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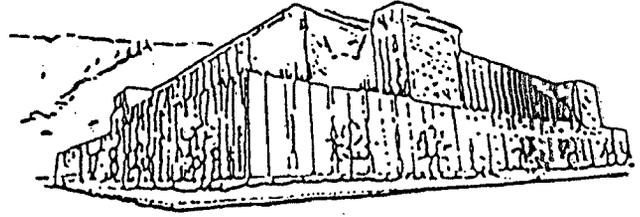
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THE BUTTERFLY EFFECT

by

Mary E. Miller

B.A. Mount Holyoke College, 1985

presented in partial fulfillment of the requirements

for the degree of

Master of Science

The University of Montana

1998

Approved by:



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The Butterfly Effect (92 pp.)

Director: Ronald Erickson *R.E*

In this collection of five personal narrative essays, I explore a variety of themes investigating the connections--and disconnections--between people and nature. How do we, as individuals and as a culture, relate to nature? In what ways do we seek to understand, to define, to interact with, to care for, and to control nature? Where are the problems? Which are the parts that are working? These are fundamental questions that need to be asked if we are to survive, and enable other species to survive, on earth.

According to *The Global Ecology Handbook*, we may be losing several thousand species each year due to the pressures of human population growth and human consumptive practices. We are squandering our wildlands at an alarming rate. Our soils, waters, and air are being misused and polluted to drive industrial society. We are creating hideous amounts of pollution and changing our climate in such a way that we may cause ecological and economic disruption on a global scale. And still, nearly a billion people--almost one-fifth of the world's human population--go hungry. Clearly, we cannot continue as we are and expect everything to turn out all right. So how do we put it right?

I believe that to save ourselves and the earth, we must change our behavior *on* the earth and, more specifically, *towards* the earth. This would involve a major shift in environmental ethics within our culture. The author, Bill Kittredge, says, "The only way you can change people's behavior is to appeal to their emotions." What is needed is to appeal to people's emotions with stories, with shared experiences. In these essays, I attempt to discuss environmental issues from a personal perspective--making them not simply abstract issues but shared personal experiences. I explore environmental and ethical themes on many levels--weaving together the scientific, the cultural, the political, and the personal. It is only by considering many levels of human experience that we may gain insight into the our past, present, and ultimately, our future on earth. It is only by changing ourselves that can we change the world.

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For my mother, Mary

and

for my father, Todd

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The Journey

I saw my first mountains through the tinted windshield of my mother's 1972 Chevy station wagon. To my eleven-year-old eyes, that wagon, a behemoth gilded with glitter-blue paint, sparkled like treasure. The mountains, hunkered frankly in front of us at the edge of the plain, held far less allure. Across three long, hot states, I had anticipated a purple mountain majesty, but these mountains were neither purple nor majestic. They were brown. They rose gracelessly from the flats into messy outcrops and eroded hills like wrinkles. Their dull slopes were awash with scruffy patches of pine, laced with swatches of dead trees and, here and there, untidy snatches of brush. Slumped and indifferent on the hot vinyl of the wagon's back seat, I turned away from the mountains and back to the game in which my two brothers and I were clandestinely engaged.

Charley, the oldest by three years, sat strategically in the middle. This gave him access to both Thomas, the youngest, and me. The game consisted of slipping your arm around your sibling-neighbor in a gesture of good-natured camaraderie and then digging your knuckles into the soft parts of the back. The kidneys proved an especially effective target. The trick was

both to keep from crying out in pain and to inflict the greater pain on your opponent, in the hopes of paralyzing his attack on you.

This game had no winners.

My mother, settled before us in the passenger seat, announced rapturously, "There they are: the Rocky Mountains. Aren't they *wonderful*?" I looked again and saw only brown earth, thinly covered with lumps of grass, rising up into bulky swells of rock and dirt. Dilapidated fence posts lurched up the hillsides; stray jack pines jutted out at bizarre angles. My father rolled down his window to smoke a cigarette, and a hot, dry wind roared past his temple, tearing at my hair.

"Aren't the mountains *beautiful*," sighed my mother.

Faltering at last, Thomas let out a whimper.

My mother shot us a menacing glance. "*If you children--*" she began, but Thomas had already succumbed to the emetic effects of the game and the car trip and, pitching forward, vomited onto my shoe.

I once read of how young egrets will sometimes commit siblicide while their parents sit calmly by. The dominant chicks in a brood will dispose of their rivals by bludgeoning them to death with their bills, all this under the placid gaze of their parents. While my brothers and I have survived physically intact to this day, there are elements of that story that ring true for us--although I would not characterize my parents' gaze as placid. It was more indifferent, distracted as they were by their own rivalry, taken up with their own games.

I looked down at my shoe in horror. Charley howled with laughter.

"That's *it*," pronounced my mother, pressing her lips into a thin line.

"We're going home."

You cannot grow up in Minnesota without having at least one relative somewhere in your family go through treatment for chemical dependency. I have met people from other parts of the country who, upon hearing that someone has "gone through treatment," ingenuously ask, "Treatment for what?" This is the sort of response that makes a Minnesotan smile knowingly. In my case, there were two in my immediate family and others scattered about--grandparents, cousins, distant aunts and uncles.

Alcoholism was an elite club. Why, it was even fun! My father had been in the club since he was a college boy, sending my mother portentous postscripts to his love letters which read, "Regarding your concern about my drinking, I want you to know that you have nothing to worry about, darling, as I have it all under control." Years later, his first-born son would join the club as soon as he was able, which for Charley was at about age fifteen. Club members joked together about their bygone drinking days, recalling past acts of sordidness--committed under the influence--with witty and genuine nostalgia.

The rest of us were expected to laugh along with waggish complicity and cheer from the sidelines, all the while working ourselves on getting better and better and better. We were to rally around the afflicted and support them with an unconditional, take-no-prisoners love. We were to be perky and to persevere, keeping our eyes fastened like radar upon the prize. If we faltered, if we became depressed, despondent, despairing, we were to remind ourselves of how much better things were now than they used to be. Be

grateful, we were told. Don't wallow in self-pity, we were chided. For God's sake, let go of it all, already. The past is past; things are so much better now! Isn't it wonderful?

"Isn't it wonderful how your father has changed?" my mother asks me dreamily. "Isn't he much better now than he used to be?"

"Yes," I say. "Yes, he is."

"Honestly, I can't believe he's the same man," she says. "He's so much nicer to live with now, isn't he though?"

"Well, Mom, I don't live at home anymore. I haven't for a long time."

"Well, yes," she concedes, frowning at me. "But I can tell you, he's a lot better than he was when you kids were at home."

Surrounding those family members not active in a recovery program of one kind or another, there buzzed a sort of greedy speculation. In my family, if you were not a club member or a cheerleader, you were snubbed. You were out of touch or in denial and chances were, you drank in secret.

There were many secrets.

Consider this: On June 7, 1939, a baby, aged nine months, is admitted to St. Mary's Hospital in Minneapolis. He is severely undernourished. The cause of his condition listed on his chart is "Unknown." He is kept isolated in a square, white room with a door containing a small window fitted with a sliding panel. No one is allowed to enter the room with the exception of the doctors who care for him and the nurses who feed him. The baby eats hungrily. Once a day, his mother is permitted to view him through the window in the door. When the panel slides open with a click, the baby snaps

his wobbly head around to see the blond, smiling head of his mother framed in the window. Immediately he clamps his mouth shut and refuses to eat. This goes on for weeks, until the doctors forbid the baby's mother to visit, though they never probe the parents for an explanation, and none, of course, is ever offered. The baby is my father.

And this: In December of 1965, my father passes out on the living room floor of our home in Richmond, Virginia. It is Christmas Eve. My mother is left alone to clean up after the guests and to set out Santa's presents for her children, who will be up and eager to open them in a matter of hours. But the doll's house, which my father has built for me, is too large and too heavy for her to carry up from the basement where it is shrouded beneath an old blanket, so she kneels down next to my father and pounds on his chest with her two fists. He responds finally by raising his leaden arms and wrapping his fingers around her throat, squeezing shut her windpipe until she, too, blacks out. The next day, I creep downstairs to find the doll's house beside the Christmas tree, where I play quietly all day.

And this: On December 27 of this past year, we are gathered to celebrate the thirty-second birthday of my brother Charley. His fiancée has joined us, along with her four-year-old son, Sam. My family--Charley most of all--dotes upon Sam. Charley offers to take him along in the car to pick up a few last-minute items from the grocery store. He returns with Sam four and a half hours later, blind drunk, his eyes sunken like dull red stones in his frowzy face. He is annoyed that we find this situation intolerable. Days later he reveals to us that since treatment four years earlier, his longest stint of sobriety has lasted perhaps three weeks. His stricken fiancée confides ashamedly to me that she finds it difficult to trust him.

The secrets we keep alienate us, from each other and from a more free and full experience of life. The shame and self-abhorrence that my father and mother harbored in their walled hearts and which they taught to their children kept each of us separate from the other. Life is about making connections: connections to people, connections to places, connections to the earth on which we live. But we were not worthy; we fought against those connections. We distanced ourselves. We disconnected.

My family made that journey to Montana in 1974 to mark the beginning of a new life together. It was just one month after my father had attended treatment, and it was the first time my family had ventured out as a unit beyond the Minnesota state line. By the time we reached those first mountains, we had braved the thick, swampy heat of Minnesota, crossed the searing plains of North Dakota, and made our way over the baked hills and through the gulches of eastern Montana. We did not turn around, as my mother decreed in that moment of swift rage so typical of her, but stayed for the full ten days.

I don't remember much of that trip. I remember the scrubby, stony sparseness of the land, which was different from the rich, airy woods, the gentle hills, and the verdant lowlands and lakes I knew. I remember the birds were slightly off-color, and the flowers were small and wan and looked like weeds. The trees were different: they were nearly all pines--scaly spindles with branches sharp as icicles and a scent that bit the nostrils--unlike the round oaks and elms and maples of home, whose broad leaves gushed greenly from

plump, sturdy branches. I remember my father made an effort to talk to me occasionally, which was also different. It surprised and embarrassed me, and I wondered what good thing I had done to deserve it.

I realize now, looking back on it, that for my mother, this was to be a journey of redemption. At least, those were my mother's fierce intentions. For her, it was a journey that delivered her from a wretched past, a shipwrecked marriage, a shattered sense of self, to a more hopeful future. Unfortunately, as it turned out, it was her journey, not mine. As our station wagon wove through those mountains, she locked her eyes onto the far vistas, gleaning them of serenity. But the mountains seemed distasteful, cluttered to me.

For my father, I can only surmise that this was a trip that had to be endured in his quest for forgiveness from my mother. He went along with it because it made her happy. Or at least because it was what she said she wanted.

"Didn't we have *fun* on that trip!" exclaimed my mother recently, when I happened to mention some detail of it. I looked at her, trying hard to remember. She noticed my hesitation and said, "Oh, we did! We had a wonderful time! Don't you remember the card games we played?"

I remembered different games.

How could I have so completely missed the loveliness of that land? The indifference and distaste I felt at that young age for the Western landscape could be attributed to the normal self-absorption of children, by

whom the world is perceived largely within a radius of some twenty or thirty feet of their own bodies, and for whom such high-minded notions as beauty and serenity rank down alongside a balanced diet and making your bed. But in my case it was more than that. The inner fear and turmoil I knew colored the world I perceived. I was the second born, the middle child, the forgotten one. More importantly, I was born female, a crime in my family which rendered me nearly invisible with the shame of it. My hold on a secure world was so tenuous that anything unfamiliar threatened to loose me into chaos. I did not, as other children did, welcome new experiences, seek out adventures; I avoided them. I sought protection and solace instead, and solace and protection originated in the known and were banished among the strange.

The known at that time included the lake that lay at the base of the hill near our house in Minneapolis, where hemlocks towered and willows bowed and wept, and pin cherries and crab apples tossed their blossomed branches in the May breeze like rustling bridal bouquets. In the middle of the lake, a pair of islands offered themselves to the wildlife that sought refuge from the city closing in on all sides. Here great blue herons made their deliberate perambulations up and down the wooded shores, now and then sounding their squawking alarms and lunging into flight. Painted turtles clawed their way out of the shallows up onto the sunny trunks of fallen trees, and there perched all in a row like spectators at an event.

The known included the woods and fields where I rode on my pony, galloping through tall grass and wildflowers, and along the edges of tilled fields, the damp black earth standing in thick rifts like corduroy, and past a pond on the shallow of a hill where swans unfurled their necks to watch us as we thundered by. We rode out late through twilight into evening, under a

sky that lowered itself upon the land in a purplish dome, rich as enamel, spreading darkness over the prairie like poured cream.

But the mountains--the mountains were strange and threatening to me. Therefore, I ignored them.

My brothers had different experiences for which they evolved different strategies. Charley and I were diametrically opposed. Charley was my father's pride and my mother's joy--and tribulation. He was a handsome boy, slender and athletic, with a dark fringe of hair sweeping low over eyes of cerulean blue and a mouth perpetually fixed in a sly grin. His compact body was packed with shored-up energy, his movements sudden, impetuous, possessed of an effortless grace, even as he did nothing so much as pick a flat stone up off the shore of the lake near our house, and drawing back his sweatshirted arm like the cocked wing of a bird, send it skittering across the water.

Charley excelled at the physical and the social, but went about failing or coming close to failing each of his classes with a calculated nonchalance. He was wildly popular at school--especially with the girls who, when the weather turned warm, would line up like blackbirds across the top of the back fence of our yard, swinging their bare legs as coquettishly as they could imagine and calling to him to come out of the house and pay them some attention. Charley was seldom home, but when he was he would oblige the girls just enough to stroke their infatuation, sidling out and charming them with his gentle teasing. His teasing ways with me did not take nearly so charming a turn: with me he could be nasty, mocking and derisive, and in a reactive way

the hatred was mutual. "What's he *really* like?" the schoolgirls would ask me during recess, grabbing my elbow. "Is he as wonderful as he seems?" I pondered this; I pondered their willingness to consider the validity of my perception, and said finally, "He's a jerk."

Thomas was altogether different. He was a waif, small and towheaded, with delicate, almost hollow bones, and freckles brushed like pollen across his nose and cheeks. Thomas had a sweet innocence about him that caused me to wonder whether he would ever be capable of functioning as an adult. (I figured I could always take him in, if the need arose.) There exists a picture taken of us when he was ten months old and I was a little over two. It is one of the few photographs that was taken of us as children. In the picture, we are seated together on a couch, Thomas in front of me, slumped like a sack of flour against my small body, and me with my arms wrapped around this toppled baby as though I were holding on for dear life. Whether I was holding on for his or for mine, I'll never know.

