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## **Not Quite Natural: Stories From the Edges of Humanity**

Patrick Walters

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NOT QUITE NATURAL: STORIES FROM THE EDGES OF HUMANITY

A Thesis

Presented for the

Master of Fine Arts

Degree

The University of Memphis

Patrick Walters

December 2010

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## ABSTRACT

This thesis, entitled “Not Quite Natural: Stories From the Edges of Humanity,” is a collection of creative nonfiction essays. It features stories about people who exist on the fringes of the human experience, from a man who infects himself with hookworms in an effort to cure his severe allergies to a woman who discovers a deaf man who has no language. It also features stories about groups of people on the edges of the human experience, including a community that refuses to leave its town, even though a fire is burning a hundred and fifty feet beneath it and a group of World War I soldiers who stage an impromptu truce. All of these stories are based on pieces that aired on *Radiolab*, a public radio program based at WNYC and distributed by National Public Radio.

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## Introduction: Science, Story and the Radio

In March of 2009, I read a brief article in the front matter of *Harper's* magazine. It wasn't even really an article. The magazine reprinted the Frequently Asked Questions section of a website for a company called Worm Therapy—"a business in Mexico that sells worms to treat asthma, allergies asthma, allergies and other autoimmune conditions." When I read about a hookworm being referred to as a "dose," I was intrigued. And at first, my stomach turned a little.

When I read that people were paying more than two grand for one of those doses, I was stunned. Especially given this disclaimer, from the Frequently Asked Questions section reprinted in the magazine: "Question: How do I know if will work? Answer: This is experimental; one of the consequences of a new technology is a degree of uncertainty."

I quickly tracked down the owner of the company, a California entrepreneur named Jasper Lawrence, and got him on the phone. He spent two hours explaining to me the scientific validity of his theory that hookworms do something to dampen the overactive immune responses that lead to autoimmune conditions like asthma. The breadth of his knowledge impressed me. And for a guy who was selling hookworms on the Internet, he seemed shockingly lucid and articulate. His story captivated me.

Before I explain the specific reasons for collecting these particular stories in the manner I've collected them, I want to take a little time to talk about why it is I find them so interesting.

For the past several years, I've been very interested in the relationship between humanity and the rest of the natural world. As an undergraduate at the University of Delaware, I applied to a program that allows a handful of students to concoct a major not

offered by the university, and I created a degree in Environmental Literature. I'd been interested in science and nature since childhood—I spent much of my youth hiking and camping with my father—but my primary curiosity was about the stories that came from that world. I found myself less interested in practicing science than writing about it.

Later, after realizing I didn't want to limit myself to the study of books, I added journalism to the title. I decided to pursue this intellectual interest as a newspaper reporter, hoping that one day I might be able to move into a medium that would allow me to explore the stories and ideas that intrigued me in a longer form. But before I even managed to land a newspaper job, I met Skloot at a journalism conference in Boston, and not long after that she invited me to study with her in Memphis.

Studying with Rebecca at the University of Memphis helped me move toward longer form writing in a big way. I began reading more widely in the field of long-form, creative science journalism, and Rebecca exposed me to a whole new canon of writers, some of whom have become favorites—including Burghard Bilger, Dennis Covington, Alan Burdick and Frederick Kaufman.

Rebecca and I also bonded over an affection for the work of John McPhee, a writer whose books I'd fallen in love with as an undergraduate—especially *The Control of Nature* and *Encounters with the Archdruid*, two of my all-time favorites. McPhee has written about oranges, canoe builders, the New Jersey Pine Barrens, geology and dozens of other subjects, but the reason I find those two particular books so interesting is that they explore the boundaries between human nature and the rest of nature.

*The Control of Nature* features three stories. The first examines efforts by the Army Corps of Engineers to prevent the Mississippi River from taking a new path—the



path that makes geological sense—toward the Gulf of Mexico, in order to save the city of New Orleans from becoming a city without a river. In the second, McPhee travels to Iceland to observe efforts there to prevent a giant wall of lava from pushing the country's most important fishing harbor into the ocean. The third features residents of the mountains above Los Angeles, who refuse to accept the fact that the mountain doesn't want them there, and rely on an elaborate system of retention ponds to protect their homes from a nearly constant barrage of mud and rock slides.

The second, *Encounters With the Archdruid*, is a sort of literary triptych, as well. McPhee profiles David Brower, then head of the Sierra Club, and one of the organizations most militant protectors of wild American landscapes. He does this by traveling with Brower into three of these landscapes—the Glacier Peak Wilderness; Cumberland Island, a wild barrier strip off Georgia; and Glen Canyon, on the Colorado River. To provide some dramatic tension, McPhee brings along Charles Park, a wealthy miner of beautiful mountaintops; Charles Frasier, developer of Hilton Head, and hopeful developer of Cumberland Island; and Floyd Dominy, the government official behind the damming of the Colorado River that flooded Glen Canyon.

The best way to describe what I enjoy and respect about these books, is to use a term from biology. I learned it from my sister, a biologist who studies tiny plants that live on top of mountains. The ones she finds most interesting are the ones who make their home along the tree line. As you walk to the top of a mountain, the trees disappear abruptly, as if they've hit an invisible wall, through which you can pass but they cannot.

Biologists call this spot, where the trees end, an ecotone—a border between two ecosystems. These borders often appear stark—trees below the line, no trees above it. But

if you look at the line itself, you'll often find some of the most interesting and evolutionarily advanced creatures that exist on the mountain.

That's where McPhee conducts most of his best writing. And that's where I'm most interested in doing mine.

Much of Rebecca's book, *The Immortal Life of Henrietta Lacks*, also exists in this space. So do the pieces in this collection. And so too does a piece I spent most of graduate school pursuing, but you will not find here in this manuscript.

I want to mention that piece briefly, because although it is not included here, the work I did on it informs everything that is included.

In my first year in Memphis, searching for a thesis idea, I came across a story about a guy in Tunica—not far down the river—who had built a special boat called the *Asian Carp Eradicator*, and that he'd convened a meeting to combat what he called, “the most dangerous invasive species in America.” The story appeared in the *Tunica Times*, and it included a few lines that made this sound like serious business: “Last week [Harry] Johnson and [John] May held a session with dignitaries: Mississippi Department of Wildlife Fisheries and Parks officials, Tunica Chamber of Commerce Director Lyn Arnold, State Representative John Mayo, and State Senator Robert Jackson.”

I visited Harry, but I didn't end up getting to spend enough time with him to see how well his boat worked—he got locked up for neglecting to pay child support. I did, however, catch a glimpse at a story that turned out to sit squarely in this space between humanity and the rest of nature that I find so interesting.

The short version is this: Fifteen years ago four species of Asian carp escaped from fish farms into the Mississippi River. With no natural predators, the fish, which can

grow to 100 pounds, took over the river. Then, they swam north, toward Lake Michigan.

But to get from Big Muddy to the Great Lakes, a fish must travel nearly 300 miles up the Illinois River. In 2002, biologists spotted the Asian carp 50 miles south of a canal which connects the Illinois to Lake Michigan. Twelve months later, the U.S. Army Corps of Engineers built an electric barrier in the canal to keep the fish out of the lake. It cost \$10 million—a small sum compared to the \$4.5 billion generated annually by fishing on the Great Lakes.

In addition to fishermen and boaters, wildlife biologists fear what the Asian carp might do to the lakes if it gets in. How will the ecosystem change? What will happen to the fish that live there now? How will these changes affect the people who live near the lakes? Many of those people are fighting desperately to keep the fish out.

Fighting not only because of the ecological consequences, but because another striking factor: When the Asian carp get scared, they leap out of the water—and they leap high, sometimes ten feet in the air. These fish are big, averaging about twenty pounds. One fisherman described getting hit with one by saying: “It’s like getting hit by a wet bowling ball.” He’d had his nose broken by one.

And so people are fighting back by building boats like the *Asian Carp Eradicator*. And by launching carp-killing jamborees, like the Redneck Fishing Tournament, which every summer now for the past few years gathers about 300 competitors on a small stretch of the Mississippi River to coax hundreds of the jumping fish into their boats, where they are killed with knives and bats. Others have taken to shooting the fish out of the air with bow and arrow. It’s a free-for-all.

I wondered: What inspires such hatred toward a fish? So I applied for a grant, got some money and spent six weeks canoeing on the Illinois River, where the population of fish—and fish haters—is most dense. That was many months ago, and I'm still working on an answer to the question. I need to go back. And the reason I haven't, well, that brings me back to the story I began this introduction with.

I found out about the story of Jasper and his hookworms fully a year and a half into my studies at the University of Memphis. I was deep into my research on Asian carp, but the writing had stalled. I didn't have very many characters who gave me the feeling that a great deal was really at stake for them. I had trouble seeing the narratives in their lives. My intellect was captivated, but my heart wasn't in it.

But Jasper presented something different. Here was a character and a story. The story had a plot; it had twists and turns; it had scenes and dialogue. It captured my emotions *and* raised interesting intellectual questions. So I changed gears.

And then something surprising happened: I ended up pitching Jasper's story to a radio show. I'd been a fan of a show called *Radiolab* for years—more on the show in a moment—and one of the show's producers I'd recently met told me they were considering doing a show on parasites. I decided, let's see what this is like. What would it be like to tell a long narrative like this on the radio?

