothing more than a thin curl of ribbon, and other nights it's round and full and portentous, a pregnant beacon. And yet I know all its brilliance is borrowed. The moon has no light of its own; it pirates its light from an invisible sun.

The other beacon in that night is Rocky Flats. The lights from Rocky Flats shine and twinkle on the dark silhouette of land almost as beautifully as the stars above, but it's a strange and peculiar light, a discomfoting light, the lights of a city where no true city exists. It, too, is portentous, even sinister—if only one could have the ability to see beyond the white glimmer, to see what is really there.

In the daylight, we can see the Rocky Flats water tower from our back porch. "What is Rocky Flats?" I ask my mother.

"I don't know," she says. "It's run by Dow Chemical. I think they make cleaning supplies. Scrubbing Bubbles or something."

Neither of us likes housework very much, so we leave it at that.



THE DAY Tonka arrives, the field behind our house smells of melted snow even though spring flowers poke through the mud. Tonka comes in a two-horse trailer pulled by a white pickup and he is everything Buster was not. Young. Frisky. And he's never had a bit in his mouth.

"He's not quite broke yet," Glen explains. Glen is a cowboy, the real thing, and we know he's in some kind of deep, secret trouble if he's working off a debt for my dad. His girlfriend comes along. She's short and pretty and sits on the tailgate of his truck. My mother wonders aloud if Glen's wife is at home.

Tonka is the most gorgeous creature I've ever seen. Brown and white patches splash across his coat. He has a long cream stripe across his left shoulder and a narrow white blaze down his nose. His legs are so white it looks like he's wearing silk stockings.

"Hey, Krissy," Glen calls. I hate that name. I jump off the fence I'm straddling with my sisters, and he hands me a piece of horse candy. With his feathery lips Tonka nibbles at my neck and arms and then plucks the candy from the palm of my hand. "He likes you," Glen says.

"Let's get her on!" my dad says. My mother waves from the back patio where she's getting the birthday cake ready.

"Well," Glen says, "I guess she can ride bareback." He swings me up across Tonka's smooth brown back and hands me the reins. "Just hang on tight, honey. Grip with your knees." The bridle is nothing more than two strips of leather and a rawhide cord across Tonka's nose. "Just give him a little neck rein to make him turn. You know how to do that?"

I shake my head.

"Just press the reins across this side if you want to go left and this other side if you want to go right. Pull straight back and he'll stop."

"Okay."

Tonka flattens his ears back toward me as if he doesn't like what he hears.

"Just don't let him know you're nervous. Remember, you're in control."

I nod.

"Off you go." Glen makes a clucking sound, like a chicken.

Tonka doesn't move.

"Give him a little nudge with your heel, honey," Glen says.

Tonka doesn't seem to know what to do.

"Here then," my dad offers, and reaches out and swats him hard across the rump.

Tonka leaps straight up like a grasshopper and suddenly we're lurching across the field. His back is as smooth and slick as a watermelon. I clap my legs against his sides and Tonka understands this as a command for a dead run. Fenceposts fly past. I lunge forward onto his neck and try to find something to grab.

"Hang on!" my sisters yell.

"Grab one rein and turn his head in!" Glen calls. "Make him turn and stop! Pull a rein!"

I've lost the reins. I catch a blurred glimpse of my mother, who is shouting something about not running through barbed wire.

I twist my hands into his mane. And then I see it coming. The one apple tree—the big one—where we pick green apples filled with wormholes to take home to our mother. The trunk is old and gnarled and there are two large limbs, one on each side.

Tonka is a veteran of tricks. Later it will occur to me that this was not his first performance. Just before we make contact, he drops his head and slides under the bough, smooth as a limbo dancer. The branch hits me straight across the chest, full force.

I fall flat on my back. Is this death? I can't breathe. By the time Glen's face is peering into mine, I manage a gasp.

"Don't worry," he consoles me. A wide grin spreads across his face. "Everyone gets the wind knocked out of them once or twice."

"You fall off, you have to get right back on," my dad adds, jogging up.

I lift my head and Tonka trots over, swinging his head from side to side in a kind of celebratory shake. He sniffs me over in a friendly way. Do I have more horse candy?

"She can wait until tomorrow to climb on again," my mother calls. "Birthday cake first."

I stand. The ground feels a little shaky beneath my boots. Glen hands me the reins. Tonka gives me a nudge and obediently follows me back to the house.

For the first time I'm in love.