While my mother and father lavished Charley with a sort of *laissez faire* devotion interspersed, on my mother's part, with periods of raging frustration, then ignored and neglected me, they regarded Thomas with something like mild yet forgetful amusement. That is, they were alternately pleased with him and oblivious of his very existence.

Thomas reacted by throwing tantrums. He would scream and scream with a gusto that belied his frail body. He would squeeze shut his face, raise both arms like Christ dying on the cross--arms that ended in clenched, trembling fists--open his mouth, and project his voice to the heavens. Our parents termed it "steaming." Once, faced with the prospect of three cooped-up young children for a thirty-hour car trip for a temporary move we made to

Richmond, Virginia, our parents administered drugs to each of us to knock us out for the duration of the drive. Charley and I sank instantly into stupors, but Thomas, bless his heart, reacted in an opposite fashion and steamed vociferously for the entire thirty hours.

Aside from the mostly silent dinners we spent together back in the early days of my youth, the only time my family interacted as a whole was on summertime excursions we made up to my grandparents' island. It was one of the few places where my mother was truly happy. She found comfort in the wildness--a sort of recovering wildness, considering the land had been skinned of nearly all its trees seventy years earlier--and she imbued in me the gentle love she felt for that landscape.

It was in the summer of 1963 that my mother's parents bought that island of ten acres up on Whitetail Lake in the north central lake region of Minnesota, some eighty miles south of the Canadian border. The entire northern part of the state was logged out in the early part of this century, leaving bright birch forests and the rotting ties and trestles of James J. Hill's Great Northern Railroad laid like partially ripped-out stitches across the watery fabric of the landscape.

The lake teemed with waterbirds. Mallards paddled contentedly around the island and nested in its bushes. Wood ducks, blue-winged teals, and hooded mergansers with their bottlebrush pompadours lived shyly in protected coves and down the secluded stream, its gentle current blanketed beneath water lilies. Double-crested cormorants, goldeneyes, buffleheads, and pintails were strewn like glass marbles across the bays. Shovelers dipped their broad, spatulate bills into the rich shallows, and fat coots bounced like water toys, grazing the marshes. Osprey and bald eagles circled high overhead to fish

the waters, or sat as sentinels in the few remaining red and white pines that had escaped the loggers' greedy saw and jutted out over the young forests. "The bald eagles build nests big enough for a full-grown person to lie in," my mother told me. "The biggest one ever found was in Florida: it was ten feet across, fifteen feet deep, and weighed two tons." I wanted to know how they were able to weigh it, to which my mother replied, "It got so heavy it broke the branches of the tree the eagles built it in and fell to the ground."

Our favorite birds were the loons. They glided silently and low through the water, dipping their heads and diving for minutes at a stretch. They built spongy nests of hollow reed and cattail at the tip of the island's narrow point, and during the early months of summer they toted their fluffy chicks around upon backs of glossy black flicked with white paint. On still evenings, the loons would lift their necklaced throats and call with pure, sweet tremolos that pierced the bluing air of dusk.

My father fished. He would fish for just about anything--northern pike, lake trout, largemouth and smallmouth bass, crappies, sunnies, muskellunge, and the king of the northern waters, the walleye. (Once my father hauled in what he supposed was an big, fighting northern, or a muskie, only to discover that he had caught a loon who had snagged the lure in the crook of its wing. Another time he landed a snapping turtle.) Back in his drinking days, he preferred to fish alone or with Charley, but on rare occasions he would allow the rest of the family to accompany him.

On these outings, my mother would sit in the bow of the boat with a book, glancing up when my father exploded with stifled fury over some "technical nightmare" or other--a snagged line, a lure cast inexpertly by a child into a tree, a motor that killed suddenly in a brisk, onshore wind--to roll

her eyes at us in an attitude of disgust. The rest of us would arrange ourselves according to his directions on either side of the boat, our poles poking out evenly over the water, our eyes struggling to focus the spidery filament that descended into green depths shot with dusty shafts of light. We watched carefully to see that the line was not too slack, not too tight, not too close to any other line, holding the rod gingerly, alert to sense the sudden drag that meant seaweed, or snag, or, if we were lucky, an actual bite, and waiting in silence for the moment when something would happen, or when my father would state the two words that meant he had given up on us and we were heading somewhere else or back: "Reel in."

It was after one of these long, hot afternoons spent sitting still and silent in the boat and with no fish to show for it that we headed in to find my grandparents, along with assorted disgruntled aunts and uncles, not, as they had promised, putting the roast on the grill in time for dinner at six--for which we were already late--but entertaining half a dozen of their cronies from the mainland, tossing back martinis and filling the cabin with their blaring laughter.

Now, my father made it a point never to go up to the cabin when my grandparents were there, simply because he so loathed their company, but he had made an exception this time after my mother promised him that they would be sure to behave, that she would see to it that they not invite any of the neighbors over for cocktails, that it would be a nice, quiet weekend, and that he'd hardly even know they were there. So when my grandmother turned her soaked eyes upon us where we stood at the door, exhausted, sunburned, and hungry, and, clapping her hands together, exclaimed, "My God in heaven, you're back so soon! Did you catch anything?" my father

responded by pulling curled lips back over his teeth into a wolfish smile and asking with a sneer, "How's dinner coming, Carol?"

"Your father was a real asshole," my mother recalls recently.

"Why did you marry him?" I ask her. "Why did you stay with him all those years?"

She thinks about that and says, "I could see he had potential."

We ate hotdogs that night. The cocktail party cleared out, and my grandparents attempted to assuage my father's still-smoking temper with quantities of scotch whiskey and cards. We all played--all twelve of us packed around the dining room table--and a few hands into the game Thomas, who was having a typical run of bad luck, hurled his cards down onto the pine floor and started screaming. Charley laughed at Thomas, which made him scream all the louder, and I watched as my mother tried to calm him. When his screams abated and we took up the game again, I made some playful, prattling remark that I do not now remember, at which point my father, dropping his head forward in a gesture of hopeless weariness, said something I didn't catch but which caused the face of every player at the table to go slack. No one spoke. No one so much as acknowledged his remark. After the game, Thomas related to me in the bunk-bed room we shared that what my father had said in response to my words was, "Somebody tell her to shut up."

Years later, I am having lunch with my grandmother. "You know, Molly," she says, "I really don't know what your mother was like when you

kids were children. I know she was awfully worried about your father and his drinking." She pauses. "Were you happy?"

Blanching, I falter, "It was difficult. I'm happy now."

She looks intently at me for a moment, then shakes her head and declares, "Your parents should never have had children."

In that summer 1974 following our trip West, my mother was fresh out of my father's treatment program as a co-dependent spouse, armed with a quiver of quick-fix, self-help maxims, and faced with a litter of lost children and a dismal history of failed parenthood. So she did what any self-sustaining parent in recovery would do. She sent us to Ala-teen.

All through the next winter and for several years thereafter, we were shunted from one group to the next. When we raised objections--we didn't like it, we didn't understand why we had to go, couldn't we please miss just this *one* week?--our mother was resolute.

"You're sick," she explained, her expression lugubrious, her voice replete with compassion. "You need to get better."

I didn't understand. "Why?" I asked, my voice reedy with despair. "*Daddy* was the one who went through treatment, not *me*. I didn't do anything wrong."

"It isn't about right and wrong," replied my mother. "It's about living with an alcoholic. You've lived with an alcoholic your whole life. That makes you sick--it makes us all sick, everyone in the family." She thought for a

moment. "It's kind of like having the flu," she said, adding, "I'm sick too," and she smiled brightly, as if to entice me.

Sometimes she offered us "choices." "You can have your choice," she'd say, as though she were indulging us. "You can either go to group, or miss hockey practice for one month." Or, "You can either go to group, or miss your riding lessons for one month." When I gave in to her demands, she would smile in mournful triumph, sweep the bangs from my forehead, and croon, "Remember that you're sick, honey."

But I didn't feel sick. I felt creepy.

"Are you a prostitute?" my mother asks me. I am twenty-three at the time, and make my living as a free-lance writer.

"What?" I say. "What? What are you talking about? Why would you ask me that?"

"I just worry about my children," she sighs, adding tentatively, "So are you?"

The groups were held in someone's basement, or in the basement of a church or social service building. The rooms were invariably shabby. (I have always been terrifically affected by surroundings--perhaps peevishly so.) Stained carpeting was rolled out over cracked linoleum; school surplus chairs lay littered about. Fluorescent lights or bare bulbs illuminated walls of plywood and cinder block upon which tawdry posters slouched like pin-up calendars in a body shop. In these rooms, ten to fifteen adolescents flopped in a circle and talked sardonically, unwillingly, bitterly of their lives--or refused

to speak, eliciting a spate of interrogation and harassment from the group's co-leaders--mothers or fathers of the kids present.

"What are you hiding?" they demanded. "Why are you so *angry*?" they accused. "How does this make you *feel*?" they challenged, pushing a child to the floor and sitting on him.

Tales emerged of fathers who beat, of brothers who raped, of mothers who abandoned. When it came around to my turn, I spoke politely of a silent father, an indifferent mother, a mean older brother--crimes so slight in comparison. The co-leaders ordered us regularly to beat each other with *batakas*, long, cylindrical pillows shaped like baseball bats with handles for swinging. This, we were assured, was the stuff of healing. We were charged with being emotionally dishonest if we balked.

Occasionally my mother joined the group as a co-leader. She was tough-talking and hard on the other kids, but when my brothers or I spoke of our lives, she sat silently watching, her eyes peering out at us through a veil of anguish, the slopes of her cheeks lacquered with tears.

My mother had good intentions. Sometimes I must remind myself of this. But when I think back on those shabby rooms and of what went on between the wretched confines of their cinder-block walls, what I remember is the anger and the guilt and the shame of those group leaders as they raged against these, their sad and bewildered children, in a desperate, confrontational attempt to heal their wounds. You can force a child to jump through certain hoops, all in the name of health and wellness, but you cannot force her to experience a level of maturity which is beyond her years.

I know this; I was one of those children. I longed to bolt from those rooms, to escape the rantings of the co-leaders and dash outside into the

startling cold of winter--a cold that pierces your nostrils and seems to fill your shocked lungs with helium. I longed to run out onto the black ice of the lake near our house at night and take refuge on those islands whose trees spread stark and vein-like branches upwards like black sea fans through the indigo sky, and where, among the tangled branches, black-crowned night herons, their long, white crown feathers slung like silken strands over their shoulders, flock to nest in the spring. I longed to climb the willow that overhung the shore and sit among the gossamer catkins which streamed down like green-gold hair, enclosing me within their flaxen tendrils. I longed to ride my pony deep into the heart of the Big Woods.

Nature heals in a way people cannot even hope to understand. The hours I spent riding my pony through the woods and prairies did more for me than all those weeks and months and years of "group settings" (a term my mother firmly applied). It was out in the woods and lakes and prairies of my youth that my heart opened to the world, that I was gathered up like a weeping child into a mother's arms and comforted.

I feel I ought to say that it wasn't all bad. Nothing ever is, is it? We lived in a nice house near a lake. We had a nice yard. We had pets (although my father routinely threatened to drag my dog--a shamefaced mongrel named Sally whom I rescued from starvation and who never relinquished her habit of peeing in what she must have supposed were unobtrusive corners of the living room--down to the lake and shoot her. One evening, upon hearing his

threat for about the fiftieth time, my mother turned to him and snapped, "Fine, go ahead." He never brought up the subject again.)

We lived in the city, in a neighborhood that was built on the soft, rich landfill from a dredged swamp. Back around the turn of the century, some scheming developer drove men and shovels down to the swamp that engulfed the southern section of Minneapolis. They scooped the swamp into a lake and built raised beds of neighborhoods with the muck that remained.

Our house was perched on the top of a small hill. Lilacs, lily-of-the-valley, dogwood, and forsythia blossomed at edges of the yard; trillium, transplanted by my mother from the northern woods, clustered in shady, overhung corners. Sally the dog would sit regally on the stoop, watching with disdain as the pair of brindled shelties next door loafed and dawdled about, exploding suddenly into circular flight at the approach of a stranger and shrieking their sheltie shriek. I remember these things with an almost pastoral fondness. Still, when I visit the home of my young cousins and see once again the pale yellow beds inscribed with rose and blue flowers that once graced my bedroom as a child, I wonder why it all happened the way it did.

"What was it like for you, growing up in our family?" I ask my brothers during a rare reunion a few years ago.

They shrug. "I don't know," Thomas says. "I don't think it was that big a deal." He looks irked. "Why do you ask?"

Charley laughs. "I was a lot happier when Dad was drinking. He was great to me," he says. "Afterwards, he started paying attention to you, and that really pissed me off."

Then somewhere along the line things began to change--slowly, imperceptibly, as if by magic. My father changed. He was no longer the "emotional refrigerator" one counsellor had dubbed him. He melted.

When I was fifteen, my father's mother died of a stroke. Her grandchildren, my brothers and I, were unperturbed: she was the antithesis of the doting grandmother, with her trenchant sarcasm and her ruthlessness, characteristics that led the preacher at her funeral to preface his sermon with, "We all know Lillian was a *difficult* woman." Lillian, too, was a drunk, like her father before her, who ran off when she was a child, prompting his abandoned and ashamed wife to proclaim him dead, a lie Lillian carried with her, unknowing, into adulthood.

Once, when we were small, Lillian flew to visit us at our house in Richmond, Virginia. I was three at the time; Thomas one and a half. We had been playing together on the lawn, and, with a toddler's aplomb, I reached out to retrieve a toy from Thomas's hand, whereupon he began to shriek. Lillian, sizing up the situation, turned to my mother and declared, "That Molly is a sneaky girl."

The fact that your grandmother regards you as sneaky is not likely to engender warm emotions between the two of you, and as I stood at her grave side that unseasonably warm day in April, the pale green grass exhausted from a winter's weight of snow, I glanced about at the mourners, searching for something to engage my interest, and found it on my father's face. It was anguish.

I was aghast. It was the first time I had seen my father cry. Once I did not think him capable of sadness. Once I believed he was incapable of remorse. It was a wall between us, between this father who seemed to regard life as though it were a misbehaving animal that needed to be dragged down to the lake and shot, and this daughter who was capable of being choked with emotion at the sight of a few sticks of furniture.

My father cries all the time now. We joke about it. He comes home from movies and challenges me wryly long-distance over the phone: "Guess when I decompensated on this one?"