Reporting and writing Jasper's story for radio was an entirely new experience. It was a challenging one, but it was also enchanting. Radio provided opportunities for expression I never knew were possible. Several months after I did Jasper's story for the show, I accepted a full-time job as a writer and producer. The stories in this collection are

a product of my first year on the job—in many ways, they’re simply an expansion on the work I did in the MFA.

Before I describe the stories and explain why I’ve collected them here, I want to say a few words about radio—largely because I know the university has never before accepted an MFA thesis based on stories prepared originally for that medium. This is an exciting moment, but I understand it raises certain questions: What is *Radiolab*? How does it fit into the spectrum of creative writing on the radio? And in what particular ways did my training at the University of Memphis prepare me to be doing this kind of work?

*Radiolab* is an hour-long public radio show that covers big ideas, often through the lens of science and mostly through method of storytelling. Each hour takes an abstract topic—like parasites, or time, morality, limits, language, et cetera—and explores it through a variety of stories. Many of these stories are narratives. And most of the stories I’ve written since I was hired fall into this category. These are the sorts of stories I’ve included in this collection.

In a lot of ways, *Radiolab* is similar to the hit show *This American Life*. *This American Life* was founded in 1995, and it made its name on a fierce commitment to *not* covering the news. The show features long, essay-style pieces from radio producers, but also from writers—including Dave Eggers, Malcolm Gladwell, David Foster Wallace, Nick Hornby, Chuck Klosterman, Michael Lewis, Gay Talese and Tobias Wolfe. The show was the first radio show to bring truly creative fiction and nonfiction to the radio.

*Radiolab* has followed in stride, but tweaked the format slightly. The focus is still on airing the highest quality narrative storytelling. But *Radiolab* tends to explore each topic with a sort of rabid curiosity that *This American Life*—which airs weekly, as

opposed to monthly—often doesn't have time to do. The big different is that on *This American Life*, the topic is an organizing principle. On *Radiolab* the topic is a giant, seemingly impossible question—we use the stories to answer it, in admittedly limited ways. And like most creative essays, the stories are presented in a way that often leaves the listener with more questions than answers.

Still, both shows share more things than they don't, and they cross-pollinate heavily. In fact, the fourth chapter from this collection—the piece on hookworms—aired on *This American Life* several months ago. Both shows have recently become enormously popular—about 500,000 people podcast *This American Life* each week and a million download *Radiolab* each month. On the radio, the shows reach a million and a half listeners each, via roughly 400 local public radio stations that carry them.

It is useful to point out a few key elements that make *Radiolab* a unique creation. For one thing, *Radiolab* has two hosts, Jad Abumrad—a composer turned radio producer—and Robert Krulwich, a science reporter who has worked at NPR and ABC for the past 35 years or so. And one of the things that makes writing for the show unique, even in radio, is that they share the narration—I write for both Jad and Robert, and often I think it's a little like writing for a couple TV characters. One of the other things that makes *Radiolab* very unique, is that Jad and Robert share a great deal amount of the narration with the guests. And, in a way, I write for them (the guests), too.

For instance: A typical *Radiolab* sentence may include a phrase from each host with a phrase from the guest. I'd call it a three-person sentence, but it's really a four-person sentence, because I'm the one who wrote it.

This might sound strange. But in a lot of ways, writing for *Radiolab* isn't so different from doing the kind of writing I was doing in the MFA program, and I think this is a big part of why I love my job so much.

But to explain exactly what it is I do, I want to take one of the stories in the collection and break down the process. Let's look at the first piece: "A Man Without Words."

In June we decided to do a show on language. Jad, one of our hosts, had heard about a study that showed children basically cannot think until they develop complex language skills, a provocative idea, but only a starting point for the show. I was assigned to captain the show, meaning it would be my responsibility to brainstorm several other ideas to flesh out the hour.

I found a story about a group of linguists who had found a group of Nicaraguan children that had developed its own, completely new signed language. Then I found a story about a neuroanatomist who had a stroke that temporarily knocked out her ability to use language and, amazingly, she found this to be one of the most pleasurable experiences of her life. And I found a Shakespeare scholar who could get us inside the head of the man who some argue coined more new words than anyone in history. But if we were going to do a show on language, the question I really wanted an answer to was, what is it like to have no language at all? Is it even possible to grow up without language?

This question led me on a little journey into some pretty dark places. I read a lot about feral children, real-life version of Romulus and Remus. Dozens of children have been found wandering the edges of various forests, their fingernails long as claws, shaggy hair all over their bodies, a chilling look of animal fear in their eyes. These children did

not speak when found and, despite the efforts of brilliant teachers, most never learned to speak.

I also read pages and pages of case reports about children locked in small rooms by abusive parents, given food and water, but nothing in the way of affection or education. These children, like the ones who grew up in the woods, could not speak, and in most cases never learned to do so. But the damage to these children was too comprehensive; their stories weren't just about language.

Then, after weeks of research, I happened to come across a book by the famous neurologist Oliver Sacks. It was an old book, one of his first, and it was called *Seeing Voices*. Oliver, it turned out, had become interested in the same question I was pursuing, but 25 years earlier, and he had concluded that although it is nearly impossible to enter this world and *not* acquire language, it can be done, and the way to do it is to be born deaf. In his book, he relates one story after the next about children born deaf and never taught sign language, and he explains in painful detail the ways this hindered their cognitive and emotional development:

Whether deafness is preferable to blindness, if acquired later in life, is arguable, he writes, but to be born deaf is infinitely more serious than to be born blind. For the prelingually deaf, unable to hear their parents, risk being severely retarded, if not permanently defective, in their grasp of language, unless early and effective measures are taken. And to be deficient in language, for a human being, is one of the most desperate of calamities, for it is only thought language that we enter fully into humanity.



One of the case studies Oliver mentions in his book is the story of Susan Schaller, a young sign-language interpreter, who meets a 27-year-old man who had never been taught any language. As soon as I read about her in the book, I sought her out and got her on the phone. Her energy was palpable, and I knew she was the one to help get us inside the experience of being without language.

After speaking with her, I went to the library and picked up a small book she'd published about her experiences. I read it. And then I provided Jad and Robert, our hosts, with some notes. A few days later, the three of us interviewed Susan together. Then the real work began.

Over the following seven weeks, I wrote and rewrote our version of Susan's story. I began with a large pile of raw materials—two hours of interview with Susan and several file folders thick with my notes—just as I might have begun work on a story written for a journal or magazine. I made an outline. I told the story to friends and family over and over, trying to get a feel for which parts worked and which parts didn't. I wrote a very rough first draft—a shitty first draft, as Anne Lamott, would say. And then I began a rigorous process of workshopping that draft with my colleague, Soren Wheeler.

Soren is my editor, but he is not the kind of editor you might find at a magazine or publishing house. In my editing sessions with Soren, we sit side by side, with the most current draft in front of us, and together we walk through the story, marking passages that aren't quite working for us. We point out places where a character's motivation is not clear. Or where, perhaps, a description is too wordy. We circle passages of exposition and brainstorm ways that they might be folded into the narrative. We consider how dialogue, both within the story itself, as well as between the hosts and the source, is working to

keep the story moving forward. We spend most of our time talking about structure, but we also discuss tone and mood and how it develops as the story progresses.

Mostly, Soren and I work the piece on paper. Then, I go into the computer and edit the tape. I do my best to include as much of the subject's voice as possible; one of our goals is to let the people we interview tell their own stories. But we help out a lot.

I cut the interview into large chunks—here they're talking about the moment Susan first saw the deaf man. Then I cut that into sentences that might be useful—here she describes what he looks like. And eventually, I cut every sentence into phrases—here she describes the color of his eyes. I label all of these and pile them in a tray, and as mold the story closer and closer to its final shape, I rearrange these tiny pieces in countless different ways, combining them like jigsaw pieces in a puzzle whose final form I'm not yet certain of. I arrange phrases into sentences and paragraphs. I write lines for the hosts to speak in front of, between and behind these little pieces of tape.

The purpose, in the end, is to build cinematic narrative that paints scenes in the listeners mind, but moves from one scene to the next quickly, so we keep their attention.

This particular piece went through fourteen full drafts, and countless smaller, casual edits, before I handed it off to the guy on our team who does the scoring—lays music under various sections. I rewrite so often that sometimes I feel more like I'm working on a poem than a piece of prose. I like that feeling.

This is as good a place as any, I think, to mention a few things about the form of this manuscript. What follows is a work of straight prose. It does not come with music or sound effects; it is a silent piece of writing. You will not hear voices in your ears as you read, but I hope you'll hear them in your mind.

Still, these stories were written for *Radiolab*, and a few conventions remain.

Pervasive use of quotations: You'll notice that all seven of these pieces in this collection rely heavily on the words of others. You may see certain quotes and think, couldn't he have just written that line himself? In many cases, yes, I could have. But I think you'll notice when you listen, the use of an interview subject's words—whether that subject is an expert or the person who experienced a story directly—establishes a very specific kind of mood.