A FEW weeks after Tonka arrives, my grandmother comes for a visit. Opal is tall and elegant and wears sweaters from her travels in Norway with my grandfather, a Lutheran minister who has recently passed away. Opal's shoes and handbag match perfectly and she speaks her mind, an unusual trait in our family. She doesn't approve of the glass of bourbon my father often has in his hand and she's not sure how she feels about her daughter's marriage, even after four kids. But she wants to see the new house we're building out by Rocky Flats, even if it's not much more than a hole in the ground.

My parents have a new Kodak and my mother wants a photo of the four of us kids with Tonka. A photo Opal can take back with her, a photo we can use for our Christmas card. I lure Tonka to the fence with horse candy and pull the bridle over his ears. We decide not to use a saddle so we can get more kids on his back. My mother aims the camera. My dad swings Kurt up first. "You sit in back," he says, his voice a little too loud, the edges of his words

tumbling one over the next. "You're the little guy. It's easier on the horse's kidneys."

"Okay." Kurt grins a toothless grin.

"Karma next," Dad says. He swings her up and Karma's long legs hang down Tonka's sides. Tonka gets a little jumpy.

Karin goes up next. She grips the mane at the base of Tonka's neck. "Whoa," she says as Tonka sidesteps. It's crowded now. My plan is to stand in front and hold the reins, but suddenly I'm lifted from behind. "There you go!" Dad exclaims, and tosses me up, too high, too hard, too fast.

I have no time to protest. I land on Tonka's neck. He ducks his head, spooked, and I fall forward. Karin tumbles on top of me. Karma grabs Kurt and they slide off together, just before Tonka bolts.

My mother pulls Karin up off the ground. "This one's okay," she says. Karma and Kurt seem fine. I can taste dirt in my mouth. "Let me see that arm," Mom says. I hold up my right arm and it hangs at an angle. "I think you've broken it," she says.

"It looks like the bone is sticking out." Karin likes graphic details.

"I'll take her to the hospital," Opal says. My mother hands her the keys. We drive to the emergency room, Opal humming grimly behind the wheel. When we return hours later, I have a white plaster cast and a sling. Opal reports that not a single tear was shed. "She's pretty tough," she says.

"All my kids are tough," my mother says. We sit down to a dinner of hamburger casserole, canned peas, and Jell-O salad. No words are exchanged between my father and grandmother.

Later, as I lie in my bed with my arm in a cast—now covered with flower-power marker, thanks to my sisters and brother—I hear Opal arguing with my mother in the living

room about my father, his drinking, how it's affecting the children. What is she going to do?

No one argues in front of the children. Nothing is said in front of the children. We know not to talk about our father's drinking even among ourselves.

MY ARM heals. Months pass. Our Sunday-morning drives continue as our new house nears completion. On this Sunday—May 11, 1969—the Colorado sun is clear and bright and it's Mother's Day. My sisters and I wear matching dresses and saddle shoes. Kurt has on a little sweater and tie, and my dad wears a clean shirt. At the restaurant, our favorite Italian place, my mother tells us to behave ourselves as we straggle from the car and gather around the fountain on the restaurant's patio. My dad digs into his pocket for pennies and we each make a wish before dropping one into the water. "This means that you'll always come back," my dad says. "Just like the fountain in Rome. It's like a curse."

"It means you'll always come back to a place that makes you happy," my mother corrects, and after an hour's wait—there are many families in the courtyard waiting to celebrate Mother's Day—we are seated at a table. My mother orders a Manhattan and gives me the liquor-soaked cherry. We eat big plates of spaghetti with fresh bread and butter and spumoni for dessert, so much that we have to sleep on the way home, the four of us slumped together in the backseat, property lines forgotten, our stomachs so full they ache.

TWO MILES away, in an underground plutonium processing building at Rocky Flats, a few scraps of plutonium spontaneously spark and ignite in a glove box.

A glove box is where plutonium triggers are made. The production line at Rocky Flats consists of a series of linked, sealed, stainless-steel glove boxes, up to sixty-four feet in

length, in which plutonium is shaped by human hands. The glove boxes are designed to be kept at a slight vacuum so that any accidental leak will draw air into the box rather than allow plutonium particles to escape. Uniform-clad workers stand in front of the glove boxes and place their arms into heavy, lead-lined gloves and peer through an acrylic window to mold and hammer the plutonium “buttons” into shape. Running above the glove-box line is the chainveyor, an enclosed conveyor system that moves plutonium from task to task along the line. Tall, transparent plastic glove boxes move the plutonium up and down, between the glove-box line and the chainveyor, like dumbwaiters. Small stepladders are provided for workers, particularly women, who aren’t tall enough to reach the arm portals. It’s difficult and cumbersome work, with no small amount of risk, as plutonium is highly combustible.