The second time I saw the Rocky Mountains was four years ago. I was twenty-five, accompanying my mother on one of her trips, this one to a ranch in the lush cradle of the Sunlight Basin of Wyoming. The Sunlight River slid over the bottom of the basin, then cut into it a canyon with green fields sloping up on either side, jutting upwards into red-, yellow-, and black-rock mountains covered in ponderosa pine, white pine, Douglas fir, spruce, and lodgepole thickets. The mountainsides bloomed with lupine, larkspur, meadowsweet, phlox, fireweed, buttercup, bluebell, aster, purple virgin's bower, and Indian paintbrush. In the forests we saw elk, mule deer and moose; on the prairie hillsides we saw coyotes, marmots, and picket pins. Way up high on the steep sides of mountains, bighorn sheep clattered along impossibly narrow ledges with their young following close behind. We rode all day and took long walks in the evenings.

One morning, we wake early, pack a lunch, and drive back into Montana, back to those first mountains I ever saw. Though it is June, snow is falling from a sky of laundered cotton, the flakes hitting us in the face with great, wet *swacks* and veiling the distant hills so that we catch only glimpses of them, overlapping each other like hearts on a Valentine, before snow drops again like a curtain. We hike a trail up into a canyon where a warm creek tumbles down in a series of waterfalls, carving out pools in the rock. The banks and boulders and trees along the creek are covered in velvety emerald mosses, wildflowers, and bright, delicate, creeping plants. Tiny jewels of water nestle like diamonds on the verdant pillows. Finally, we climb onto a flat ledge overhanging the creek and unpack our lunch.

“Well,” says my mother. “Well. Isn’t this just *wonderful*?”

And I feel the old anger rise within me.

Any other person saying those words in such a setting would elicit nothing but the most genuine agreement from me, but the fact that it was my mother saying them, and the fact that they were the same words she had used in so many other contexts--contexts that were not what I considered even remotely wonderful--made it almost impossible for me to maintain civility.

I wish it could be different. I wish I could say, “The past is past,” and let it go at that, but the past sometimes rises up around me like a tide, and I am swamped in it as surely as if the mound of earth on which our old house was composed suddenly crumbled away back into the marsh. I stagger in it; I reel in confusion. I think, “But perhaps I am not remembering all there is to remember.” I think, “Perhaps I am being unfair.”

After all, the person you become is a personally biased composite of all the experiences that go before you, and the truth of your life is something that

can only ever be partially seen and explained. Moreover, truth is a liquid thing, changing minute by minute. Scenes recede, tumble around, run cloudy and clear, shift perspective and shift placement in the landscape of your life. Other scenes are remembered, pitched into the jumble. And I am supposed to make sense of it all, to judge it fairly, to understand. But I do not understand. I am supposed to have reasons for not understanding. But I do not even have that. What I have is a child in a car, the wind tearing at her hair, her brother grinding his knuckles into the small of her back. What I have is a shabby room with a circle of sad-faced children, refuge on the back of a pony at twilight, the sudden flight of waterbirds over a cold lake. What I have is this rock ledge, these delicate, creeping flowers, this snow.

Geese

We called them Canadian geese. Years later my mother, who by that time worked at the State Department of Natural Resources and knew all the proper names for things, told us they were really Canada geese, not Canadian. But in my growing-up years we didn't know any better.

When the geese first came, they were as strange to me as peacocks falling out of the sky. It was 1969, and I was six. On the shores of our lake in the middle of the city, the wild geese ambled over the lime-colored grass of May on black stalks of legs, grazing and napping and eyeing passersby with a wary spitefulness. They had thick black necks and sooty backs and resplendent white undertails like bloomers, and their black faces and slanted white jowls made them look crafty. We walked the one block down to the lake to feed them old crusts of bread. That was before we were told not to feed wildlife; we didn't know it would turn them into feathered thugs. We just liked to watch them gobble and hiss.

People came from all over to see the wild geese. They loved the geese so much that they convinced the City to clip the geese's wings to prevent

them from bolting off and flying somewhere else. The City installed a pump in the lagoon to keep a circle of water open over the winter so the geese would have a place to swim. Throughout that first winter, as the flightless geese paddled in circles on that small disk of water, or huddled together out on the ice, everyone hoped that come spring, the geese would have lots of babies.

The geese did have lots of babies: yellow puffs darting about on the grass and zipping after their parents over the banks of the lake into the water: *plink, plink, plink, plink*. In fact, the geese had so many babies that they have gotten out of hand. That is what the City says about them, anyway: that they are “out of hand.” Of course, it goes without saying that the people had lots of babies too. But nobody says the people have gotten “out of hand.” It is the other way around, entirely. There is only so much space to go around, there in a park in the middle of a city, and the geese are hogging it.

Their musty green droppings violate the walking path and soil the stylish, outdoorsy shoes the people like to wear on their sporty jaunts. The people circle the lake in droves, snapping, “*Shoo!*” at the birds and flicking their hands daintily. The geese hiss back through parted beaks lined with fine, delicate, file-like teeth, their wet tongues outstretched and quivering like taut pink slugs. The people stare at the geese with fear and loathing. “Those birds are a nuisance and a menace,” they say, backing away. So the City herds the geese into cages and takes them away in trucks. They say that they take them to places that don’t have any Canada geese and would like a flock of their very own, but I’m not so sure.

But this is not what I meant to talk about; I’ve gotten off track. What I meant to talk about is the year the geese first came, and how strange they

were, and how my brothers and I walked the one block down to the lake to feed them old crusts of bread. I should say that it was my younger brother, Thomas, and I who liked to feed the geese. My older brother, Charley, preferred to throw rocks at them. That was the kind of boy he was.

Yes, what I meant to talk about is how Thomas and I walked down to the lake, plastic bags filled with crusts clutched in our small hands, and fed the geese, shyly, and breathed in their fusty scent, and watched and listened to them--listened to the low, sweet, harmonica grunts they made as they shuffled about on the sweet, fringed grass of May.

Come and See

1. Awakening

I suppose it all started twenty-seven years ago with leeches. It may have started before then, but if it did, I certainly don't remember it. I expect that as a baby I had looked at the usual things--the dancing shapes of the hickory branches that rocked in my windows, the stark colors of carrots and peas, the scuttling of a bug over a stone on our lawn in Minneapolis, where I sat plopped and staring. I may have even eaten a few bugs in my time, as babies will do, but it wasn't until late in my third year that I suddenly opened my eyes to the world with a jolt and started to see things--to really *see* things--not just with the sort of passive but tolerably appreciative eye of the self-absorbed, but with the passion of an artist or a scientist.

I do not mean to say that I was an artist or a scientist. My drawings from that time suggest no such thing, nor do my experiments with our two Siamese cats, whom I would imprison in my doll's frocks and then follow around the house, excitedly observing their behavior as they tried to stagger

free of the hideous flounces. No, I cannot claim any precociousness in the arts or sciences. It was simply that as I neared age four, my eyes seem to have awakened from a pleasant slumber. And what first drew them--what first grabbed them and held them still in the grip of a breathless beauty--were those leeches.

A leech is truly a vision of loveliness. During the summers of my childhood, my mother took my two brothers and me, along with assorted aunts and uncles and cousins, up to the island that my grandparents owned on Whitetail Lake in northern Minnesota. On days when the sun shone and the water warmed up past freezing, I toddled back and forth through the shallows that lined the island's shores, parting the smooth green reeds that dangled over my head like an inverted curtain falling from the floor of the lake upwards to the sky. I peered into the water, watching for nervous, gasping minnows; for the crawfish, with their claws like tiny lawn clippers and their scalloped tails; for the frogs and tadpoles with their ballooned eyes; for the striped perch always with the stupid expressions on their faces; and for the magnificent leeches.

I remember all those creatures fondly, but I remember the leeches as one remembers one's first love--the thrill, the intensity, the steady, rapturous gazes. Colored a warm, chocolate brown spotted with black, they oozed across the sandy lake bottom like dark leopards. When startled by a puff of sand or the swipe of scooping fingers, they took off through the water at a dead wriggle, their supple bodies stretched thin up to six inches and rippling smoothly as a ribbon off a girl's hat caught by the wind. When cupped in my

hand, the leeches transformed themselves into fatted blobs, creamy with slime and soft as butter to the touch. I would catch them and carry them around with me.

While I scouted the shallows, my mother and her sisters would stretch out on the dock, reading books and sunning themselves, rousing from their individual reveries every now and then to discuss the pitfalls of married life or to exchange a bit of gossip. Cradling a leech, I would sneak over to where they lay, slip under the dock, and curl a plump arm up over the dock's edge to place the slimy prize on one or the other of their bellies or thighs. If it happened to be one of my aunts, the afflicted would invariably scream and flail her limbs, then throw dark glances at my mother who pretended to be absorbed in her reading. If it were my mother, she wouldn't skip a beat. She'd tilt her book forward, slide her gaze down the length of her body until it stopped at the leech, and then flick the creature away without so much as a how-do-you-do. That was the sort of woman she was.

After the leeches, things seemed to explode outwards. Or perhaps they imploded--it's hard to say which it was. Anyhow, I began to see; I began to notice things; I began to pay attention. I saw patterns--the raised veins in a leaf, animal shapes in clouds, the delicate imprint of mice feet in snow like necklaces slung over white winter meadows, the pale mosaics on the skin of the chameleon I kept in a glass box on my windowsill. My eyes were telescopes; I had bionic vision. I saw smokey black trees lining the tops of hills, spread like Spanish fans and burning into the edge of sky. I saw fiery prairie grasses tossing their tasseled heads in the bright sun, and the blood-red berries of the sumac thick as clusters of bees clinging to the tangled branches.

My limpid gaze could crystalize the world as though it were a syrupy sugar caught in a beam of boiling light. Riding my pony through the woods, I would lie back with my head pillowed on his furry rump to gape at the trees bobbing, the branches splayed and swerving like black tentacles against a blue sea of sky.

And then, somewhere along the way, all that changed.

2. Structure and Function

I was a shy child; I didn't talk much. I watched. When I imagine myself now back in my child's body, I picture a small creature with eyes like saucers, like moons, easily startled and easily rapt.

Now, at thirty, I am again often startled by what I see: snow thawing on the spring hills, the white breast feathers of the woodpecker hammering on the pear tree, the pale blue petals of the crocus that appear one day at the foot of the porch. What is this vision, that roused me to the glories of leaches and rouses me still? What are these eyes? Lumps of strange matter, lodged in my skull, oddly shaped, strangely patterned. How do they work? How did they happen?

According to scientists, there are three basic kinds of eye known to exist in the world--pinhole eyes, compound eyes, and lens eyes--from which countless subtle and not-so-subtle variations have sprung. Pinhole eyes are the sort favored by mollusks--a group of some 100,000 marine species

including snails, oysters, octopi, squid, and the chambered nautilus, a strange, squid-like creature that lives within a fat, coiled and striped shell. The protruding head of the nautilus is fringed with tentacles that quake and quiver through the water like streamers of gold, or slowly furl and unfurl like the undulation of babies' fingers. Just above the fringe, two eyes like wet coins open to the world.

In the pinhole eyes of the nautilus, light enters the eyeball through a small hole in the front of the eye, as though the eyeball were a ping-pong ball that had been pricked with the point of a pencil. The light travels through the interior of the eye directly to the back where it hits receptors which send messages to the nautilus' brain. Lo, the nautilus sees--sort of. It's a nice, simple eye, but the wearer receives only a narrow shaft of light through the hole, and the lack of a lens severely limits the clarity of vision. To the nautilus, the world is likely to be a murky, blurry place.

Compound eyes are the sort most bugs have--literally eyes on stalks, or clusters of stalks, like bunches of telescopes poking up from the mound of the bug's eyeball launching pad and scanning the world for visual information. The eye on the end of each stalk provides the bug with an image; the common housefly, for example, receives hundreds of images at once. Scientists disagree as to whether these images are perceived separately, a view similar to watching several hundred television sets, each turned to a slightly different channel, or whether the images are integrated into a single looming and bulbous picture. Either way, the compound eye is great for detecting motion but leaves a lot to be desired as far as identifying what you're looking at. To help compensate, a tiny lens in each stalk increases resolution.

Resolution is the ability of the eye to produce a clear picture by separating and defining objects in its visual field. The lens also works to control the diffraction of light through the opening of the eye. Diffraction is the ability of light to bend around corners.

Despite these advances, the compound eye falls far short in terms of resolution when compared to the human eye. Basically, it's too small to do the work. In fact, one scientist calculated that for a bug's eye to have the same resolution as a human eye, the eye would have to be over three feet in diameter and weigh some 880 pounds. Another price of such minute apparatus is paid in the limited scope of the color spectrum that the bug is able to perceive. In order to maximize their performance, honeybees ignore red.

Lens eyes such as ours have their own structural and functional limitations. Structure and function go together; each determines the other. The two intertwined shape our experience of the world. Light enters the lens eye through a comparatively larger opening in the eyeball: the pupil, from the Latin *pupilla*, meaning "little doll," for the tiny reflection of ourselves we see when we look into another's eyes. The pretty iris we lavish so much attention on is actually a group of tiny muscles that expand and contract to alter the size of the the pupil and thus control the amount of light that enters the eye. Under the iris, a rubbery lens fits neatly like a monocle. The lens actually changes shape to compensate for diffraction and to focus on objects seen at different distances. It flattens to focus on distant objects, thickens to focus on near ones.

Overall, this is the most efficient visual system of the three, best at

controlling diffraction and creating good resolution, but a lens eye is particularly vulnerable to malfunction: one small structural defect in the eye can screw up the whole system. It's also developmentally and physically expensive: it takes a lot of muscles, nerves, and brain space to operate. Yet, with all that, we see only thirty percent of the range of light that comes from the sun; the other seventy percent--infrared and a bit of ultraviolet--is invisible to us. It was also presumably invisible to the sheep whose eye I carved up in my seventh-grade science class.

That poor old sheep's eye was like a gob of greasy cheese sitting on my desk. When we cut the eye open the lens popped out like a prize--a lump of hard rubber the roundness of a quarter, the thickness of a finger, and the color of dull amber. "How can a sheep see through this thing?" I wanted to know, to which my science teacher replied that the lens only becomes that way after death. He said the words "after death" the way one would say "after lunch" or "after art class." I think "opaque" was the word he used to describe the after-death lens of a sheep. I figured opaque meant yellow, and I held that lens up to my own eye and tried to look through it. But all I saw was the grainy yellow of a dead sheep's eye.

I set down the rubbery lump next to the now split-open ball of cheese and, after fastidiously wiping my fingers, touched my own eye. I won't go so far as to say that I thought about my own death, because I didn't. I was only twelve, and as I've said, I was not a precocious child. But as I looked down upon that sheep's mangled eyeball, I decided that the only way I could sensibly deal with the horror that lay before me on the desk was to become a doctor.