I should also note that these quotations are very rarely the direct, verbatim sentences and paragraphs that came out of the interview subject's mouth. Most newspaper and magazines require their reporters to maintain the integrity of a quote, at least on the sentence-by-sentence level. We do not. Like I said before, we cut each interview down to the phrase—and in many cases, down to the word—and through a careful process of rearrangement, we create the lines you hear on the radio or see in this manuscript. This is a painstaking process. But it serves the story.

A sense of dialogue: When you listen to the show, you will hear it alternate, at times abruptly, between narration and interview. One moment, the host will be telling you a story; the next, he will be asking the interview subject a question. This, like everything else we do in the editing process, is deliberate. Dialogue, we learn in our MFA programs, is one of the best ways to move the action of a story forward. You'll see many moments in this manuscript where dialogue is exchanged between characters in a story. Sometimes one of those characters is me. Sometimes it is Jad. But we also create a sense of dialogue by allowing the question-and-answer that happens in the interview to become

a part of the storytelling. Again, this is a tactic more effective on the radio, I think, than in print, and I've removed many instances of it. But at other times, I've left it in tact.

Short paragraphs: Because so much of the story happens in dialogue—either real character-to-character dialogue or a sense of dialogue created by the hosts—many of the paragraphs in this manuscript are short. The radio is not a medium that lends itself to long, reflective paragraphs. But then again, I'm not the kind of writer that especially enjoys or excels at that kind of writing. When these stories are working, they're moving quickly, from one beat to the next, one scene to the next.

The author and the speaker: All of the stories in this collection are written in my voice and from my point of view. However, you'll notice that when you listen to the radio versions of the stories, many of the lines are shared by Jad and Robert. Like I said before, I write for these guys almost as if they are a couple of TV characters. Sometimes I also think about it almost as if I'm writing for a set of fictional characters—or writing a poem, where I may be the author, but the speaker is a character I've created. Since this is a printed manuscript, though, for the sake of clarity, I've merged their both their characters with mine, so all the stories are told by one primary narrator.

All that said, the best way to experience these stories in their fullest form is to listen to them. Jad, one of the show's hosts, has said that when the show works, it should create “a dreamlike state,” where ideas and stories wash together with music, images and sounds. He has, alternately, talked about it as a “conversation in a diner, but where the special rule is that whenever you start talking about something, a story or an idea, it appears, in some sonic, narrative or theatrical form.” Hopefully, some of this tone has translated to the page here; but elements of it have no doubt been lost. And for that

reason, I hope you'll take the time to listen to the radio pieces, before or after you read this manuscript. I think you'll enjoy them.

The stories collected here are a combination of literary journalism and essay. In the MFA program, I learned that creative nonfiction must meet two criteria. It must use literary techniques, including voice, mood, tone, symbol, metaphor, dialogue, characterization, plot, epiphany; and it must rely on the tools of reality, including fact, research, history, investigative reporting, experience and memory.

These pieces ally themselves with literary journalism in their attempt to delve deeply into another person's experience and build from it a story with real characters, a narrative arc, dramatic tension, scenes and dialogue, and to do this in a way that remains true, emotionally and intellectually, to what that other person went through. It differs memoir and personal essay in its aggressive commitment to gazing outward.

But they also contain elements of essay. They are not all narrative. They wander into contemplation and questioning, looking at the stories being told and wondering at them. Last month, in his final "Notebook" column for *Harper's* magazine, the essayist Lewis Lapham wrote about the essay form: "Construe [it] as a thinking out loud, and by its improvisational nature it inclines in the direction of poetry or music, the language meant to be heard, not seen." Writing for the radio—and certainly writing for *Radiolab*—is, at its best, a "thinking out loud."

Now, on to the stories themselves. As the title suggests, these are tales from the edges of the human experience—or, to use a metaphor from earlier in this introduction, from the ecotone between the human and the nonhuman world. At their best, they question what it means to be human and, perhaps even more than that, what it means to

be normal as a human. Most of these stories examine people who, depending on how you look at them—or maybe how much time you spend looking at them—could be considered very strange or, simply, exceptional.

I have a quotation from Samuel Johnson above my desk: “The two most engaging powers of an author,” he says, “are to make new things familiar and familiar things new.” I have the first part of it underlined. I’m not sure why, but I prefer to look to the unfamiliar—to look at the things most people call weird—to try to and understand it a bit and to come back to tell other people about it. I enjoy reading memoirs and essays written by people from my world—my country, my part of my country, my social status, my race, my gender—especially when those writing make me see these supposedly familiar things in a new way. But as a writer, so far at least, I prefer to work in the reverse dynamic.

At any rate, these stories engage people very different from myself and, for the most part, very different from all of us. And yet, they also raise universal questions about what it means to be human.

I’ve arranged the stories so that you will move from inside the human body—the brain, specifically—to outside it. Each chapter will address one big question that I think we can all feel is somehow important to us. Here’s a quick roadmap.

We start with language. What does it mean to be without language? Can you truly be human without it? And how does one end up with no language in the first place? This is the story of Susan Schaller and the 27-year-old languageless man that I introduced earlier in the introduction.

Then we move to memory. What are the limits of the human mind? How much can a person remember? In the 1930s, a Russian psychologist discovered a man whose memory appeared to have no limits. He could recall seemingly endless strings of numbers. He memorized Dante's *Inferno* -- yes, the whole thing! And once he realized the depths of his talent, he went on the road, performing memory tricks for vast halls packed with adoring fans. But as the years passed, the dark underbelly of his talent began to reveal itself, raising the question: Would you really want a memory that had no limit?

In the third chapter, we consider the effects of a very particular sort of brain abnormality—a brain tumor. But here we ask a counterintuitive question: Is it possible that a brain tumor could do something good for you? This chapter tells two stories, one of a man with perhaps the oddest pleasurable tumor every recorded by neuroscientists, and another of a nun, whose brain tumor brought her closer to God.

The fourth chapter leaves the brain, but considers the effects of another abnormality inside the body. But one that was placed there intentionally. What's the proper relationship between a man and the human hookworm? Most of us would say: No relationship. But this chapter tells the story of Jasper Lawrence who traveled to the darkest corner of Africa in order to invite the hookworm into his body. All because he was convinced its presence would cure his allergies and asthma. Is he crazy? Not entirely.

The next chapter also tells a story of a creature that crawls on the ground. It's a story about a lobster, and a lady who decides to do something strange with it—don't worry, she doesn't try to put it inside her body. In 1991 Bonnie Hazen encountered a lobster in a supermarket—a big lobster, in a little tank. Most of us would have walked right by. But something about the scene struck Bonnie Hazen as, well, wrong. And so

began a story asks: Why do we relate the way we do to the animals who end up on our plates? And why, sometimes, do some of us decide not to let them onto our plates at all?

Chapter six also features a non-human in a major role. But this time the creature is a tree—the bristlecone pine, which happens to be the world's longest living species of tree. In the early 1960s, a young scientist named Don Currey hiked up into a particularly ancient grove to do some research on climate change by examining the trees' rings. But when he cut down a specimen to examine it, he made a terrible discovery. What is it, this story asks, that makes us assign so much value to those oldest of Earth's creatures?

In chapter seven—the piece in the collection closest to a pure essay—we begin with a question, one of the deepest questions we can ask about ourselves: If evolutionary biology says every creature in nature should be selfish, perhaps even violently selfish, why does goodness seem to creep up so often in our lives? We meet a scientist who studies Costa Rican vampire bats, we step through a strange computer simulation that yields a shocking result and we travel into the trenches of Flanders during World War I.

And finally, in chapter eight, we come back to a story that turns the focus squarely on humanity. In the early 1960s, a massive web of coal mines beneath the small town of Centralia, Pennsylvania, caught fire. But instead of sending residents running from their homes, the catastrophe did something very strange. It split the town. Half the residents decided to leave. The other half dug in their heels and stayed. And then things started to spiral out of control. The question is: What does it mean to make a place your home? And once you've made it, what does it take to make you leave?

In addition to these stories, all of which are “finished” radio pieces—I suppose nothing is ever finished, we're just forced to stop revising it—I'm also working on a



variety of stories right now, including a piece on two brothers who one day faced a decision so difficult that they placed their fate in the hands of a pile of tea leaves; a piece on the legendary blues musician Robert Johnson, and the legend about his deal with the devil; a piece on Louis Pasteur and his miraculous discovery, in 1848, that all the molecular building blocks of life are asymmetrical and, on top of that, that all are left handed; and a piece about a man who unintentionally trained an African gray parrot to help him control his bipolar disorder and psychotic tendencies.

Each of these stories will be workshopped, rewritten and edited dozens of times before being released onto the radio. I'm looking forward to incorporating the feedback I receive on this manuscript into that work.

*Radiolab* will also present a live show—on the topic of symmetry—which will feature the story about Louis Pasteur, as well as pieces on a scientific experiment that reveals two strangers to have essentially the same brain; the infamous drug thalidomide, an immensely successful cure for morning sickness that, when mirrored on the molecular level, becomes incredibly poisonous; the relationship between the side of one's hair part and how likeable he is; as well as stories from Borges and Lewis Carroll. We'll perform the show once in New York and once in Washington, DC—at the Shakespeare Theater, where Jon Stewart recently interviewed Barak Obama—and I am deeply excited about the chance to work in yet another new medium for creative nonfiction storytelling.