There is no immediate alarm—the alarm has been disconnected to save space in the crowded production room. Production takes precedence over safety.

The spark goes unnoticed.

In sixteen years of operation, the plant has quietly doubled in size. More than three thousand employees work their daily shifts and then go home, where they can’t talk about where they work or what they do. Few people have clearances to enter more than one building. No one knows exactly what happens at Rocky Flats. Workers in one area don’t know what other workers do. The press doesn’t know. It’s all under the cloak of national security.

The half-buried 771 complex—several buildings designed to manufacture plutonium—is at the center of the plant, surrounded by guard towers and barbed wire. A bluff hides it from the road. Hundreds of glove boxes snake across a floor area that encompasses two buildings: Building 776 and Building 771. The production floor is like a big, shiny kitchen stretching the length of two football fields.

The word *trigger* is almost euphemistic. In a nuclear warhead or hydrogen bomb, there are two steps: an initial fission explosion, called the “trigger,” followed by a secondary fusion explosion. Each stage releases nuclear energy, and the two stages happen so quickly that they appear to be simultaneous. The principal isotope, or form, of plutonium in these bombs is plutonium-239. The trigger is cradled in conventional explosives, which compress the plutonium inward, creating a high enough temperature and strong enough pressure to initiate an atomic chain reaction. Roughly the size of a softball or grapefruit, this initial bomb, a smaller version of the Nagasaki plutonium implosion bomb, triggers thermonuclear fusion between tritium and deuterium, the two forms of heavy hydrogen, and is capable of leveling a small city by itself. But the detonation that creates this fission explosion then triggers the far more powerful fusion explosion of a hydrogen bomb—a mushroom cloud, as in the bomb that destroyed Nagasaki.

The plutonium triggers created at Rocky Flats form the explosive fissionable core essential to every nuclear weapon in the United States’ arsenal. Yet each pit is an atomic bomb in its own right, of the same type as the Trinity and Nagasaki bombs.

Precise manufacture of the trigger is crucial, as any flaw or variation could cause a nuclear warhead to malfunction. A perfect, “diamond-stamped” trigger is the goal, again and again, whatever the risk.

On this day there are few workers due to the holiday. Only a skeleton crew is on hand. More than 7,640 pounds of plutonium¹⁷—roughly enough for one thousand thermonuclear bombs—is held in the maze of glove boxes, pipes, tanks, and containers.

Small fires are common. When a plutonium chip sparks, the worker douses it with sand or drops it into machining oil to snuff it out. There is no automatic sprinkler system or

floor drainage. Water is used on plutonium only as a last resort because water can cause plutonium to go “critical”—that is, it can create a spontaneous nuclear chain reaction that can be lethal to anyone within close proximity.

But no one sees this spark. The spark in the glove box grows into a flame.

Four security guards, Stan, Bill, Joe, and Al, are driving to work. They don't mind working on Sunday, even though it's Mother's Day. The shift is quiet and the pay is good. Like many Rocky Flats employees, they like to carpool. They know each other well. One of the best things about working at Rocky Flats is that it feels like family. Stan likes driving; he's behind the wheel of his new Chevy Corvair. Joe, who tops three hundred pounds, rides shotgun. Bill and Al are both tall and have folded themselves into the backseat as best they can.

Given the constant ravages of wind, rain, and snow, the road out to Rocky Flats can be rough. Old-timers tell stories of flat tires and overheated radiators in the summer, black ice and whiteouts in the winter. Back in the fifties, when the plant was being built, the weather sometimes made it impossible to work. The wind alone could push a man off his feet, and cattle knocked down outhouses while men were still inside. That's all changed now. The road is paved and the old guard shack is gone, replaced by a compound of more than ninety buildings, all hidden from the road by a bluff. Only the entrance gate is visible.

May can be as cold as February, but this afternoon is tentatively calm. Cottony clouds rest their bellies flat against a blue sky. Meadowlarks sing. The dry brown of winter has given way to foothills spotted with a few pine trees, hardy grass, and fragile wildflowers. Beyond the foothills a sharp-toothed ridge runs from north to south, with the dark, flat slabs of the Boulder flatirons in the distance. The road is nearly deserted. Families are at home or church or waiting for tables at restaurants.