If I were a doctor, I thought to myself back then, I would understand everything about that sheep's eye--I would know that sheep's eye inside and out. The act of slicing it up would have no power to trouble me. I would survey it as coolly and lightly as one might survey a tricky piece of machinery. I would poke my scalpel into it and respond not with a horrified, "What have I done!" but instead with an interested and liling, "Aha." This, at the time, seemed like a comforting thought.

It was a matter of maximizing my performance.

3. Feature Detectors

Sight first developed in ancient seas. At some point in their evolution, early creatures grew patches of skin that were sensitive to light, allowing them to tell the difference between light and dark and also to discern the direction of the sun. What began as a simple skill used to find sources of energy, food, and eventually mates has since evolved into a tool used in the creation and experience of art, an appreciation of nature, the accomplishment of work tasks, and the evolution of wide-ranging notions of beauty and goodness--somewhat more sophisticated skills used to find sources of energy, food, and mates. The more things change, the more they stay the same.

Of course, not all animals use vision to locate themselves and others in the world. Dogs, for instance, rely more on smell than on sight. A professor once told me that if the nasal membrane were removed from a dog's nose

and smoothed out flat like a sheet, it would be roughly as big as a football field. If the same were removed from a human being, it would be the size of a postage stamp.

There is a bizarre fish of the genus *Eigenmannia* that lives in the murky waters of the Amazon and its inlets. *Eigenmannia* has almost no sight, a sense which would be nearly useless in its turbid home. Instead, the fish produces a weakly electric field from an organ in its snout and “sees” using electroreceptors located in the pores of its skin throughout its body, a situation akin to our bodies being studded with fairly myopic eyes from head to toe. Objects that come into *Eigenmannia*’s electrical field distort the fish’s “view,” either by concentrating the electrical flow (if the object is a better conductor of electricity than water) or by dispersing it (if the object is a poorer conductor). Thus, the fish perceives one or another kind of electric “shadow” to locate objects in its surroundings and to sense the edges of those surroundings themselves.

Eigenmannia’s system of perception seems mighty peculiar and far removed from our own. Our own vision seems so natural to us that we often assume it is simply the mirror image of what’s out there. But the eye is no blank slate. Our vision is a strategy, and nothing more. It is our strategy for surviving in the world, and like all strategies, it is not infallible. Structures and functions have their limitations. Like *Eigenmannia*, we use what we’ve got—our eyes and brains—to collect information coming at us in the form of light, then selectively screen and process it, ignore some types of information and exaggerate others, all in a massive effort to interpret our environment

and make decisions that will ensure our survival.

Take toads. Their visual network is similar to our own, only simpler. Light from the sun travels to earth at 186,000 miles per second and enters a toad's eye replete with information about the toad's surroundings. The information is then sent, at a comparatively sluggish sixty miles per hour, through the optic nerve--more precisely, a bundle of nerves--to two separate places in the toad's brain: the optic tectum and the thalamus. In each of these destinations, visual information is screened and processed to provide the basis for decisions that the toad makes in responding to its environment.

Here's where things get simpler: if a toad is not moving, and there is nothing moving in the toad's scope of vision, the toad sees nothing. The neurons in the toad's eyes don't fire and the toad is utterly blind. For moving objects, the toad detects and analyzes them in roughly one of two ways: is the moving object a horizontal thing or a vertical thing? Feature detectors in the brain help the toad to accomplish this. Feature detectors work sort of like keys fitting into keyholes: when an image passing over the toad's eye fits onto a corresponding imprint in the brain, a bell rings and the toad reacts. The thalamus of the toad's brain has a feature detector that detects vertical objects--like toadmongering storks--while the optic tectum has a feature detector that detects horizontal objects--like tasty worms. If the stork-detecting thalamus rings, the toad hunkers down into a crouch; if the worm-detecting optic tectum rings, the toad goes on the hunt.

Like a toad's, our eyes and brains have special feature detectors that "encourage" us to recognize and react to specific stimuli. For example, our eyes react especially strongly to edges, exaggerating the contrast between dark

and light areas. This phenomenon, which the scientists call lateral inhibition, highlights for us the outlines of objects and boosts the clarity of our vision. Lateral inhibition, considered by many to be the grand organizing principle of visual processing, happens when nerves in the retina are struck by light and fire excited messages to the brain, while at the same time they try to prevent the nerves next to them from firing.

To picture this, imagine ten nerves in the eye lined up like ten children sitting quietly in a row. Each child has their arms looped around the neck and shoulders of the child on either side of them. Suddenly a beam of light hits five of those ten children and the five in the light respond by leaping to their feet in excitement. Now, each of those five excited children is simultaneously seized with the impulse to push down their neighbor, so while they jump up and down in excitement, they also clamp their hands down on the shoulders of the child on either side of them, trying to force their neighbors back to the ground. But the excitement is too much for the five children in the light, and none are forced back down.

No, the action takes place with child number *six*, who is sitting quietly in the shadows with the remaining four children, minding her own business. On her dark side is another seated, quiet child, but to the lit side is naughty child number five, who is dancing up and down most rambunctiously in the light, while at the same time squashing her--child number six's--head down towards the ground in the throes of his excitement. In addition, since excited child number five is being pushed down (or inhibited) by only one other child (the one cavorting next to him in the light) rather than two, his jumps are stronger than the other excited children, and he is making a series of the most reckless leaps imaginable into the air.

So what you have is five jumping children and five seated children, with child number five going maniacal and child number six with her face pushed into the dirt. That is lateral inhibition, from which feature detectors of extreme complexity and discrimination have evolved. With this simple edge-exaggerating phenomenon, our eyes help us to resolve and identify the objects we see. If we identify those objects correctly, then the difference between our visual exaggeration and the reality of our surroundings is inconsequential. We know what we're looking at and that's the whole point.

Compared to toads, the feature detectors in our brains are infinitely more complex--the result of our comparatively hulking brains--and largely mysterious. I have read of brain-injured people who, as a result of damage done to a particular part of their temporal lobe, cannot recognize faces. They can see perfectly well, they can recognize objects, they can identify people by familiar clothing, but when shown a facial portrait of their friends, their spouses, even themselves, they are at a complete loss.

Once, eleven years ago, I, too, found myself at a complete loss.

It happened soon after the horse I was riding inadvertently flung himself onto the top of a three-and-a-half-foot bundle of logs. The logs had been lashed together with rope to make a hogsback jump, the second of fifteen obstacles dotted throughout a three-mile cross-country course over which I was riding in competition. The jump was situated at the edge of a dark wood, just inside the leafy shadows. Beyond lay a green field flooded with sunlight. Spectators thronged the boundaries of the course, lounging in clusters on either side of the bundle of logs.

My horse and I, having jumped from one bright field into that dark wood, were on our way to leap back out of the wood into that second bright

field when it dawned on me that my horse was paying no attention to the logs directly in our path, but instead had locked his eyes upon the colorfully dressed spectators lining both sides. I slowed him down, attempted to direct his eyes toward the fence by pushing his head around with one hand, and when finally he caught sight of the logs, he panicked and leapt wildly into the air--a good two strides early--and instead of clearing the logs we landed smack on top of them, sending them flying apart and sending my horse pitching into a forward somersault while I was sent smashing helmet-first onto the ground.

It was so embarrassing.

A couple of the show officials helped me off the course and into a patch of shade, where I lay down and immediately sank into unconsciousness. When I awoke, a middle-aged woman in a droopy straw hat was seated beside me, watching me with interest. She looked vaguely familiar--as though we had met somewhere before but I couldn't quite put my finger on where or who she was. I couldn't have said who I was either, or what I was doing lying in a patch of shade in the countryside of some unknown landscape. I could detect objects all right, but I couldn't identify a thing. Suddenly I was gripped with panic, which--curiously--included a fear that those around me might sense my total lack of cognizance.

Feigning nonchalance, I asked the woman in the straw hat a series of questions, alert for clues. Over the next thirty minutes, the details of my life returned to me in pieces, in fits and starts, and I came to realize--after studying her at some length--that the woman seated beside me was my mother. When I was fully returned to my senses, the woman in the straw hat

who was my mother asked me, "Are you feeling better?"

"Yes."

"Fine. Let's go home."

Visual memory and perception are inextricably linked. We use our thin, flat retinas, each no bigger than a quarter, to continuously search out identifiable objects doing recognizable things. We locate ourselves in the world mainly by sight; we locate each other and all that surrounds us by storing up images in the temporal photo albums of our brains. Brains and eyes, sight and memory, structure and function--each half of a pair depends on the other. To see is to remember; to see is to know. Most of our metaphors for knowledge revolve around "seeing." That I could see my mother and not know her strikes me as the work of some dreadful strangeness.

4. Revelations

As I've said, after a while I stopped seeing the way I had when I was a child, scouring the lake bottom for leeches. It wasn't anything tragic or even dramatic. I can't say that I was particularly aware of it. It was like a dulling of sensation. It was like the sifting of dirt through the fingers. And when the dirt is gone, you clap your hands briskly together and think, Ah, much better now! But how do you know that you wouldn't rather be holding a lovely handful of dirt than nothing at all?

But you see, I went ahead and grew up. And there were more important things to think about than leeches, and trees like Spanish fans, and

the blood-red berries of the sumac thick as clusters of bees. There was college to consider. There were careers. There was my future. There was heaps of thinking to do. To maximize performance, you choose to ignore certain things. Everything I did took on the aspect of intellectual probing. While writing papers on erudite subjects for my college classes, I jotted down notes on slips of paper that read, "What does this mean to me? What has it meant for my life? Why is it important?" and then tuck them briskly away. The dirt sifted.

During that time, I was still toying with the idea of becoming a doctor. My father, who was himself a doctor, kept his medical textbooks in the basement of our house. When I was in high school, and later on breaks from college, I would descend into the murky gloom of the basement, drag the damp, heavy volumes out from their boxes, sit on the basement stairs and force myself to pore over them, in order to prepare for my future in medicine. There were innumerable pictures of people with a staggering variety of diseases and deformities; there were close-ups of abnormal tissues and festering sores, and all those anatomical drawings that make people look like machines. I made myself look at all of it. I figured it would be good for me; it would prepare me for real life. Above ground, the trees and hills and animals that had once grabbed my eyes and held them were seeming increasingly dull in comparison. I stopped noticing things; I no longer paid much attention.

Our culture puts a high value on pragmatism. We are taught as children to be rational, to be objective, to be hardworking and ambitious. This was the direction in which I was steadfastly headed. But how is one to be rational with a bird? To be objective with a painting? To be hardworking and ambitious with a flower?

I don't mean to sound melodramatic. It's just that when it came to the physical senses, I became somewhat complacent. One scientist writes, "While no amount of thinking will make a red region look blue, [an] observer's expectations can influence the perceived identity of objects." You learn to expect what you see; you learn to see what you expect. You learn to be smug. But the one thing about true seeing is that it swiftly removes all smugness. Consider the sifting dirt, for instance. A recent article in *National Geographic* informs me that almost two-thirds of the total vegetation of the grasslands upon which I grew up is underground. If placed end to end, the roots and root hairs that grow beneath one measly square yard of tallgrass prairie would stretch for twenty miles. Furthermore, a square foot of prairie soil holds about half a million nematodes, little crawling creatures, which has led ecologists to conclude that nematodes, not bison, have probably always been the dominant plant-eaters of the prairie. And earthworms actually outweigh bison in terms of total weight per acre on a prairie.

Of course, that's not much of a surprise, these days. There aren't many bison left. There isn't much prairie left, either. Practically everyone knows that; I won't bore you with the gory details. Suffice to say that because of these facts and others, somewhere along the line I decided not to become a doctor. It just wasn't for me. Given the current state of world affairs, it didn't seem as compelling a profession as it once had. I couldn't fathom spending my life in the sterile environments of hospital and office. Also, I realized that underneath my pragmatic composure, the pictures in those medical texts were making me sick.

Then somewhere along the line, I started to see again.

It didn't come easy; it took a concerted effort on my part, and on the part of the things that were trying to get me to pry apart my stubborn eyes and brain. I remember one instance distinctly. I was twenty-one and visiting the National Gallery in London. Rounding a corner, I came upon a painting by van Gogh--a crude wooden chair with a rush seat: an object altogether ordinary, yet so extraordinary that the experience of seeing it was like walking face-first into a brick wall. It was as though van Gogh had stripped away all the dullness, all the complacency, had shaved and shivered all of life down to the heat and light and matter contained in a single trembling chair, and then had painted it as though his very soul depended on it. Perhaps it did. He was a somewhat unhinged individual. In *A Natural History of the Senses*, Diane Ackerman writes that van Gogh may have suffered from temporal lobe epilepsy, poisoning by the digitalis administered to treat the epilepsy, cerebral tumor, syphilis, magnesium deficiency, and severe depression; he also drank kerosene and ate paint--any or all of which could have afflicted his personality as well as vision, exaggerating yellows and causing him to see halos around lights.

But that chair! The wood glowed and glowered with light, the rushes in the seat burned with an inner fire--the same fire I saw inside those prairie grasses as a child. There lay absolute color, pure light, distilled emotion. There lay the painter's soul and there stood mine before it, fully present and fully lit in the twin beauties of light and color.

People see in color partly because we evolved as fruit-eaters, an evolution that enabled us to easily pick out fruit against a green background.

Color vision also helped to alert us to the dangers of poisonous plants and animals, which often wear bright warning colors like yellow, orange, and red. There are two types of photosensitive receptors found in the thin retina that lines the back of our eyeballs like a skin: rods and cones. We perceive color with the cones of our eyes, and only in moderate to bright light. Three types of cones--each containing different forms of visual pigments--respond differently to red, green, and blue wavelengths. About seven million of these cones are clustered on the central fovea, a small hollow in the middle of the retina. If you were to hold a forefinger out at arm's length and look with one eye at the fingernail, the image of your fingernail would cover the entire fovea. Our eyes are constantly flitting around to get images in front of the fovea; if they were still, we would get that one small spot of clarity and the rest of our view would be hazy, indistinct.

Outside of the fovea, one hundred and twenty-five million rods are distributed throughout the rest of the retina to detect luminosity--shades of white and black, but no color--useful for night vision, when there isn't enough light to make the cones fire their colored messages to the brain. At night we don't see in color. And since rods are located outside of the central fovea, to see objects well at night we must look slightly away from them.

Color itself comes from the bending of light. The white light from the sun is actually composed of an infinite number of wavelengths, or bundles of energy, that have varying amounts of pliability. Of this infinite number of wavelengths, we perceive about seven groups of colors: the seven colors of the spectrum. When light travels through a prism, such as a water droplet suspended in air, the wavelengths each bend according to their individual

abilities and separate into bands of reds, oranges, yellows, greens, blues, indigos, and violets. I know this and yet, in truth, I understand it no better. What trickery is this? I look at a rainbow--I have no idea why I see what I see. Or why I don't see what I don't see. At the age of eight, I asked my mother where God lived.