It's an exciting time to be writing creative nonfiction; the Internet is creating all sort of new opportunities for young writers to publish their work. And in a strange sort of throw back, the radio has become an excellent one. People used to say that video killed the radio star. But radio is actually alive and well.

Two years ago, at AWP I hosted a panel discussion called, “The Voice Over: Creative Writing on the Radio,” and invited two of my favorite radio producers, as well as the director of the Third Coast Audio Festival to help me present a listening session. We brought in some big speakers and dimmed the lights. I went out to get some coffee for the panelists, and when I got back, a few minutes before start time, I ran into the fire marshal, shouldering through a crowd to exit the room my panelists were inside.

“This your room?” he asked gruffly.

“Yeah, what’s wrong?”

“You got too many people,” he said. “Gotta kick some of them out.”

And he did. We’d filled the room with two hundred people, and dozens had to be escorted out of the back of the room. With that many people—not just people, writers!—the lights dimmed low and the sonorous voices of my favorite radio writers booming through the room, I felt that I was part of something new and exciting. You could feel the excitement amongst the people in the room, too.

Last month, *The New Yorker* magazine finally got around to covering the Asian carp story I originally intended to write as my thesis. They sent Ian Frazier to Illinois, and he came back with a fine piece of writing. It was a little sad to see a story so close to the one I wanted to write—the one I’d so fully reported—in such a big magazine. But for two big reasons, it was very exciting.

First, I can now tell all my writer friends that the first story I ever spent more than a week reporting was published in *The New Yorker*—I just didn’t write it.

And second, Ian neglected to include the person I found most interesting and wonderful in all my reporting, a fisherman named Orion Briney, who for reasons I don’t

have space here to explain I'm convinced is one of the last true American men in the entire state of Illinois. I'm fascinated by him in a hundred ways, and I plan to go back and tell a story about him. When I do, though, I won't just bring my notebook and a pen; I'll bring a radio recorder, too.

## A Man Without Words

In a lot of ways, this is a typical story. It's about a man. And a woman. It's about how they met, how they got to know each other, how they taught each other things, how they made each other angry, how they laughed and cried with each other. But in other ways, this is one of the strangest stories I've ever heard. To be clear: The man is the reason the story gets strange. But before we get to him, I want you to know a few things about the woman. Her name is Susan. And her part of the story begins many years ago, one day when she was just 17 years old.

"I was riding a bicycle to high school," Susan says, when all of a sudden, "a catering truck hit me, and I was put in the hospital with a concussion. And the concussion was bad enough, that it slowed my brain enough so that I couldn't read. And so, naturally, I couldn't go to school."

Which, Susan says, was awful.

"At 17 I was very much a nerd," she says, "And I was bored out of my mind."

So, Susan was sitting there in the hospital, miserable, surrounded by books and wishing, frankly, that she was back in school.

Until one day, one of her friends, "a friend of mine who was just a little older and had graduated the semester before me, suggested going to the nearby university and crashing classes."

But if your brain was so tweaked you couldn't even keep up with high school, why go to the university? Why wouldn't you just go swimming?

"I couldn't read," Susan says, "but I could listen and I could hear, and the person was saying, oh, it's a lot better than high school."

And so one day, she went to this college in southern California. The class session had already begun and Susan was trying to decide which class to duck in on. And she was just wandering down a random hallway.

“And I opened the first door on the left,” Susan says.

There was nothing special about this door. It had no sign inviting aimless, slow-brained students to wander in. It had no color—none that Susan remembers, at least. It had no decorations, no special window, no strange and fascinating handle begging to be tested. But that’s the door Susan picked. And in she went.

“That was the accident,” she says, “that changed my whole life, just picking that door.”

The class was called visual poetry, and the room was filled with deaf and hearing students. At the front of the room, there was this older guy. He was thin; he was bald. And he was tracing shapes in the air with his hands.

“It was as if we was painting pictures in the air,” Susan says. “And then they immediately disappeared. Then another picture appeared.”

The professor was named Lou Fant.

“I was mesmerized,” Susan says. “The professor was signing.”

And Susan didn’t know it then, but Fant was one of the world’s foremost sign language instructors—a legend in sign language circles. And this class was one of the first classes ever to teach sign at a regular, hearing university.

“I had walked into history,” Susan says, “and didn’t know it.”

So, fast forward to the late 1970s: Susan, who by now was fluent in sign language, moved to Los Angeles.

“And I was snatched,” she says, “and put into interpreter training programs, because at that time there were very, very few interpreters. And I found myself in a classroom.”

In a community college.

“In something called a reading skills class.”

So she walked into the class, saw kids all over the classroom, making big excited gestures one to the other. It was as if everyone in the room was shouting, but soundlessly. Susan shuffled anxiously across the room, thinking to herself all the while: What am I doing here? Everyone in this room is deaf.

“I thought somebody made a mistake,” she says. “Everybody is signing here. They don’t need an interpreter.”

And then, she saw something that stopped her, stopped her steps, stopped her thoughts.

“At the door,” she says, “I saw this man holding himself.”

Kind of off by himself, his arms wrapped around his torso, his fingers clamped desperately to his own back.

“Making his own straitjacket.”

And she went over to the instructor, and pointed at the guy, said who's that guy over there? And the instructor said, well, he was born deaf. He has this insistent uncle who brings him here everyday. But we don't know exactly what to do with him.

Susan looked back at him.

“He was a beautiful, um, well now I know, I don't know if I would have had that in my head at the time, beautiful looking Mayan,” she says, “you know, high cheekbones and black hair, black eyes.”

And something about his eyes caught her attention. As she talked with the instructor, she saw them darting from her face to the instructors. Back and forth, wild and insistent.

“He was studying mouths,” Susan says.

So Susan walked up to him and said: “Hello, my name is Susan.”

And this is where things start to get a little weird. This guy looked at her, and instead of signing his name, whatever it was.

“He brings up his hands.”

And he signed right back to her.

“Hello, my name is Susan.”

Susan shook her head and said: “No, no, no, I'm Susan.”

And he responded: “No, no, no, I'm Susan.”

She took him outside, pointed to a tree and signed: “Tree.”

“Tree,” he signed back.

“What kind of tree is this?”

“What kind of tree is this?”

She pointed to a squirrel and signed: “Gray squirrel or brown squirrel.”

He responded: “Gray squirrel or brown squirrel.”

Everything Susan said he tried to say.

“I call it a visual echolalia,” Susan says.

And she remembers thinking: Why is he doing this? He doesn't look disabled.

“He was intelligent,” she says. “I wouldn't have been able to answer if you asked me, how can you see intelligence? But you can actually see intelligence in people's eyes.”

He was just missing something.

“To copy me meant that he didn't really know what I was doing.”

And she thought to herself, this is more than a translation problem.

“If he knew Mexican sign language, he wouldn't react this way.”

And then it occurred to her.

“This man doesn't have language.”

And this guy is a man, a full-grown adult.

“He was 27 years old.”

And in all those years, nobody had taught him a single word of sign language.

“He didn't know he was deaf,” Susan says. “He was born deaf. He didn't know there was sound. Twenty-seven years, no idea that there was sound. He could see the mouth moving; he could see people responding. He thought we figured all this stuff out visually. And he thought, I must be stupid.”

And it makes you wonder: What do words do for us? Are they necessary? Can you live without them? Can you think without them? Can you dream without them?

But back there in the classroom with Ildefonso—that's the pseudonym Susan used for him when she wrote his story down years later—Susan had a much simpler question in her mind: Who are you?

“What have you've been doing for 27 years?”



So she thought, let me see if I can teach him some just basic sign language.

“I wanted to give him language so he could answer my questions,” she says. “I wanted to know who he was and he wanted to know who I was, and in order to get there, we had to have a bridge of language.”

So she took out a book and made the sign book.

“But the sign for book,” Susan says, “looks like opening up a book, so he thought I was ordering him to open a book.”

So he grabbed the book, and he opened it.

“Because he thought I was asking him to do something,” Susan says. “It was very difficult. If I gave him the sign for standing up he thought I wanted him to stand up. And so I couldn't, I couldn't have a conversation with him. And it was the most frustrating thing I have ever done in my life.”

This went on for weeks.

“I taught him every single day,” she says.

And everyday, the same thing happened—he copied her.

“Oftentimes,” Susan says, “when we said goodbye or just left—we couldn't really say goodbye—I really believed that we wouldn't see each other again. And I was oftentimes very surprised when he would be sitting there at the table. And I think sometimes he looked surprised that I showed up.”

But they both kept showing up.

“I think both of us,” Susan says, “our motivation was, we wanted to meet each other. And we had this huge gulf between us. How could I get to know him? And vice versa?”

“I never thought about language the way I do now until I faced this languageless man.”

But after about a month of Ildefonso imitating everything Susan did—“constantly miming,” she says, “copying me”—she had an idea.

“Perhaps,” Susan says, “it’s just possible that if I, if I died tomorrow, I would have had only one really, really good thought in my life. And this was it: I’m going to ignore him. I taught an invisible student. I stopped talking to him, and I stopped having eye contact. And I set up an empty chair.”

And then she held up to this empty chair a picture of a cat.

“And I was trying to explain,” Susan says, “to this invisible student about this creature, a cat. So I’d be miming a cat and petting a cat. And then I sign the sign for cat.”

Then she hopped to the other seat, the invisible student’s seat, and pretended to get it.

“Oh, I know!” she says, “You know, with my facial expression. Oh, I get it!”

She played all the parts, both the teacher and the invisible student.

“Doing all these crazy things. And he just watched me.”

He stopped copying her, which was good.

“But I’d do this over and over and over for days and days and days.”

And she says he just didn’t get it.

“He looked bored a lot of times.”

But one day in the middle of one of these endless pretend student exercises, Susan says, “something happened.”

Out of the corner of her eye, she sees him shift his body. “And he looked,” Susan says, “it’s interesting how his body was upright, and he looked like something was about to happen.” Susan lived on a horse farm when she was very young, and she says Ildefonso looked like he was about to rear up. “He looked around the room,” she says, “this is a 27-year-old man, and he looks around the room as if he had just landed from Mars and it was the first time he ever saw anything. Something was about to happen.”

His eyes grew wider, she says, and then wider. And then: “He slapped his hands on the table.” And she could see the thought that had just crashed into his mind: Oh! Everything has a name!” He stared at Susan in a demanding way.

“Table,” she signed.

He pointed to the door.

“Door,” she signed.

He pointed to the clock on the wall above the door.

“Clock.”

He pointed to Susan.

“Susan,” she signed. “My name is Susan.”

And then, Susan says: “He started crying. He just collapsed and he started crying.”

“What is it,” Susan says, “that happens in human beings when we get symbols and we start trading symbols? It changes our thinking. There’s something about symbol table that makes the table different.”

And the amazing thing is that this isn’t an isolated case. Susan told me a little story from 18<sup>th</sup> century France, a story about a boy named Jean Massieu.

“He was born deaf,” she says, “raised without sign language in a hearing family. And when he was about 12, his family sent him to a deaf school in Paris.”

And it turned out that school was the first deaf school in the world. And his teacher, a French priest named Sicard—who happened to be one of the first teachers of the deaf in the world—tried to teach him to read and write French. He began by drawing pictures and writing the French names for things beside them. But for many weeks, Massieu struggled.

“At first,” Sicard wrote years later, “his pupil was utterly mystified. Words didn’t make any sense to him at all.”

Until one day, something happened, and all of a sudden he got it.

At that moment, Sicard wrote, he developed a tremendous hunger for names. Massieu demanded names for everything. We visited an orchard and went into a woods. His soul expanded. He was like a landowner seeing his domain for the first time.

Massieu had become like Adam.

Helen Keller describes a similar breakthrough—for her, it happens when she first comprehends the word for water. And there is something about this that suggests the bursting of a dam.

For Ildefonso, Susan says, the experience was much the same.

“Ildefonso was in love,” she says. “He was in love. He was like, everything has a name. And for the first couple weeks he had this list of names that kept growing and growing.”

Paper. Eagle. Clock. Green.

“I kept copying words for him.”

Cat. Alligator. Cat. Cardinal.

“Gave him the sign for door,” she says, “then I would write D-O-O-R.”

Serpent. Cheetah. Strawberries

“And he folded this paper as if it was treasure. And he would pull it out everyday and he would carefully unfold it, and he would add to it.”

Orange juice. Apple. Blue Jay. Oak. Thinking. Believe. Horse. Leaf. Idea.

“Add to it.”

Lamb. Lou. Table. Bird. Wall. Dove. Name.

“Add to it.”

Pig. Left. From. Right. Cows. Hawk. Left of the blue wall. Octopus. Symbol.

Treasure. Words. Eggs. Ham. Hippopotamus.

“What is it that happens in human beings when we get symbols?”

On the one hand, once you’ve begun to put words onto things, you can look at a thing, say this symbolic sound, table, and the person opposite you knows what you’re talking about. But Susan seems to be suggesting something even deeper, that when you get the word for table, then suddenly the table, in fact, looks different. As if somehow the word changes the world, in some fundamental way. And it turns out that something even more amazing happens when you go one step further, when you start putting together strings of words.

Not long before I heard Susan and Ildefonso’s story, I read about an experiment, in book called *A Thousand Days of Wonder*, by a British psychologist named Charles Fernyhough. So I called him up to talk about it. It takes a little journey to get to the mind-blowing part, but we’ll get there; just bear with me. The whole thing happens in a room.

“Yeah, you’re put into this room,” Charles says, “which is colored completely white. The walls are white; the ceiling’s white; the floor’s white.” It’s all white.

“Everything’s white. And you can tell where you are to the extent that some of the walls are longer than others.” Translation: It’s a rectangle. “Yeah, it’s a rectangular room.”

And just to give you some of the baseline conditions here: Imagine you are a rat in this room. “And somebody comes along and hides an object in one corner of the room,” Charles says. “It can be anything. I mean for rats you would hide food.” Say, a biscuit. And this person hides the biscuit in one of the four corners, even lets you see her hide it. But before you can get to it, she picks you up by your tail and spins you around a bunch of times.

“So you don’t know where you are,” Charles says. “You don’t know which direction you are facing. And then they say, right, now go find the biscuit.”

So if you do this with a rat, Charles says, what will happen, is the rat will say, *alright let me go find the biscuit*, and it will “go to one corner, which looks right. But of course the room also looks like that if you turn around through 180 degrees and face exactly the opposite direction.” Because it’s a rectangle.

“So they get it right fifty percent of the time,” Charles says.

Because in a rectangle, each corner has an identical opposite.

Now, what the experimenters did next is they took one of the four white walls, and they turned it blue. So imagine this scenario: you’re in this room; you’ve got these four white walls, or rather three white walls. And one of them is blue. And suddenly, you’re not confused anymore. You can relate everything to the blue wall. You can say,

the corner with the biscuit was left of the blue wall or right of the blue wall—let’s just say left of the blue wall. You now have this blue wall as sort of a navigational clue.

“That makes sense,” Charles says. “We would all be able to do that. That’s not going to be difficult for us. Turns out though,” when it comes to the rats, he says, they’re still scoring fifty-fifty. “It’s as if they can’t take any notice of the blue wall.” Even with the blue wall they can only find the biscuit fifty percent of the time. Think about that: Rats can see color. And rats can find their way through extraordinarily complex mazes. They’re spectacular navigators. But this simplest of tasks stumps them.

The problem, Charles says, is that even though they understand and remember directions like left and right, and they can understand colors, “what they can’t do is connect those two bits of information together.”

In other words they can do left. And they can do blue. But they can’t do left of blue.

“These different kinds of knowledge,” Charles says, “can’t talk to each other.”

Which makes you wonder: How do they know that? Did they interview the rats? Did they poke around inside the rats brain and figure out it doesn’t have the neurons to do left of blue? It makes you curious: What doesn’t the rat have? What’s he missing?

And here’s where the experiment gets weird: Some humans are missing the same thing.

Consider the work of a Harvard psychologist named Elizabeth Spelke.

“I spent the first ten or fifteen years of my scientific life,” she says, “studying creatures who don’t talk.”

Liz is famous for her work with babies.

“And I was interested in their abilities in relation to other animals.”

So she created the Baby Development Lab at Harvard, which is filled with toys, and, on any given day, five or six babies—toddlers, too. And several years ago, Liz decided to build a version of the white room in this lab, because she wondered, if rats have so much trouble connecting the idea of left to blue, what about baby humans?

“Surely,” she thought, “a self-respecting, eighteen-month-old, human child would succeed in putting them together.”

But it turns out, they don’t.

“What we find is that children behave just like the rats.”

Seriously?

“Just like the rats.”

Just like the rats or almost like the rats?

“Well,” Liz says, “we don’t test them with food; we don’t test them with digging; so in superficial ways, superficial features of the studies are different.”

But she says kids, like the rats, can’t connect the idea of left to the idea of blue. They just can’t do it. They can’t do it at one. They can’t do it at two. They can’t do it at three or four or five. According to Liz: “We find that those children start performing like adults around six years of age.” Not until they’re six can the kids do the left of blue trick.

Only at six do they fill in this gap that’s keeping them from seeing left of blue. And the question is: What? What happens?

“Several people have suggested,” Charles says, “that one candidate for a process that’s doing this is language.”



But think about that: Most kids start talking at two. By the time they're four, they're talking so much the grown-ups around them can barely keep up—asking questions, pointing things out and demanding names, begging for words to describe their world.

“But what they haven't yet started to use,” Liz says, “is spatial language, and particularly the kinds of spatial language that adults would use in this situation to describe what they're doing.”

And somewhere around the age of six they start to use phrases like: Left of the blue wall.

Liz says those aren't just words that come out of the child's mouth. She thinks that inside the child's brain, the phrase links these concepts together.

And in that moment, the child leaves the rats behind.

To put it in another way: Her basic idea is that a child's brain begins as a series of islands. And on one island way over here in the brain, you've got, say, color. We can call that the blue island. That's the part of you that perceives the color blue. And way on the other side of the brain, you've got the part of you that perceives spatial stuff, like left.

Maybe there's a third, for objects, like wall.

These islands, Liz says, are there from the beginning, from the moment you're born, but they're separate. Only when you get the words left, blue, wall, can you for the first time come upon the phrase: left of the blue wall.

And in that moment, all the islands come together. It is literally the phrase itself, Liz says, that creates this internal connection.