We were in the kitchen, baking a cake. For some reason, I was seized by the desire to see His Face, after all those church services that spoke so glibly of God and even had pictures of God, though for the life of me I had seen neither Hide nor Hair of Him. So I put the question to my mother.

"God is everywhere," she answered, matter-of-factly. My mother was raised Catholic, with Latin masses and black veils over the head. My question didn't strike her as particularly challenging.

"Everywhere?" I repeated. I glanced around. "Even in the oven?"

"Even in the oven," she said.

Now whenever I use an oven, I take a good long look. But I could swear I've never seen God there. So which do I doubt? The existence of God or the reliability of my senses? Senses can be deceiving; one must take care not to rely too heavily upon them. Last July, I took a day and hiked up into the mountains near where I now live in Montana.

I had climbed to the top of a hill and was wandering about in the grasses, exploring for wildflowers and keeping an eye out for a good spot to lie down in the sun and read. As I stepped over a patch of purple-eyed mariposas, there was a sudden explosion of crashing brush--stalks of dry grasses hurtled into the air as a giant beast lurched up out of the very earth and lunged--which way, it was impossible to tell. It was so sudden and ferocious--it was so massive--it smashed into the light. It was a violent beast, a

spotted beast, a speckled fawn, a tiny thing that I had scared up from its small, curled nest in the thick grasses, where it would have lain with its tiny hooves folded like buds against its white belly, holding perfectly still but for the flick of eyelashes, the faint pulse of breath on its sides, until I came along and nearly trampled it. After a few hops over the top of the hill, the fawn dropped back down into the grasses and was still. And I stood there, feeling ridiculous.

5. Predation

Up until about twenty million years ago, our prehuman ancestors lived in the woods. Over the five million years that followed, climatic changes and fire shrank the forests and jungles, forcing us out onto the plains and grasslands. It was then that our vision really took off and left the other senses in the proverbial dust: while our eyes make up less than one percent of the weight of our heads, a full seventy percent of our body's sense receptors are located there. So, in the Book of Revelations, when the four horsemen of the Apocalypse coax the slain lamb to preview the horrors that signal the end of the world, they offer him the strangely quaint entreaty, "Come and see."

Our ancestors came to depend on their eyes in those wide open spaces of the early plains, using their vision both to locate prey and to keep an eye out for other predators. Predators like us have their eyes set on the front of flattened faces, creating a narrow, binocular, forward-directed field of view that's useful for sighting and tracking prey. Since predators tend to position themselves so that their prey lie straight ahead of them when they prepare to

strike, a forward-facing pair of eyes is extremely advantageous. In addition, predatory primates such as ourselves seize prey with their hands, which may account for our highly developed hand-eye coordination.

The two overlapping images--one from each eye--that we get with our binocular vision are integrated in our brains to provide us with important information about distance, which we perceive as three dimensions, or depth. To maximize depth perception, you have to maximize overlap from the two eyes, which means they both have to be pointed in the same direction (forward), leaving predators with little in the way of lateral view--a drawback that's compensated for with necks that swivel. Owls are especially good at neck swivelling. Their eyes, made for hunting in the dim light of night, have evolved into enormous elongated eggs virtually crammed into tubular sockets--a configuration which prevents owls from rotating their eyes in the slightest. Instead, they swivel.

Prey, always vulnerable to being pounced on from any which way, have eyes set on the sides of their head. This way they can monitor the entire scene--many of them moving their eyes separately to do so--without so much as tilting their head. Rabbits, for instance, see a 360° panoramic field of view at all times (compare this to the 190° horizontal-100° vertical visual field of humans), but the binocular field of a rabbit is only 24° (in humans, it's 130°). Thus, rabbits and many other prey animals have little in the way of overlapping images, which leaves them with a rather flat picture of things.

The prey our early ancestors were after and the predators they were trying to avoid usually sported some combination of superior sense of smell or hearing, faster speed, larger size, and greater strength than they. Eyes and brains were our competitive edge. They appear to have worked, too. Mass

extinctions of large mammals, especially large herd animals, occurred on a number of continents shortly after the arrival of humans thousands of years ago. This extraordinary coincidence has led scientists to formulate the Pleistocene overkill theory: in a nutshell, we killed them. Some 73% of the large mammals in North America went extinct soon after humans arrived over the ice bridge we call the Bering Strait, sometime between 11,300 and 12,000 years ago. These vanished animals included elephants, horses, camels, giant ground sloths, giant beavers, and towering bison over twice the size of the comparatively dwarfish bison that survive today. South America lost 80% of its large mammals; in Australia, 86% disappeared. A little structure and a lot of function can get you into trouble.

Of course, the Pleistocene extinction theory is just a theory; no one knows for sure whether or not it's true. It could be true. It could be partially true. The difference between exaggeration and reality is inconsequential. We know what we're looking at and that's the point.

Ours is a society of voyeurs. Where did curiosity go wrong and turn into something furtive and dangerous? Shopping for groceries with my mother at the age of four, sitting in the back of the cart with my legs dangling between the metal spokes, I would stare out at the hunched old ladies, at the sick, at the crippled, with a sort of fascination and horror. My mother told me it was hurtful to stare, so I stopped. Or tried to. Sometimes I just became shamefully stealthy, peering at them through sidelong glances, or from

behind the blind of my cupped hand or--when I was older and cleverer--a box of jello, a can of soup.

Later, in my tenth or eleventh year, I had a macabre desire to see an autopsy. I used to ask my father to tell me how it was done. He would describe for me how, if the pathologist wants to see the heart, he takes pruning shears to cut through the breastbone, then grabs hold of it and pries the ribs apart as though he were opening a wardrobe. He would describe for me how, if the pathologist wants to see the brain, he carves a circle around the boney head with a little shop saw and lifts off the skull like it was a beanie. I asked my father if I could go along and watch this sometime, and he said sure.

I never did get around to it. At the time, it seemed that a lack of planning, logistical snags, perhaps an accident of conflicting schedules--my father's and mine--prevented me from taking part as an observer in these rites. But I think the truth is that despite my early determination to adopt a cool, scientific demeanor when it came to split-open eyeballs, cloven skulls and gaping thoracic cavities, I was at heart an emotional kid.

You could say that we are curious for reasons that have to do with exploring the world outside of ourselves. You could say that we are interested in how others experience life, how they cope with difficulties, or that we long to gain some insight into avoiding other's misfortunes (like death, for instance). You could say that our fascinations can be traced back to some ancient instinct to cast out the "unfit" or the "dangerous," and in doing so, save ourselves. Horses tend to dislike those of their kind that are light-colored: pale grey, or worse, white. In a herd of domestic horses, the dark horses will tend to hang together and drive out the white, responding instinctively to a circumstance that historically would have attracted

predators from afar--a bright white horse stands out like a lighthouse on a grassy plain--although about the only predator those domestic horses have to worry about now is us. Of course, we don't hunt down white horses and eat them, anymore. We put them in the circus. It's a different take on predation.

At a dinner party several weeks ago, one of our guests told a story about her great-aunt who had been one of a pair of twins born five weeks premature back in the early part of this century. At birth, the great-aunt, who is now eighty-six and expresses herself by performing monologues as the character Mary Magdalene, weighed just two pounds--the size of two one-pound chunks of butter. She would have died (and sadly, her twin sister soon did) without an incubator. There were no incubators available in the town's hospitals at that time, or perhaps they were too few or too expensive for her parents to afford. So her parents carried their two babies down to the circus, the only place in town where you could get free access to an incubator, where those babies lived--and one died--during the first few months of their lives. You see, people back then would pay to see preemies, the same way they would pay to see other unusually shaped people and animals whom they called freaks.

I, too, have paid to see freaks.

I would like to say that it happened a long time ago, but I'm not sure that four years can be considered much of a long time. My friends and I were at the Minnesota State Fair. It is the largest state fair in the world, although whether it is the size and pageantry of the fairgrounds or the public attendance that makes it the largest, I do not claim to know. It was late in the evening; the sun had long since set. The night sky reeled with the fantastic lights of the rides and rang with the shrieks of riders and the awkward clink

of organ music. We were loafing, exhausted, on the packed dirt of the midway while gusts of unnaturally warm air smelling of hot grease wafted over us, wanting to leave for home but with six tickets left over from the day and a dull-witted determination to spend them. And as we were standing right next to the World's Fattest Man--*880 Pounds, And Still Growing*--we thought it would be hilarious to take a peek, and so two of us went for three tickets apiece.

I had seen Big Bertha at this same fair when I was a child of seven. I remember walking up onto a boardwalk that was built alongside a trailer home--one section of it plate glass to accommodate viewers--where Big Bertha lived and ate, and it was all very tastefully done: I was outside, she was inside, behind the window; I could gape in comfort and relative unobtrusiveness, and she could watch T.V. and eat hamburgers in the air-conditioned comfort of her own home and workplace.

Not so with the World's Fattest Man. I am lured into a trailer, where I expect to view the World's Fattest Man lounging in some sort of makeshift living quarters (an identifiable object doing a recognizable thing), but what I find is quite the opposite. Once inside, the World's Fattest Man is a finger's breadth away on my left, clad in shabby, foul-smelling clothes and seated in what can only be described as a tiny, whitewashed penalty box--the kind found in hockey arenas--only large enough to enclose his sad bulk and a minute, black and white T.V. set on a shelf a few inches from his greasy face to which his eyes are dully transfixed. The walkway is not the spacious, tidy boardwalk I was expecting but a thin, peeling corridor bordered on the outside by plywood walls that follow exactly the perimeter of the penalty box, so that during my entire viewing time I am not more than seven or eight inches

from the World's Fattest Man. It is a proximity that produces the most uncomfortable feelings of guilt and depravity, for to even flick my eyes in his direction would be instantly noticeable by him and by the repulsive freak-show zealots filing eagerly through with me, with whom I do not want to be identified in the least way.

And so, embarrassed, I refrain from examining the World's Fattest Man's belly button as I had anticipated doing, to see if it is really like the one in the illustration outside which resembles the opening to a dark cave. I avert my attention from the folds of his breasts, the magnitude of his thighs. I keep my eyes bolt forward, my breath shallow, and my expression polite, with a hint of lightheartedness, as though it were all just a lark that I am there at all--as though I only bumped in by accident and am not the least bit interested in the World's Fattest *Anything*--much less *Man*--as though I have no intention of actually *staring* at him--as though I have no intention of fastening my greedy little eyes on his ample carcass, like some vulture preying on the carrion of humanity, like a nail in the coffin of this man's humiliation.

One day I'm galloping my horse through the woods with my head thrown back, watching the branches sway and swerve like dark tentacles against a blue sea of sky, and the next I'm laying down money to see a fat man watch T.V. in a box.

6. Glory

One night last summer, I sat with a friend on the granite edge of a pond in the Bitterroot mountains, cloaked in the light of a full moon. The moon shone down like a siren, its noisy light splashing in white patches on the black water. The patches of light were narrow and long, falling over the pond like javelins of light. There was a puff of wind, and we watched as the patches bulged out at the sides, broke apart and belly-danced towards us. My friend observed that we were lucky to be sitting where we were, with the moonlight pointing straight to us over the water.

"I think that no matter where we sat the light would point to us," I said.

"That's impossible," Christian said.

So we conducted an experiment. While I remained in our spot, she rose and trotted up the granite beach. Eighty feet away, she stopped to report that she was right and I was wrong: the light had shifted away from where I was sitting and *coincidentally* happened to be shining up her way now. I sat in place and laughed. Surprised, she began walking back and forth, watching the light slide over the water, following her as she moved across the rock.

I said, "Isn't it nice to know that wherever you go the moon points to you?"

I remember knowing this, but I don't remember ever learning that it was so. What I recall is being a child in the cold nights of a northern summer, crossing Whitetail Lake from the mainland to our island. I remember sitting crouched against the cold on the plank seat of the ten-horse, in the too-big-for-me life preserver my mother made me wear, peering over the rough

orange canvas that bulged around my neck to watch the tail of the moon race over the water with me--a glittering icicle of light that always pierced the boat exactly at my body.

And above, the blue-black sky was strewn with a riot of stars--more stars than I imagined possible. When I stared round-eyed up into that northern night sky, I felt the stars pull me up towards them with spidery threads of something clear and mysterious, something like immense kindness, but also immense dispassion. It was almost grace--or mercy. I couldn't name it then, and I still can't, except to say that it reminds me of some words I once heard spoken by a physicist trying to explain to an audience of non-physicists some big concepts about how the universe works. What he said was, "Eternity is now."

Eternity was back then, too. Making snow angels at night with my little brother, I glimpsed it. Bound up in snowsuits, we had run out into the front yard late after a heavy snow. The sky had cleared; a warmer wind had started to blow. We jumped to a spot deep in the drifts, lay down, flapped our arms and legs vigorously, and then carefully rose and leapt back out of the depression, so as not to leave any footprints that might connect our angels to this world. We did this over and over, until there was a whole choir of angels in the yard. The light of the moon bent through the vapor that curled up from the snow angels, splintering into colors that glittered darkly on the snow. Standing there looking at the angels, something inside of me rose, leapt from the dry grasses of daily existence, crashed upwards into the light of my round, moonlit eyes. The angels on the snow quivered and sang, while the live thing inside of me hovered there for a few moments in the light of my eyes, then took a few short hops and lay back down again. A snowplow

lumbered up the street; neighbors began straggling out of their houses pulling shovels.

But in my soul, I can hear those angels sing. I can see those smoldering colors.

The Discoveries of Hawaii

I

Amongst the articles which they brought to barter this day, we could not help taking notice of a particular sort of cloak and cap. . . . The ground of them is a network upon which the most beautiful red and yellow feathers are so closely fixed that the surface might be compared to the thickest and richest velvet . . . and we found that they were in high estimation with their owners; for they would not at first part with one of them for anything that we offered, asking no less a price than a musket. However, some were afterward purchased for very large nails.

*--Captain James Cook, The Discovery
of the Hawaiian Islands.*

The year is 1778. Captain James Cook, an explorer for the British crown, has landed his two ships, the *Resolution* and the *Discovery*, at the mouth of the Waimea River, where it passes from the island of Kauai into the Pacific Ocean. The place where river water meets seawater is murky, reddish brown, the color of red clay. A rank smell rises off the water, the smell of rotting fish and salt and sour fruit. Long strings of seaweed covered in yellow slime float

like sallow hair on the muddy waves; pieces of driftwood knock against the hulls of the two ships. The rats in the ships' holds stir at the scent of land.