Everybody has always talked about how language is this incredible tool for communication. This device that allows us to exchange information

with other people so much more richly and effectively than other animals can. But language also seems to me to serve as a mechanism of communication between different systems within a single mind.

But all this makes you wonder: Wouldn't it also be possible that the brain is developing some new connections and this new ability is really a result of some biological change? Couldn't the words just be an after effect of something else that's happening?

Charles says, no.

"What the experiments did next," he says, "is that they thought, okay, if language is adding this extra element, let's knock it out."

How do you do that? Can you shoot something into the brain that kills the language part or something?

"There's a much simpler way of doing it," Charles says, "and a much more humane thing you can do."

Here's Liz again: "What we did is put adults in the room." And then, she says, she gave each of them an iPod. "They've got headphones." And playing through the headphones is someone talking, reading a section of one of Liz's most boring scientific papers. And the research subject has to repeat what the person in the headphone is saying. "Continuously listening to speech and repeating it the whole time they were in there."

"It's actually a really hard thing to do," Charles says, "if you've ever tried shadowing while someone is speaking. And what that does is it knocks out your capacity to use language for yourself."

"Basically battering the words out of the adult's head," Liz says.

And they did this, because they wanted to see, if you blasted the words out of somebody's head: What would happen? Can they find the biscuit? Will they be able to form that simple thought, left of the blue wall, or would they become like the rats, which can't?

“And we actually got really dramatic results,” Liz says.

“They went right back to being like the rats,” Charles says.

And you wonder: If language let's you construct a thought that is so basic as, the biscuit is left of the blue wall, what is thought without language?

And Charles says: “I don't think it's very much at all.”

Meaning?

“I'm going to put it a different way, and this involves making quite a controversial statement. I don't think very young children do think.”

And when you ask him what he means, Charles says:

I don't think they think in the way I want to call thinking, which is a bit of cheat, but let me say what I mean by thinking. If you reflect on your own experience, if you think about what's going on inside your head as you're just walking to work or sitting on a subway train. Much of what's going on in your head at that point is actually verbal. I want to suggest that the central thread of all that is actually language, it's a stream of inner speech. That's what most of us think of as thinking.

And young children, even when they're five, they don't really have that yet.

But Liz sees this another way.

“What I'm most aware of when I'm reflecting,” she says, “is the stuff that I can't put into words. I think that he's exaggerating the role of language here.”

In the end, this all really hinges on how you would define thinking. Charles would say, talking in your head is thinking. But Liz would say, take a musician. Music is a form

of thought that carries you through a definite sequence of phrases, feelings, emotions, changes, even though there are no words.

Still, Liz admits: “There is something that we get access to when we gain a full natural language that we can use not only to communicate with other people but with ourselves.”

Which brings us back to Ildefonso. What happened to him when he got language?

Turns out that after that first breakthrough, where Ildefonso realized things have names, Susan ended up leaving for a few years—she had to get back to the East Coast to care for her mother, who was getting old.

“Let’s see, it was about four years, I think, four or five,” Susan says.

But then she decided to write about him.

“And so I went and found him again,” she says. “And he had language and I could ask him all kinds of questions.”

Questions like: Where do you live? How do you get around? What kinds of things do you like? And most importantly, that big one, the first one that popped into her mind when she met him years earlier: What did you do for the 27 years you had no language? Susan explains by saying:

Everyone wants to know: What was it like to be languageless? You know, what was going on in his head? And I asked, and I asked, and I asked. And he starts telling me, that was the dark time in his life. Learning language is like the lights went on. And I tell him, well, we know about language. We want to know what it’s like not to have language. And he doesn’t want to talk about it.

But there was a day, she says, when she was working on the book, and she met Ildefonso in a restaurant, and there he was sitting with his brother, Mario, who she’d never met before. And she quickly learned that Mario also was deaf.

“And languageless.”

She was shocked.

“I can’t believe you have a languageless brother,” she says.

And he responds: “Well, let me introduce you to some of my friends.”

So they get in the car and drive for a while.

“We stop at this apartment,” Susan says, “and we walk into this little room, and there were these six Mexican men doing this mime routine.”

All of them, just like Ildefonso used to be.

“They had no language.”

Born deaf and never taught sign language.

“They didn’t even know they were deaf.”

And yet, they were communicating with each other.

“One man would stand up and he would start miming,” Susan says. “He would just start acting out a bullfight. So he’d be the bull.”

His fingers making horns out the top part of his forehead.

“And he’d be charging. And then he’d be the matador.”

Spinning and swinging an imaginary cape around his waist.

“And then he’d be somebody in the crowd watching.”

And then, he’d add a detail to that person in the crowd, a visual detail.

“A hat.”

And then another man would step to the center of the room.

“Then they’d start miming.”

He’d reenact the bull and the matador and the person in the crowd.

“Describe the hat.”

And now the second storyteller would add a new detail.

“Like, a pair of glasses or something.”

Each man would stand up, take the bullfight, the same bullfight, to a different point and add a detail.

“In other words,” Susan says, “it would take them maybe 45 minutes to say, do you remember the time when we were at the bullfight, and this woman did such and such?”

It was a tedious way of communicating.

“It was like drawing a picture.”

But as a team. And only using your toes. In the dark.

And yet, despite everything I know about how language is this great connector, this moment makes me wonder. These are five men really sharing and connecting on details. They’re exchanging a story. And they’re clearly thinking. Does language simply make things more efficient? Or does it really do something deeper than that?

Susan defers to Ildefonso.

“When I saw him a couple years later,” she says, “after this incident, I asked him about his friends, and he said he couldn’t talk to them anymore. He wasn’t willing to go through that tedious effort of all the miming anymore.

“But the interesting thing that he said is that he can’t even *think* that way anymore. He said he can’t think the way he used to think.

“And when I pushed him to ask about what it was like to be languageless, the closest he ever came to any kind of an answer was exactly that: I don't know, I don't remember. I think differently now.”

## Mister Memory

I'll begin each of the remaining chapters of the thesis with a brief introduction, in order to provide some context. This piece appeared in our episode on limits, a three-part show that featured, in addition to this piece, stories on the limits of the body—a piece about a group of guys who race their bikes across the country without stopping—and the limits of scientific understanding—in which a mathematician theorizes that we should turn the task of scientific research over to robots, because we're entering territory our feeble brains can't possibly make sense of. In the radio show, this piece sits between those two.

We heard about this story from a writer named Jonah Lehrer, a frequent guest on the show. Jonah is the author of two books, *Proust Was a Neuroscientist* and *How We Decide*, and he is an expert on the history of neuroscience. The other gentleman who helps us tell this story is a man named Elkhanon Goldberg. He is a professor of neuroscience at New York University and the author of a book called *Contemporary Neuropsychology and the Legacy of Luria*.

If you think about it, in lots of ways, the human brain is a very controlled little situation—fifty centimeters around, three pounds, easily sliced and diced on the dissection table. But in others, it's one of the greatest mysteries not only of the human body, but of nature itself. If the human form were the Earth, the brain is the deepest and most unreachable cavern of the ocean—the Marianas Trench of human biology.

And so it happens that, throughout the history of neuroscience, the brain has served as setting for countless tales of mystery and intrigue, tales that raise questions nobody even knew to ask before.



Like this one: How much can the human brain store? And is there even a limit?

And that question was raised, initially, by the story of a man we'll call Mr. S., since that's the name doctors used to discuss him in their case reports. I heard about this story initially from a friend, a neuroscience writer named Jonah Lehrer.

The story begins in the Soviet Union, back in the 1920s. It takes place in a small town, a hundred miles or so outside Moscow, and it involves a young man who was working at a newspaper.

"Yeah," Jonah says.

So Mr. S. is a newspaper reporter, and one day, his boss starts yelling at him, because his boss gives out these assignments, talks to the whole newsroom, and he notices that Mr. S. never takes notes. And this drives his boss crazy, cause his boss is, ya know, saying all these things they have to report on, and Mr. S. just never writes them down.

And so his boss calls him into his office and says: Are you lazy? Do you not take this job seriously?

And Mr. S. responds: Well, I just remember it all.

And the editor says: Come on, and he sort of quizzes him. He says, what did I assign you yesterday?

"His boss gives him this quiz," Jonah says, "and sure enough, he remembers everything, not just from that day, but from the previous week."

And he also remembers what the editor assigned all the other reporters last week. And the week before.

And the editor just goes: I don't know, what's with this guy? I mean, he's not a great reporter, but he has something queer going on in his head. So he decides to send him to a famous medical doctor in Moscow: A.R. Luria.

Now Luria is a classical figure in neuropsychology and in psychology in general. And to learn more about him and this story about his patient, Mr. S., I went and visited a man named Elkhanon Goldberg, a professor at NYU medical school. Because Goldberg knew Luria.

“Luria was my mentor,” he says. “I worked very closely with him.”

Not only was he a student of Luria’s; Luria gave him a present once.

“Ah, this is this book,” Elkhanon says, pulling a thin, hardback book from a shelf in his office. “The book, the original book about Mr. S.”

This book, it turns out, is one of the great works of early neuroscience.

“Signed by Luria,” Elkhanon says, pointing at the inside cover. “That’s him.”

It is a beautiful and almost novelistic description of what happened to Mr. S.

“And the original title was *A Little Book About Big Memory*.”

So back to the story: Mr. S. goes to this psychologist Luria. What does Luria do with him?

“Luria, in the book,” Jonah says, “talks about how he wrote about a hundred random numbers on a blackboard.”

Numbers like one and nineteen and 364.

“And asked Mr. S.,” Jonah says, “to remember them.”

“Okay, here we are on page 60,” Elkhanon reads from Luria’s book. “Mr. S. would study the material on the board.”

“For 45 or 60 seconds,” Jonah says.

“Close his eyes,” Elkhanon says, “open them again for a moment.”

Say, *okay, done*.

“And with that,” Elkhanon says, “he would reel off the series precisely.”

That’s like a superpower.

“Yeah,” Jonah says, “and this impresses Luria.”

So he takes his new patient up to the next level.

“Luria gives him this incredible assortment of memory tasks,” Jonah says, “everything from memorize Dante’s *Inferno*.”

Yes, memorize Dante’s *Inferno*—the whole thing. And the really weird thing here is Mr. S. doesn’t read Italian. He doesn’t speak Italian. He had no idea what he was talking about, and yet he gets the whole thing word perfect.

And not only that, Jonah says.

“If there’s some chatter when someone’s reciting Dante’s *Inferno*,” he says, “he’ll also recite back the background cocktail conversation in the room.”

No joke.

“He would remember everything,” Elkhanon says.

When you say everything, what do you mean by that?

“I mean everything,” he says. “Okay? Suppose he interviewed you 10 years ago, he would remember the color of your sweater, whether you held the microphone in your left hand or the right hand. He would have remembered everything.”

In his book, Luria writes:

It was of no consequence to him whether the series I gave him contained meaningful words or nonsense syllables, numbers or sounds; whether they were presented orally or in writing.

As an experimenter, I soon found myself in a state verging on utter confusion. An increase in the length of the series led to no noticeable increase in difficulty for S, and I simply had to admit that the capacity of his memory had no distinct limits.

Which brings us back to the question: How can there be no limits?

“I wish there was a good answer,” Jonah says. “Nobody has any idea why it is he had this infinite capability for recall. What it does suggest, though, is that the brain has the capability to store an incredible amount of stuff.”

But to find out just how much stuff, I decided to look someplace else. So let’s take a little trip now from Russia, in the 1920s, to London, 2009: The World Memory Championships.

So this whole thing takes place in a hotel in central London. The lobby is crowded with the world’s best memorizers. You’ve got people from Oman, Manchester, the Netherlands. There’s even a team of Chinese girls in the corner doing a cheer.

And the people here are all a little bit like Mr. S.; they are walking experiments in brain stuffing. Like take this guy:

“I’m Ben Pridmore, I’m the reigning World Memory Champion. I’m 33 years old and I live in Nottingham.”

Ben can take a string of numbers that is 1,400 numbers long—random numbers—and he can commit it to memory instantly.

“We’ve not actually reached any kind of upper limit,” he says, “of what it’s possible to memorize yet. Everyone is still consistently improving.”

But to really dig into how this works, I talked to another guy, a Navy reservist from Dallas named Ron White, who won the U.S. memory championship in 2009. And here’s how his experience at the memory championships in London went down.

“So,” he says, “I walked in the room that day, wearing my Michael Phelps t-shirt, ya know, it said USA on the front.”

He goes on:

The final minutes before you start an event, you're sitting in your chair, just collecting your thoughts. I put on my military glasses—they look like Drew Carey's glasses. I put those on to remind me, hey, remain calm. Ya know, I wore those all throughout my tour in Afghanistan; if you're going down a road and you're needing to be on the lookout for IEDs, but you're not calm—you're nervous and jittery—you could die. Then I'll put on some noise-cancelling headphones. Then I just close my eyes and sit in my chair.

Until over a big loudspeaker, the official overseeing the contest says a key phrase unique to this kind of contest: “Neurons on the ready?” And then: “Go!”

And at that moment sixty people turn over papers, and on these pieces of paper are numbers, nothing but columns of numbers. And their job is to memorize them. The room is absolutely silent. Everyone has their heads down, staring at the numbers.

But here's the interesting thing, in their heads, they're not seeing numbers. Instead, those numbers are turning into something else. Consider what's happening inside our guy Ron's head. The numbers became: “George Bush, Florence Nightingale, Randy Richardson—he's a friend, Barney Fife, Michael Jordan, Chuck Norris, Anne Frank, Indiana Jones, my friend Ronnie, King Tut.”

“I have a person assigned to every number from zero to 99,” Ron says. “And then I have a verb assigned to every person from zero to 99. And then I have a noun assigned to every digit. So you're just taking person, verbs and objects. And you're putting them all together, and they really don't make sense.”

Like, for example, some of the combinations Ron saw were just completely nonsensical.

“I saw Albert Einstein riding a roller coaster into a bunch of fog,” he says. “That was one of the images. I saw the Fat Albert cartoon character driving a car. I saw a

Victoria's Secret model—which was one of my favorite pictures—I saw a Victoria's Secret model shooting a gun. Stuff like that.”

So there seems to be something about turning data into pictures that makes that data etch in the memory.

“It becomes easier to hold onto,” Jonah says.

And nobody know precisely why that's true.

“I don't know,” Jonah says, “I would just be purely speculating here, but the visual cortex has been hugely enhanced in human evolution—I mean, it's the rear half of our brain. It might make a little sense that, given that we've got this huge chunk of visual cortex, that it's easier to store memory there.”

Oh, but I should say: Ron didn't actually do so well in the contest. He was trying to memorize these twelve decks of cards, and he had constructed this whole stack of pictures—sort of a journey of pictures through a whole military base he used to work at—but he mixed them up, did them in the wrong order. And he lost. Pretty badly.

“I was shocked,” he says. “I mean, I was just shocked. That knocked me out any possible contention.”

But let's go back to Mr. S. now. Because it turns out he also had little pictures and characters running around in his mind. But unlike Ron, he never asked for the pictures.

“No,” Jonah says, “even when he wanted not to do it, he couldn't help but do it.”

“He was born that way,” Elkhanon says. “He had this tremendous memory without any effort and without any mnemonic techniques. This is the point.”

Like his mind just made these pictures automatically, in part, Luria theorized, because Mr. S. had their weird condition called synesthesia, where your senses get tangled up.

“So he heard voices in terms of colors,” Jonah says.

“Right,” Elkhanon says, “colors of voices, smells of words.”

In Luria’s book, he quotes Mr. S. describing his symptoms:

To this day, I can’t escape seeing colors when I hear sounds. What first strikes me is the colors of someone’s voice. . . . When I hear the word green, a green flowerpot appears; with the word red, I see a man in a red shirt coming toward me; as for blue, this means an image of someone waving a small blue flag from a window.

Usually I experience a word’s taste and weight. Sometimes what I sense is something oily slipping through my hands.

And it seems this condition had been with him since childhood. Luria quotes S:

“When I was about two or three years old, I was taught the words of a Hebrew prayer. I didn’t understand them, and what happened was that the words settled in my mind as puffs or steam or splashes.”

And perhaps most interesting is what happened when he saw numbers.

“His numbers weren’t just numbers,” Jonah says. “Sometimes he imagined walking through a crowded Moscow street, and the numbers are scattered along the way.

And so he describes how, I’m walking down the street, there’s the number one.”

“This is a proud, well-built man,” Luria writes.

“Then I make a right turn onto this side street,” Jonah says.

“Two is a high-spirited woman,” Luria writes.

“Then I make a left turn,” Jonah says.

“Three, a gloomy person,” Luria writes. “Six a man with a swollen foot; seven a man with a mustache; eight a very stout woman. As for the number 87, what I see is a fat woman and a man twirling his mustache. Why? I don’t know.”

“Nobody knows,” Jonah says. “Nobody knows exactly what accounts for the individual associations of synesthesia. They just exist. But they’re this extra scaffold for Mr. S.’s memory to cling to.”

Consider this one last quote from Luria’s book. This is Mr. S., the patient, speaking: “I recognize a word not only by the images it provokes, but by a whole complex of feelings that image arouses. It’s hard to express. It’s not a matter of vision or hearing but some overall sense I get.”

Once Mr. S. realized he had this talent, he took it on the road.

“He became a traveling circus freak, basically,” Jonah says.

“Yeah, well,” Elkhanon stutters, trying to come up with a better way to describe the guy, “professional mnemonist, yeah.”

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“He gave up journalism to perform for crowds,” Jonah says.

Big crowds.

“Just crowds in auditoriums,” Jonah says.

Just imagine, Mr. S. standing backstage in some theater in Moscow. An announcer steps into the spotlight: Ladies and gentlemen, please welcome, the Captain of Cognition, the Master of Memory, the Spectacular Schereschewsky. And the audience—by the way, he could fill the house—the audience would jam in, and the announcer would



invite them to shout random numbers at Mr. S. And maybe after 10 minutes of shouting, the crowd would quiet down, and Mr. S. would close his eyes and step forward.

“And he would remember them all,” Jonah says.

This was his job.

And it wasn't just numbers, by the way. He was thrown weird phrases, nonsense sounds, nouns, verbs. And sometimes he'd do four shows a day. And the more he did, the more obvious it became that this business of his, it had a downside.