Four miles out from shore, whales are spied breaching in the morning sun.

It is Captain Cook's third voyage to the Pacific. He is roughly 2,100 miles from the edge of North America, 2,400 miles from the edge of Asia. He gives these islands that he has discovered this day in January--a Sunday in January--a name: he names these islands, the Sandwich Islands. This after the Earl of Sandwich, First Lord of the British Admiralty. Which is very much as it should be, though it ought to be noted that the islands do not at all resemble the Earl of Sandwich--in either appearance or habit--for the Earl of Sandwich is a large, bulky man, going to fat, with a purplish nose and a propensity to drink two fingers of whiskey with breakfast, and the islands are altogether different. This is what the islands look like:

Smooth, green mountains, a tangle of koa, ohia, palm, and sandalwood trees, jungle, swamp, and high, scrub desert, beaches of white sand, of black sand, of black rock, red dirt cliffs falling away into blue water, trees hung with fruit, or flowers, and everywhere, the birds: at sea, tropicbird, frigatebird, shearwater, noddy, and tern; on inland ponds and swamps, heron, goose, and stilt; over fields and in forests, hawk, owl, thrush, flycatcher, honeyeater, and honeycreeper. The sun is strong. When the wind blows, there is a clatter of heavy-leafed foliage.

Years later, the name of these islands will be changed back to Hawaii.

Of course, when Cook and his men go ashore, the island people who live in the village of Waimea, there at the mouth of the Waimea River--people who have never, to Cook's and his crew's knowledge, clapped eyes on

an Englishman before--these people believe the sailors to be great chiefs, or perhaps even gods, and they believe Cook himself to be a great god--their highest god?--whom they call Lono.

Of course, the people prostrate themselves.

Cook notes with careful precision that the people, who are uniformly brown in the cast of their color, show a considerable variation in their features. Some have visages that could pass for European, while others are coarsely made. All appear to be stout. As for the females, their size, color, and features do not differ much from those of the men, and though their countenances are remarkably open and agreeable, there are few traces of delicacy to be seen--either in their faces or other proportions.

Later that same day, the twentieth of January, the people of the island trade with the sailors. The sailors procure nine tons of water, eighty pigs, as well as a quantity of chickens, sweet potatoes, plantains and taro roots. In exchange, the sailors give the islanders a few nails and some pieces of iron.

Cook notes in his journal that the people have some primitive notion of *bartering*. Or it might be, he writes, more of a notion of *gift-giving*. Bartering or gift-giving, gift-giving or bartering: whichever it is, Cook is pleased with the exchange.

They seem to live very sociably in their intercourse with one another, and, except the propensity to thieving, which seem innate in most of the people we have visited in this ocean, they were exceedingly friendly to us.

Cook records, with some reluctance (for he does not like to dwell on such things, does not like to appear impolite towards his hosts), that when invited on board ship, the people endeavor to steal nearly everything they

come across. Cook and his crew are forced--again, reluctantly--to keep a watchful eye over them.

Among the items stolen are: a butcher's cleaver, a pair of tongs, the lid of a harness cask.

II

The year is 1994, two hundred and sixteen years after Captain Cook landed at the mouth of the Waimea River. My family and I have landed at the Lihue airport, also on the island of Kauai. My mother and two brothers and I wait on wooden benches outside the terminal while my father goes to procure for us a rental car. The breeze lifts the hair from our necks and sets it back down again. The air is fragrant with red hibiscus flowers and pots of wisteria and avenues of bougainvillea, mingling with thick plumes of plane exhaust.

It is our first voyage to the Pacific. We notice three things: the sun is strong; when the wind blows, there is a clatter of heavy-leafed foliage; the people do not prostrate themselves.

Nor do they mistake us for great chiefs, or gods. Nor do they mistake my father, as he makes his way to the rental car office, for their highest god, whom they once called Lono.

While we wait upon the benches, we give these islands that we have discovered this second day of February, a Tuesday in February, a name: we name these islands, the Annabelle Islands. This after my cat, Annabelle, who

is brown and grey and white with long fur, an abundance of fat, and an affect of extreme disdain.

Soon my father drives up in a Chevy Cavalier, which he has leased for some dollars. On our way to the rented vacation house, which is located at the mouth of the Waimea River, on land that used to be a village, and was afterward converted by the English into a sugar plantation, and later into a tourist resort, we stop to procure groceries, which were purchased for very large dollars.

I notice that the check-out clerks, all of whom appear to be of European descent, show a considerable variation in their features. The bag boy, who is from California, has not a trace of delicacy about him.

III

The order not to permit the crews of the boats to go on shore was issued that I might do everything in my power to prevent the importation of a fatal disease into this island, which I knew some of our men labored under, and which, unfortunately, had been already communicated by us to other islands in these seas.

Yes, Captain Cook, these things are unfortunate. But they cannot be helped. You did your best, Captain Cook. You issued an order, you did everything in your power. You held back your men--at least, the majority of your men--for at least the first several days of your visit. You even went so far as to limit the shipboard visits of the islanders to a few hours per visit. You

attempted to keep the women away. And who is to say, Captain Cook, that the decline in the population of the Hawaiian people from an estimated 600,000 in the year of your first landing, 1778, to an estimated 100,000 thirty years later--a decline that has been attributed largely to the introduction of exotic disease--was in any way your fault? How were you to know that the diseases you carried on board your ship, which you had seen kill people on other Pacific islands in your voyages, would kill these, the people of the Sandwich Islands, as well?

You tried, Captain Cook. But there is too much trading to be done, and too much procuring. In an attempt to facilitate the procurement of fine goods, your men offer the islanders beads, which the ships carry in large supply for this purpose. Upon discovering the beads cannot be eaten (they are intended to be hung from the ears), the people return them as useless.

Your men offer the islanders a looking glass, which is returned for the same reason.

Your men sample poi, a staple food of the islands, which is made from the root of the taro, pounded and mashed to a sticky, white paste. The men declare poi to taste terrible. They find, however, that the addition of milk and sugar renders poi very palatable; indeed, it is said to have the flavor of gooseberry fool.

About noon Mr. Williamson came back and reported that he had . . . attempted to land . . . but was prevented by the natives, who, coming down to the boats in great numbers, attempted to take away the oars, muskets, and, in short, everything that they could lay hold of; and pressed so thick upon him that he was obliged to fire, by which one man was killed. But this unhappy circumstance I did not know till after we had left the island, so that all my measures were directed as if nothing of the kind had happened.

Captain Cook again. A voyage such as his is bound to involve some unhappy circumstances, and it is often true that these unhappy circumstances are not known till much later, and it is often true that all of our measures are directed as if nothing of the kind had happened.

IV

The gift shop at Kokee State Park sells tee shirts with pictures of birds that are native to the islands: the *Pueo*, or Hawaiian owl, its hawk-like body topped by an absurdly large head fluffed with feathers and inset with enormous yellow eyes like moons; the *'I'iwi*, a sparrow-sized honeycreeper with a long, orange, sickle-shaped bill and plumage the color of a not quite ripe tomato; the *'Apapane*, a crimson honeycreeper that feeds on the nectar of the red blossoms of the ohia tree, and travels in large flocks that whistle, laugh, and cluck, mimicking the other birds of the forest; the yellow *'Akepa*, its green beak twisted over itself for opening nuts; the pert *'Elepaio*, dressed in feathers of rufous, buff, and black, like a calico cat. We walk in the canyon; we walk in the rainforest; we see these birds, though we do not attempt to procure them, nor do we procure the tee shirts that feature their portraits printed on pastel cotton fabrics. We read in a book that the *'Elepaio* sews its small nests together with spider web. We see spiders in the forest as big as saucers, hanging in taut webs they have spun twelve feet wide between koa trees. We do not attempt to procure the spiders. The spiders are uniformly

black in the cast of their color, and show a considerable variation in their features. Some have visages that could pass for European.

There are many traces of delicacy to be seen.

There are wild canyons, and smooth, meandering creeks, wet forests full of creeping plants and birds and trees weeping with green leaves, and there are valleys of deep grass whose steep walls are a tangle of streaming vines. There are black lava grottos with waterfalls pouring down into pools, and there are high bluffs of red dirt, and beaches where waves roll in, breaking arched and frilly and white upon the white sand.

Down in the village, it is a different story. Down in the village, there is much trading to be done, and much procuring. We go to procure ice cream; we find that ice cream is in high estimation with its owners, for they would not at first part with it for anything that we offered, asking no less a price than three dollars and fifty cents. (Money and muskets, muskets and money--it is all the same.) However, some ice cream was afterwards purchased elsewhere in the village, for a few pennies less.

V

The year is 1779; the day, February the fourteenth. A Sunday. Captain Cook has returned for his second visit to the Sandwich Islands, this time landing in Kealakekua Bay on the island of Hawaii. The circumstances of his death are unclear, there being many accounts of the incident, but one eye witness, a man who was Cook's first lieutenant on board the *Discovery*, a

man named James Burney, has recorded the details rather meticulously in his journal. This is what James Burney writes:

Sunday, 14th. At daylight our great cutter, which had been moored to the buoy of the small bower anchor, was missing, and on examining, the rope which fastened her was found to have been cut. This theft was the more easily committed as the boat was left full of water to preserve her from the sun, making the upper part of her gunwale even with the water's edge. Captain Clerke having informed Captain Cook of this, orders were given for our launch and small cutter to go armed to the south point of the bay and prevent any of the sailing canoes going out, but not to molest the small ones.

It should be noted that by this point in Cook's voyage, tempers are running high. For the theft of the cutter on this particular day--St. Valentine's Day--came after a number of petty thefts on the preceding days--a chisel was stolen, and twice the same pair of unlucky tongs was snatched away--and though these items were recovered, and though the people of the island were shot at with muskets, severely flogged, and kept in irons, the Englishmen are weary of this foolishness. They are weary of these people, who play mischievous tricks and throw stones and make the occasional insolent comment. For insolence is not to be tolerated--insolence and stone-throwing. It is extremely tiresome; not even the strictest campaign of shooting, flogging, and keeping in irons will cure these people of their insolence. Now the cutter is missing. What is to be done?

They must be taught a lesson. Cook must teach them a lesson. Cook and his men--eleven of his men--row ashore, in a pinnace, landing upon the slippery shelves of black lava rock that line Kealakekua Bay, to teach the

people a lesson, to cure them, once and for all, of their insolence. Their plan is this:

Cook will lure an old chief, in the name of friendliness and good will, back to his ship where it is anchored in the bay. There, the old chief will be severely beaten. It is a clever plan, but there is a hitch: the people, who have gathered to watch as their old chief is led by the Englishmen towards the pinnace that is tied at the shore--these people suspect that there is more at work here than friendliness and good will, and they begin to cry.

This, for Cook, is simply the limit. James Burney again:

This, for Cook, is simply the limit. James Burney again:

The old chief was immediately taken away and no more seen. Captain Cook likewise was about to give orders for embarking, when he was provoked by the insolence of a man armed with a thick mat and a long spike, at whom he fired with small shot, which neither penetrated the mat nor frightened the Indians as was expected . . . Two or three stones were then thrown and one of the marines knocked down. Captain Cook, who had a double-barreled gun, immediately fired with ball. The sergeant said he had shot the wrong man, on which he told the sergeant to shoot the right.

There is a great scuffle, and great confusion all around. There are insolent shouts and flying stones, a surge of uniformly brown people, and there is musket fire--Cook has shouted the order to fire--the firing comes from the muskets of the eleven Englishmen on land, and from English launches offshore. The cannons take up firing from the ships anchored out in the bay. Cook calls out to take to the boats, he turns and runs for the pinnace. But the black lava rock at the edge of the beach is uneven and slippery, the slick rock is covered with seawater and a pale yellow slime; Cook slips upon it and receives--in the same instant--a blow on the head and a stab with a spike

in the neck, which throws him into the water--an unfortunate turn, as Captain Cook, explorer for the British crown, is no swimmer. He is dragged from the water and he is stabbed and he is beaten; in short, he is killed. The implements used to kill him are these: a few nails, some pieces of iron.

Four other sailors are killed.

Seventy islanders are killed by musket ball and cannon ball.

That night, the people of the island slice the flesh from Cook's bones and burn it in a gesture of highest honor. His heart they hang on a line to dry, also in a gesture of highest honor.

The next day, a Monday, an old man who lives in the village at Kealakekua Bay steals the heart of Captain Cook, where it hangs on the line to dry. The old man roasts and eats the heart of Captain Cook, mistaking it for the heart of a pig.

VI

I am a trespasser on these shores.

We do not always seem to live very sociably with one another. The propensity to thieving seems to be innate in many of us. We are not always exceedingly friendly.

When invited onto distant shores, our people so often endeavor to steal nearly everything they come across.

Among the items stolen are: an island, an archipelago, several continents, a great number of lives.

All of our measures must be directed as if something of the kind had happened.

On a clear morning, standing at the mouth of the Waimea River, where it passes from the island of Kauai into the Pacific Ocean, whales can sometimes be spied, four miles out from shore. They flip their tails and breach in the morning sun.

The earth is not so round that we cannot see their tails curling out of the surface of the sea. It is not so round that we cannot see the spray from their blowholes hanging above them like white flowers, blooming and fading, blooming and fading, again and again.

The Butterfly Effect

The Story

Some time ago, an article appeared in the local paper that told the story of a troubled polar bear who lives in the Calgary Zoo. Snowball, the name given the bear by zookeepers, recently had been diagnosed as chronically depressed, the major symptom being her so-called neurotic predilection for pacing back and forth in her cage. To treat Snowball's affliction, zoo veterinarians prescribed the mood-altering drug Prozac, which they are pleased to announce has resulted in a dramatic reduction in her pacing. Zoo veterinarians have also launched a program of environmental enrichment for the polar bear, which consists of feeding her fishsicles--fish frozen in blocks of ice--to help her better cope with her problems. The use of fishsicles is designed to be a simulation of the natural circumstances under which Snowball might find herself, foraging for food in the wide, light, sloping regions of the arctic, rather than in a cage in the Calgary Zoo.

The article did not report whether or not the fishsicles were working.

There are two things I know for sure: I shall always be happy and I shall always be unhappy. A friend of mine who works as a wellness counselor tells me that when one employs words like "always" and "never," one is slipping backwards into the momentous perspective of a child, where each second signifies the whole of experience. Therefore, when one feels joy, one believes oneself fortunate enough to be living a life of *eternal joyfulness*, and when one feels pain, one is sure that one shall *never feel happiness again*. Her words bring me comfort, because I often find myself mistaking emotions for life sentences, and because she has an abiding faith that things are just as they ought to be, we are all where we need to be, and everything will work out in the end. But I sometimes wonder when I look into her eyes, do I see fishsicles?

I came to Montana in 1992 to enter graduate school in environmental studies. I believed that Montana was an unspoiled place. I believed that I would study all aspects of environmental issues--science, policy, history, economics, ethics--and then write for nature magazines. For example, I was excited about the prospect of writing articles on bighorn sheep. I knew a little about bighorn sheep before I came to Montana, but I wanted to know so much more. What I wanted was to write about bighorn sheep from a place of knowing. The future of bighorn sheep seemed to hinge on wide public access to thoughtful articles concerning their special needs and challenges.

What I discovered, over the course of two years of graduate school, was that I was wrong about a lot of things--the West, the issues, the articles, even

the sheep. Behind every mountain ridge is a clearcut; surrounding every mine, a biological graveyard. The rivers run with silt and poisons, or are clogged with dams; the air makes everyone sick; the wildlife are so close you can shoot them. And the special challenge for bighorn sheep is not only that they are being wiped out by loss of habitat, which they are, or by disease and parasites transmitted by domestic sheep, which they are, or by competition for forage from livestock, which they are, or by hunting, which they are. The problem for bighorn sheep is that we are telling the same stories about them, the wrong stories. Stories that don't work.

The Theory

According to modern mathematicians, a system of equations has three possible outcomes. The first outcome, Period One, is a steady state, arising when the cycles and oscillations that naturally occur in a system of equations eventually converge on one value--showing up as a straight line on a page. The second outcome, Period Two, is a periodic repetition of states, whereby the system converges on two or more values, regularly alternating between them, in an even zigzag. Period Three is the most interesting state, and the most complex. In Period Three, the data jump desultorily about the page, never converging on a pattern. Period Three never repeats itself, yet never goes off the page; it stays within certain boundaries--order inside of randomness. Period Three implies chaos.

The Characters

The Marquis Pierre Simon de Laplace, an eighteenth-century French philosopher-mathematician, believed that if you could figure out all the laws that governed the physical world, then the future would no longer be uncertain; it would be as evident as the past. This seems ridiculous, and yet much of how science is done today--in biology, ecology, medicine, economics--has accepted the notion as truth: When we know all the rules, we will be able to predict the outcome; it is only a matter of fine-tuning the laws; it is only a matter of time, and of progress.

Chaos theorists call this notion the Laplacian Fantasy of Deterministic Predictability. Chaos theorists say that the Laplacian Fantasy is over.

Some ideas die hard.

One morning two summers ago, I awoke at six-thirty to water droplets shooting through my open window and dappling my bedclothes. The pink Cadillac was parked at the curb and old Mr. Johnson, the landlord, could be glimpsed lumbering around, pulling hoses and turning the faucets up, up, up. It was August in Montana, the driest month in a dry land, and our lawn looked like something out of the depths of the rainforest. I went outside to tell Mr. Johnson the sprinkler was watering my bedclothes and we promptly got into an argument. I did not want to argue, I said; I wanted him to stop sprinkling my bedroom. Mr. Johnson shouted at me:

"You girls never water the lawn! I work twelve-hour days and I have to come over here every day and water the lawn!"

"Mr. Johnson, I assure you, we *do* water the lawn, we water the lawn three times a week," I insisted. "We are very good about watering the lawn. We are *very* responsible." I smiled brightly, but Mr. Johnson looked as though he might strike me.

Mr. Johnson is a man who believes that the world would like nothing better than to dry up his Kentucky bluegrass. He is tall--more than a foot taller than I--and his head is large and long and thick, the shape of a tall stump. The flesh on his face is the color of uncooked sausage: grayish pink, mottled, stuffed into its casing. His jowls are two drooping ringlets of flesh that hang low. Whenever we have a problem in the house--the toilet won't flush, the kitchen ceiling is leaking, the garden spigot won't shut off--Mr. Johnson comes to "fix" it, which means that Mr. Johnson comes to glare at the toilet, the ceiling, the spigot, and then to scold us: *What have we been putting down the toilet? How have we caused the kitchen ceiling to leak? Why were we using the garden spigot?* When he scolds, his jowls quiver like cheesecloth sacks filled with jelly.

"The lawn is being over-watered, Mr. Johnson," I said. "There are mushrooms growing on it."

"Of course there are!" he shouted.

There was a pause between us. "It is August in Montana," I pointed out. He stared at me blankly. "When it is August in a semi-arid environment," I said, "there shouldn't be mushrooms growing on the lawns."

But Mr. Johnson was seeking, with Laplacian doggedness, to manage his lawns in a steady state (Period One), wherein the cycles and oscillations

that naturally occur in a lawn eventually converge on one value: shamrock green.

“Do you see those dry patches?” Mr. Johnson gestured towards a strip of grass that was a paler shade of green than the rest of the lush carpet. “You don’t see dry patches like that on our lawn!”

Mr. Johnson apparently had said what he needed to say, for he got into the pink Cadillac and stormed away, off to his twelve-hour-a-day job, I presumed. I turned off the sprinkler, went into the house and lay down on the bed. I pushed my eyes shut, as though there were any possibility of sleeping. Then I decided I would start sobbing. I would start sobbing because in my life, Mr. Johnson was everywhere I looked. He was the person in power and I, who had little-to-no power, lay on my bed while he ran the sprinklers all day and all night. Mr. Johnson sprayed poisons on the wildflowers, Mr. Johnson cut down the forests, Mr. Johnson subdivided the land, built the strip malls. Mr. Johnson mined the hills and mountains, diverted the streams, dammed the rivers, and dumped garbage into the oceans. I will start sobbing, I will start sobbing. Mr. Johnson sprinkled me, and soon mushrooms would be growing on my bed.

Mr. Johnson, there are mushrooms growing on my bed.

Of course there are!

The desire for revenge was strong. I liked to imagine doing terrible things to Mr. Johnson. I liked to imagine watering him to death.

Mr. Johnson, if you lie there, in that spot, while I water you to death, there will be a dry patch underneath you. Please move.

I am not normally given to violence, or to violent imaginings.

Mr. Johnson! You have mushrooms growing on you!

No response.

The Theory

I am thinking about chaos lately, and its implications in my life.

Chaos theorists are obsessed with scale. They are especially interested in how small scales intertwine with large. They say there is a hidden order to scales of all sizes. This can be illustrated with the story of Horton, the elephant, who works himself up to a magnificent sneeze over a speck of dust that has travelled up his nose. Imagine Horton's surprise when a tinny voice rises from that dust speck, begging him to withhold his sneeze, for the speck of dust is, in fact, a planet populated by creatures that call themselves Whos. The notion of a hidden order in the intertwining of small scales with large is essentially the notion that, in one direction, there stretches an infinite number of smaller and smaller dust-speck planets, and in the other direction, an infinite number of larger and larger noses. This is known as the Principle of Self-similarity.

The Principle of Self-similarity is symmetry across scale--pattern inside of pattern inside of pattern. Self-similarity looks at how the edges of continents resemble the edges of bays and peninsulas, which resemble the edges of coves and beaches, which resemble the edges of pebbles and sand, which resemble the edges of molecules and atoms that make up the

coastlines. All these edges are irregular; the degree of irregularity is always the same. They even have a number for it. The number is 4.669.

I have a word for the chaos I see all around me. The word is, *b-a-d, b-a-d, b-a-d*.

The Problem

These are the ways in which I am gradually ceasing to be devout: I no longer wash out all plastic containers and reuse them; I seldom read nature magazines anymore; when listening to an acquaintance speak about an environmental issue, my eyes inadvertently glaze over. These are the ways in which I am failing: I sometimes purchase highly processed, heavily packaged, non-organic food products, such as HoHos; I no longer feel hideously guilty about driving a car, or going on vacations to tropical islands with my family, or shopping at BiLo. I admit to liking horse and hound scenes. I occasionally use--and throw away--paper towels; I like to read gossip magazines and I like very much, at times *inordinately* much, to watch T.V.

This is my confession.

Of all the weighty and enigmatic traditions of my Catholic girlhood, confession was far and away the least troubling. Perhaps, in part, because I went only once, at the age of ten. I remember I did not use the confessional--a somber box hung with dark red curtains so that it resembled a cloaked and ominous outhouse, but engaged in what the clergy called an "open confession," which meant that the priest sat on a stool at the edge of the alter

and people filed up one by one and chatted with him about their sins while a band strummed folk songs off in the wing. The confession itself was exhilarating: I had sinned, I confessed my sin, I was forgiven. What could be tidier! I walked away from the alter feeling as though I had been given a fresh start.

This is my confession: there are days when all I want is to go to England. I want to have tea and scones in the garden at four o'clock, and walk in fancy shoes through green, green grass dripping with rain, not caring that my shoes will crack and buckle from the drops that cling to the thin, fine leather. I'll buy more.

Why do I long for such things? I have no patience now with being poor and caring about social and environmental causes. I want to be a character in a nineteenth century English novel, dressed in dark velvet the color of the midnight sky with cream lace at the collar.

I long for cream lace.

This is not so tidy. There seem to be no fresh starts.

I read about the complex and myriad ways we are sealing our doom on earth, with overpopulation and global climate change and escalating violence and chemical pollutants and habitat destruction and hunting and species extinctions and war, and I dream about wearing dark velvet that falls to my ankles, its hem whispering over the wet grass, gathering beads of rain. I read about the oppression of women and nature, and I ponder the pros and cons of changing my hairstyle; I turn my Irish ring around on my finger to signal that I am willing to entertain suitors. But I must say quickly that I am not so very unhappy--that would be untrue, not to mention ungrateful. When you are an American, you must never be ungrateful.

I spoke with my mother over the telephone on a day when I was feeling a little down. She said when she feels bad she thinks about other people who have it worse than she has, and this makes her feel better. After we hung up I made a list.

1. Starving people in Somalia
2. Massacred people in Rwanda
3. Tortured people in Bosnia
4. Poisoned and maimed people in Bhopal
5. Same for Chernobyl
6. Anyone in the Third World who makes less than four dollars a day
7. Cripples.

I fell from grace in the Catholic church when I turned sixteen, the age at which my mother told us we could choose whether we wanted to continue to attend mass. We chose not to. To our surprise, so did she.

I began to fall from grace in my life three years ago. The speed at which I fell was directly proportional to the number of ecological disasters which occurred each month, inversely proportional to the number of people who live free of poverty and violence, a function of climate. The climate from my window appeared to be both hostile and warming.

The Characters

At the beginning of my senior year in high school, my English teacher commanded us to write a paper. As a testament to the shoddiness of the public education that was foisted upon my classmates and I, this paper was the first that we had been asked to write in our twelve years of schooling. Needless to say, we were outraged. This was sure to take a big bite out of our television viewing schedules. There was also the problem that none of us had the faintest idea *how* to write a paper. Our teacher, Miss Biddle, remained unimpressed by the thirty-odd faces gazing up at her, awash in shock. Miss Biddle sported a withered left arm, the result of polio at what can only have been an extremely youthful age, judging from the tininess of the arm, which resembled a plucked chicken wing. She had the habit, when she wanted to make an emphatic point, of swinging her withered arm into her chest where she hooked it with her good arm and folded it tight. "Three to five pages," said Miss Biddle. She swung the chicken wing through the air and hooked it tight. "By Friday."

The topic of the paper was *Lord Jim*. *Lord Jim* is a book of complex and wrenching themes, all of which I figured I would understand when I was a great deal older. At the time, *Lord Jim* seemed to me to be an inexplicably wordy treatise on boats and Africa. I could not fathom what was the matter with Jim--he seemed to suffer such unremitting torment, and for what? There was something about abandoning ship, leaving the passengers to perish--only they didn't perish, they were rescued and Jim fled in shame. I couldn't see what all the fuss was about. I would have done the same thing as Jim, and not felt nearly so terrible about it. It certainly wouldn't have ruined

my life. And who was this Marlowe? A shiftless busybody, always poking around in Jim's business. What was I going to write?

I went to my father for help. My father had been an English major at Princeton. He wrote his thesis on *Moby Dick*--specifically on why the whale is white. This was clearly the man to unravel for me the mysteries of literary symbolism and critique.

There was, however, a problem. My father, you see, is an abstract thinker. Which isn't necessarily a problem except that he is also a hierarchical thinker, and abstract thought is at the top of the list. The difference between one who engages in abstract thought and one who engages in narrative thought can be demonstrated using the example of Kant and his famous "categorical imperative." An abstract thinker would understand that Kant's categorical imperative refers to an absolute and universally binding moral law, something like a human construction of gravity, or even chaos. When a narrative thinker ponders the meaning of "categorical imperative," the results may be quite different. A narrative thinker might think of real things that are imperative to the thinker herself--the blue of the sky at dusk, the shapes of leaves, bodies of water--and their various categories.

Imperative: dresses.

Category: midnight velvet.

My father advised me to come up with a thesis statement. "Think about the themes, here," he said. "What is it that Jim is troubled with?"

I said he felt bad about leaving his boat.

"He's caught between his own youthful idealism about noble actions and the harsh realities of the world he finds himself in," said my father.

"Your thesis statement might be, 'Youth is a time of opposites.'"

Youth is a time of opposites! Of course!

Begin with an introduction, my father said. In the introduction, make your thesis statement. Then write three paragraphs to back up your thesis statement, followed by a conclusion where you restate the thesis statement.

Like so:

Hello. How are you? Youth is a time of opposites.
 When you are young, you are both fearless and timid.
 The world seems glorious and full of possibilities one moment, terrible and
 hopeless the next.
 Actions seem absolutely right, or absolutely wrong.
 Yes, youth is indeed a time of opposites. The end.

I trusted my father. What I didn't trust was my own heart, which was feeling hedgy about the book, and unsure of the connections between my father's analysis and the text. I could have gone to Miss Biddle and told her the truth, which was that I couldn't write a paper about a book I didn't understand, but the truth seemed of little consequence when one was trying to discover rules of conduct, which seemed at once absolutely arbitrary and absolutely strict. So I determined to write a paper that drove home the themes my father spoke of, and I pored over the book and picked out quotes I felt would solidly and indisputably back up my father's thesis statement.

Miss Biddle, however, was a reader of extreme acuity and was not the least bit fooled by my glib and authoritative air. I received a C on the paper, and the lesson I was to learn from that experience didn't come till years later--didn't fully arrive to me, in fact, until I stopped writing and stopped thinking

and stopped feeling according to the rules. When the rules finally stopped working, I understood the lesson Miss Biddle was trying to teach me that many years ago, which was that no amount of faith, work, and good intentions can make up for a lack of conviction.

In January of that year, I suffered a bad fall from my horse which landed me in the hospital. One day, several teachers from my school came by for a visit, among them Miss Biddle. Miss Biddle smiled sadly down on me where I lay crushed and swollen almost beyond recognition in the hospital bed. She had brought chocolates. When it was time for the teachers to leave, Miss Biddle continued to smile sadly and then, in a gesture of exquisite gentleness, she leaned forward and, with her one good hand, touched my hair on the pillow.

It was the only part of me that didn't hurt.

Cycles and Oscillations

I am given to passion; I am given to extremes.

When an old boyfriend and I broke up some years ago, I went into a temporary decline. My journal entry for the date of the break-up reads:

Everything bad that has happened to me in my life is here with me now, and I will never get over any of it. And I don't even want to try to feel better because feeling better is only a trick that makes you think that everything will be okay and you will live to feel happiness again when really the cold truth is you will only live to feel unhappiness again. So what is the point? Why not step in front of a bus? Because it doesn't matter who is hurting you or why. What matters is the familiar pain, and not being able to stand it anymore, no matter how hard you try to get over everything.

The problem with sustaining this sense of tragedy, futility, and despair, is that one invariably develops an itch between the shoulder blades. It is always an itch that is difficult to reach, and, in fact, it seems utterly pointless to reach it, considering one's frame of mind. Yet it is so very itchy; it will not be denied.

In the early 1960s, a Polish mathematician named Benoit Mandelbrot was looking at background noise in telephone lines. The telephone lines he was studying were those used to transmit information from computer to computer. Engineers were seeking, unsuccessfully, to eliminate noise--background disturbances in the telephone lines which caused communication errors, and which they supposed were the result of local, specific problems in the lines. What Mandelbrot found was that there *were* no local, specific problems. Noise was inevitable. Noise occurred in a random fashion, but it also tended to come in clusters: that is, periods of errorless communication would be followed by periods of errors. Rather than seeking to eliminate noise, Mandelbrot believed engineers should accept it as a natural part of the life of telephone lines. Rather than trying to control errors, engineers should simply deal with them as they came up.

According to Mandelbrot, chaos and stability are not mutually exclusive. Chaos is stable; it is structured. It shows evidence of cycles and oscillations, though its peculiar type of cycles and oscillations never exactly repeat themselves. Mandelbrot classified the variation in terms of two kinds of effects: the Noah Effect and the Joseph Effect.

The Noah Effect signifies discontinuity: when a quantity changes, it can change arbitrarily fast. The Joseph Effect means persistence. Floods and

droughts, for example, persist. Despite an underlying randomness, the longer a place has suffered drought, the likelier it is to suffer more. The Noah and Joseph Effects push in different directions, but they add up to this: Trends in nature are real, but they can vanish as quickly as they appear.

The Noah Effect

A year ago, our landlord, Mr. Johnson, decided to upgrade our front stoop with the addition of a railing, built of various lengths of white, plastic plumbing pipe screwed together with white, plastic joints and cemented shallowly into place along the edges of the stoop. It is impossible to say what Mr. Johnson's motives were. If Mr. Johnson intended for the railing to improve the safety of the stoop, he was badly mistaken about the sturdiness of the installation, for the pipe could be pushed over with but the slightest pressure of wrist and hand. If Mr. Johnson intended to make our house the laughing stock of the neighborhood, he couldn't have chosen a better vehicle than a railing built of sewer pipe. Early one morning, I found Mr. Johnson methodically applying a coat of white paint to the slick white plastic of the new railing. Mr. Johnson was having some trouble because the paint wouldn't stick to the slippery pipe. It was clear that this was testing Mr. Johnson's patience, for when I inquired about the purpose of the railing, he grew furious. "We're making some improvements," he shouted, as though this settled the matter.

One evening, shortly after the railing was completed, my housemate Christian and I sat on the front stoop, surrounded by a bloated web of plumbing pipe. From the apartment above, the music of the upstairs tenant drifted out the window like a smog. As we are wont to do, Christian and I lapsed into a comfortable despair. After a few minutes of this, however, we decided to take action. We would no longer sit idly by while our lives were encroached upon by sewer pipe and bad music. We would act in a forthright manner; we would think about what we needed, and then ask for it. We would be decisive and firm, a case study in assertiveness training. We would call up Mr. Johnson and tell him we needed him to kill the upstairs tenant and then commit suicide.

Instead, we moved.

It was about this time that I signed up for a pottery class at the Lodgepole Pottery, a private studio that advertised classes in the local paper. I imagined the Lodgepole Pottery to be a sprawling studio full of promising ceramic artists busily creating. As it turned out, the Lodgepole Pottery was a tiny, one-room shack crammed full of buckets, bottles, tools, lumber, plaster, boxes, rags, sheets of plastic, paintbrushes, and clay in various shapes and various stages of wet, dry, and fired. Faded newspaper clippings and scribbled notes and maxims littered the walls. A table, covered with more scribbled notes and a jumble of tools, sat in the center of the room; potter's wheels lined the perimeter; an enormous gas heater dominated one corner. The studio couldn't have been more than fifteen feet square; it looked like it might house two people, so long as they were extremely good friends or deeply in love. There were nine of us: a woman of around thirty with bright yellow hair and a triumphant smile, six vivacious high school girls, myself,

and the instructor, a tall, white-haired man in his fifties named George. George had the appearance of one who had lost all zest for teaching years ago.

That first day, I intended to make a salad bowl, and was anxious to get on the pottery wheel. But George spent the first hour giving us a detailed account of the untimely death of his wife, then set out cookie cutters for making Christmas tree ornaments out of clay slabs. The six high school girls threw themselves to the task; I built a cup. George looked distinctly annoyed. The following week, after a distressingly long story by George of the 1947 UFO landing at Roswell, New Mexico, George reluctantly showed us how to throw pots on the wheel. Despite my resolve with the salad bowl, I found working on the wheel to be far more difficult than I had imagined, and I was forced to content myself for nearly a year with the tiniest of bowls and saucers.

Which wasn't so unfortunate as I found the work to be absolutely absorbing, in the way that riding a horse well is absorbing, or dancing, or diving off cliffs. There was centering the clay on the spinning wheel, which took absolute stillness and concentration, and seemed to be as much about feeling centered in the body as about skill and technique. There were days when one did not feel the least bit centered in the body, but one tried hard to pretend that one did, as though the clay could be tricked. This never worked. One always ended up on the verge of shrieking.

The clay was an alligator to be wrestled; the clay was a horse to be strongly and gently collected. When the clay was an alligator, it was good to go outside and sit by the creek and remind oneself that the clay is only a horse in alligator's clothing. It was good to remind oneself never to engage in a fight with the clay; the clay is stronger; the clay will always win. It is made of pungent earth and sweet-smelling water and it will outlast one, even in the

short term. There is the point in the throwing process when one pulls up the sides of the pot--a risky point, for much can go awry. The walls can become an uneven thickness; the walls can wobble and slump; the rim can crack and fling apart. Fortunately, after the two-hundredth or so pot, these problems can be minimized. After the two-hundredth or so pot, a skilled potter can take advantage of clay's earthly qualities: that it is both strong and pliable, that it is capable of dramatically changing its shape and of holding together at one and the same time. It also true that clay improves with faith.

When my nephew, Sam, was young--four and five--he believed firmly in magic. He used to watch me catch bugs and snakes to show him their strange bodies, or part the white petals on begonia flowers to point out their sexual characteristics, or call my horse galloping in from the pasture with a whistle, and he would ask, wide-eyed and staring, "Molly, do you have magic?" The answer always came: "Yes, Sam, I have *lots* of magic." Despite the intended irony, the words never failed to startle; I had forgotten they were true. It is a pity we forget that there is magic in the world; it is a pity that we try so hard to figure everything out. We would do better to gaze wide-eyed and staring at all that surrounds us--the bugs and snakes, the flowers and the horses, the bighorn sheep, the nephew--and to accept the fact--proven again and again, yet so seldom acknowledged, so little believed--that everything, everyone has magic.

The Joseph Effect

My friends at the pottery studio are easily discouraged. When a pot comes back from the firing looking not exactly the way they had in mind, they gnash their teeth and stamp. Here is where they applied the red glaze, and now look: it is brown! Here is where they painted the flower, here--in the center of the plate--and the stain has bubbled horribly; if they eat off of it, they will get brain damage! How many of their friends have they unknowingly poisoned at dinner parties? Why didn't they invite their enemies? And the flower--the flower, even if it had not bubbled, is pitiful! It looks like a bit of wadded-up Kleenex.

For you see, it is not only the wet clay on the wheel that must be coaxed into a state of being. After the thrown form is completed, after trimming off the excess clay and after the first firing, the pot must be glazed, and glazing can be a harrowing experience. It is here that one must take a blank pot and turn it into a work of art, choosing glazes and stains, imagining designs and pictures and stories and patterns, experimenting with different combinations of colors and different applications. It takes an enormous amount of intuition. On good days, intuition is a horse; on bad days, an alligator. You can't imagine how difficult it is to make an alligator jump through a hoop of flames. I can shout and crack the whip; I can jump up and down, dance around, leap through the hoop myself, over and over again, hoping the alligator will get caught up in the mood and follow me unwittingly. But there are days in which the alligator does not budge, the alligator has other plans; the alligator lies on the floor of the studio, smiling wickedly, dreaming of chickens.

George, our ceramics instructor, finds us terribly amusing. For George knows the risks in ceramics--he knows of the many things that can go wrong. George knows when pots are likely to crack or to explode in the kiln, and when they are not, and, moreover, what to do when it happens. He knows at what temperature almost anything can be expected to melt. When his wife's body was cremated, the undertaker informed George that the fire into which his wife was about to be delivered was as hot as the surface of the sun. George told the undertaker that his kiln could easily cremate his wife at only 2,200 degrees Fahrenheit, some eight thousand degrees cooler than the surface of the sun but eight hundred degrees hotter than the undertaker's measly flame.

Like the god of his kingdom, George hordes his knowledge, doles it out sparingly--a pinch here, a handful there. He prefers to tell stories--of the bears that climb his pear trees, of his interesting experiences at strip joints, of famous artists he knew slightly in his youth. George can go on for an entire afternoon about the nutty shenanigans that went on at the last boy scout jamboree. To obtain specific information about ceramics from George, one must practice utter humility, praise his wisdom, beg his mercy. One must refrain from the temptation to jump on him and start pummeling.

The Butterfly Effect

There exists a phenomenon in chaos theory that describes the link between actions and consequences. The phenomenon is called Sensitive Dependence on Initial Conditions. Sensitive Dependence on Initial

Conditions means that tiny differences in input can become huge differences in output. Taking weather as an example, this is the notion that the fluttering wings of a solitary butterfly one fine afternoon in Peking can transform storm systems the following month in New York. For this reason, Sensitive Dependence on Initial Conditions is also called, the Butterfly Effect.

In the early 1960s, a research meteorologist named Edward Lorenz devised a system of three simple, though nonlinear equations. Linear equations are easy; they can be solved. Nonlinear equations cannot be solved, but they can produce information through interacting together. Lorenz was interested in complex behavior. He was also interested in weather. Lorenz contended that the weather showed complex behavior, an unpopular notion among meteorologists of the time, who believed, with Laplacian fervor, that as soon as all the kinks were ironed out, weather forecasting would approach perfect accuracy. Lorenz believed that some things in life could not be predicted, and he sought to prove this with his three nonlinear equations. He plugged numbers into the equations, and made a picture from the data. The picture traced a double spiral in three dimensions, whose lines never overlapped but undulated into infinity; the picture looked like a pair of butterfly wings, slowly fluttering.

The house in which I now live sits on the floodplain of Rattlesnake Creek. It is a tiny cottage built of wood, painted the color of clotted cream and trimmed in pale green the shade of honeydew melon. There is no lawn. There is wild grass that grows tall in thick bunches like fine green hair, and

that flops over from its own weight, also like hair, leaving erratic parts crawling across the ground like the paths of snails. In summer, wild roses grow as high as the tops of the windows, and wild iris, thyme, chamomile, blue cornflower, and white phlox bloom over bare patches of dirt that were once planted with a view towards order and symmetry, but have since reverted to a jungle state. On the west side of the house, a vegetable garden bursts with numerous varieties of largely inedible vegetation, except for a magnificent nest of strawberries that continue to grow at the garden's center, in a slow burn like embers.

On the south side of the house, thick-trunked, arching cottonwoods and ponderosa pines stand eighty feet high. Occasionally, a storm will tear a branch off the cottonwoods and it will slam to the ground. A number of these cottonwood branches have landed in the circle of grass and trees inside of the dirt-road turnaround, called the commons, where the inhabitants of the four tiny houses at the end of this road might communally graze their sheep, if they had any. As it is, the commons is hardly used except by wild animals. There is a bench in the center, for lounging upon in fine weather, which is used almost exclusively by raccoons.

The creek moves by some seventy feet from the front door of my house. On some days, the creek, as they say, flows. Today, however, the creek hurtles. It is early spring, with the ground frozen like a lid over the earth, and a couple feet of snow piled on top, and inches of cold rain coming down on top of that, and miles upon miles of feeder creeks pouring down the mountains that lead into this valley to feed this flow--this hurtle. The ground from the front door of the house to the banks of the creek might be described as faintly slanting: there are perhaps three vertical feet that separate the creek

from the living room. This is not enough to inspire confidence on high-water days. I know the creek will someday enter the house; it is only a question of when. To live in this house is to live on borrowed time, to have faith that the vagaries of nature will work around one, will hold back until one has moved one's life onto higher ground. This forces one into a deep spirituality, a connection to nature founded upon prayers and pleas and thanks. Please don't let the creek flood my house today, please please please please. Thank you.

Then there is the matter of the furnace. The furnace runs on gas. One can see the flames between the cracks in the vents. It does not make one feel entirely safe--these flames, that gush up when the furnace ticks on with a jolt, followed by a noise like a distant explosion. For the furnace is old; the furnace has seen better days; the furnace might be engulfed in flames at any moment. At any moment, it might be necessary to divert the water from the creek into the house to put out the furnace. This is a house that hangs always in the balance between fire and flood.

I have propped up before me on the desk a photograph. The date printed on it's white border is November 1966. The photograph shows me at two-and-a-half, dressed in a red corduroy jumper seated on the floor of our house, my legs jutting straight out, at the end of each a red buckle shoe. I am clasping a large blue picture book which I have opened to the inside cover. My little brother, Thomas, a year old at the time, is toppled over my left leg, his face mashed into the book. Perhaps he is tasting it. I look down upon his

toppled form and read the story aloud to him, as though the page had words on it--as though, at the age of two-and-a-half, I could actually read. My expression is instructive, verging on didactic.

Yes, Thomas, youth is indeed a time of opposites, but you know as well as I do that this--this, right here and now--is not yet the end.