And here's where we finally reach the limits questions that we're really examining here. He would hear all these nonsense phrases being thrown at him, and they would build up in his mind, until he just had heaps of them up there.

“And it's important to know,” Jonah says, “this was frustrating for Mr. S.”

He had a constant stream of memories pouring into his brain, and he couldn't get any of it out. And on top of that, as they piled up, the memories began to kind of mush together—one would trigger another and another and then another.

“It was this suffocating web of associations,” Jonah says.

“The moment he encountered anything,” Elkhanon adds, “everything even remotely related in his past to that something was immediately evoked in his memory.

Which sounds horrible, if you think about it.

“I agree,” Elkhanon says. “That would be a bloody nightmare.”

“The mind isn't just interested in storing information,” Jonah says. “It really wants to be able to get meaning out of that information, out of those memories. And that actually seems to be turned off, to be inhibited by remembering too much.”

In other words, there really is a limit in our heads. It's a different kind of limit. It's not the limitless ability to remember one number after another, but a precious balance in your head. If you remember too much, you will make no sense of the world—in a sense, making sense of the world is an act of negation.

Which makes sense. Think about living in a big city like New York; if you remembered every person you ever bumped into on the street, you wouldn't be able to have a relationship with your wife or your husband or your child, because they'd just be lost in this thick crowd in your head.

Somehow that's the balance—the act of forgetting is crucial to create preciousness.

## The Magical Tumor

This piece factored in an episode on tumors. It was preceded by a story about a virulent strain of mouth cancer that has, for the past several years, been decimating the population of Tasmanian devils. The really creepy thing about it, though, is that unlike any other cancer ever described by scientists, it's contagious—passed from one devil to the next when they bite one another on the mouth.

The episode is concluded by a piece on the HeLa cells—taken from a woman's cervical cancer tumor in 1951 and found to be the first immortal human cells. Former University of Memphis professor Rebecca Skloot serves as our guide.

In this piece, “The Magical Tumor,” we hear about two very strange tumors. We learn of the first from a physician named Orrin Devinsky, famous for his treatment of strange neurological conditions, especially those rooted in disturbances of the temporal lobe. We learn of the second from a writer named Mark Salzman, author of several books, including *Iron and Silk*, a memoir about teaching English in China, and *Lying Awake*, the novel discussed in this piece.

Sometimes the human body creates things inside itself that seem almost like little creatures of their own. Example: Tumors. They eat and grow and reproduce. But more often than not, they destroy the body that created them, the body that's given them a home. But what if a tumor could be good? What if a tumor could be rich, beautiful and desirable? Remember that film *Phenomenon*? John Travolta played a man named George Malley, who got a tumor that made him a genius. He learned Portuguese in twenty minutes. He developed a perfect memory. His tumor was exquisite.

And sure, that's fiction, but it raises a real question: Can a tumor do something good?

So I brought that question to a doctor named Orrin Devinsky. He's a neurologist at NYU Langone School of Medicine. And Orrin has had a lifelong interest in the beneficial effects of certain kinds of brain conditions.

"Right," he says. "I'll just tell you, I think, one of the most fascinating cases in neurology very quickly."

It's about this guy, who developed a very, very pleasurable tumor.

"A gentleman was described," Orrin says, "who ever since he was a child, would look at safety pins and have an orgasm."

At safety pins?

"At safety pins. The more shiny, the more numerous the safety pins, the stronger the sexual experience."

And this happened from his pubescent period?

"Sometime in puberty he made this association—when he looked at a safety pin, he had an orgasm."

For this guy, the condition was terribly embarrassing—and yet, sort of wonderful.

"So yeah, so he realized this is not something most people do, never talked about it. And he did it in private."

He grew up, finished high school and fought in World War II. But when he got back home from the war, things changed.

“He was on early discharge and got married,” Orrin says. “And then started having less sex with his wife, because the safety pins were much more enjoyable. Sometimes he just had to think about a safety pin, not even hold it up.”

Sure, this is strange. But I think you could say that the experiences this guy was having with the safety pins gave him a kind of pleasure that maybe is unavailable to the rest of us. And certainly wasn't available to him any other way.

Until, Orrin says, this guy began to have seizures.

“He got admitted to a psychiatric hospital, the Mosley, one of the big psychiatric units. They got an EEG, and to make a long story short, there was a benign tumor.”

Right in the part that's called the temporal lobe, sort of in the middle of your head, right behind your eyes.

“But they took it out.”

They took it out?

“They took it out,” Orrin says, “and they cured him of his wonderful experience. So he could look at safety pins all day long, but he would never again enjoy them the way that he had for his whole life.”

How did he feel about that?

“I think it was a mixed blessing, as you would imagine.”

And this idea, that from a tumor you can get something not so good, but also good, this is an idea that has, well, there's been a novel written on this theme. The title of the book is *Lying Awake*, written by an author named Mark Salzman.

So I called Mark to ask him about the story. And the basics of it go like this: Mark decided to imagine a nun.

“Our main character,” he says, “is Sister John of the Cross.”

And it happens that this particular nun joined a nunnery, because she felt lonely for a relationship with God.

“Yes,” Mark says. He goes on:

It’s just not enough for her to tell herself, yes, God is there. What she longs for is a tangible sense of God’s presence, a sense that she can really feel God’s presence in her life. And she begins having what she thinks are migraine headaches; the regular doctor that the sisters see tells her that she seems to be having migraine headaches, coming more and more frequently. And there comes a point when one of these headaches changes dramatically, and then everything is different.

You kind of have to imagine this scene taking place in an environment of profound silence, She’s in the cloister, she and one other sister, working on a sewing project. They’re sewing an altar cloth.

In his book, Mark writes:

One of the pins slipped out of her hand, ringing like a miniature triangle as it bounced off the floor. She looked down to the floor and saw it, but it looked impossibly distant. When she reached down for the pin, her hand looked strangest of all, as if it belonged to someone else. The silence in the room came alive, like the words left out of a poem. Something buried so deep inside her that she’d forgotten it was there rose to the surface. Sister, are you not feeling well? God was present in Sister Anne’s voice; he was present in her face. Nothing was changed, yet everything was changed. God is here, she answered. You were here all along.

And for someone seeking a connection with God, this seems like a field goal.

She’s aching to feel his presence. And there he is.

“That’s right,” Mark says. “This is the moment she’s been waiting for all her life.”

But there’s a problem: she has a tumor—you probably saw that one coming.

“Yes, she has a meningioma,” Mark says, “a benign tumor—small, about the size of a raisin—in the temporal lobe area of her brain.”

Right in the same spot where the safety pin fellow had his tumor.

And when she goes to see her doctors, they tell her, this tumor is what's been causing her migraine headaches. But they tell her something else, too. The tumor is also behind that feeling of spiritual ecstasy she felt while sewing that altar cloth. And this puts her in something of a spot.

“The problem for her,” Mark says, “is should I have the tumor removed, give up the most satisfying and fulfilling experience of my whole life? Or should I sacrifice my health, in order to share with others the experiences that I'm having?”

So, I pose the question to Orrin: What do you tell people?

Because he sees patients like this. This is what he does for a living.

“Every case is unique,” he says, playing it safe.

But if a person comes and says, I'm having what I want, and you are suspicious that what she also is having is a disease, what do you do about the patient?

“If I knew for sure that the tumor, let's say, was benign and would never grow,” Orrin says, “and the only thing that person experienced was this religious feeling that they found extremely enjoyable, I would say let's do nothing, but let's do serial scans to make sure nothing grows and that you're safe.”

But in Mark's book, as it happens, the nun got a little worse. She had a few more headaches; they got more severe. And her doctors took the tumor out.

“The seizure activity stops,” Mark says. “These experiences stop coming. And she does feel afterwards a sense of ... blah. She feels as if she sort of tumbled out of a Himalayan mountain into a muddy village. This is common, apparently, among patients after they've been treated.”

And this story raises an even deeper question, I think: If someone has a very important and meaningful experience, and you have a sense it may be an abnormality, a physical abnormality, that is triggering it, do you regard them as delusional? Like, there's just the possibility here that maybe these people are having an actual conversation? Or do you not even consider that?

"No, I mean, so science," Orrin says, haltingly, stumbling. He goes on:

I think the question you ask and I think you're getting at is, could it truly be that this is God's avenue to speak to us? And people in the late 1800s thought it was through the right hemisphere, and that's often where these cases occur, in the right hemisphere. So it may be that that's right. It's the more emotional hemisphere. And when things are in a perturbed state, you may be more receptive to experiencing spiritual things. And I think there probably is some physiologic basis that allows you to tune into a broader world, and maybe some states of neurologic dysfunction allow you to harmonize or tune in or receive those messages, so to speak.

In which case, then your tumor or your epilepsy would be?

"The window or the conduit."

And even though we're talking about a tumor, if you think about it, every feeling, every thought you have comes from some cells in your brain. And if any of those cells can produce a glorious experience, then the experience stands on its own. Even if the cells producing the experience are tumor cells. And sometimes, in very well documented cases, these are extraordinarily profound, desirable things.

"They're often hard to put into words," Orrin says.

Have you tried?

"Yeah, I mean, people, ya know, Dostoevsky is probably the most articulate person with epilepsy who's had a religious experience and who wrote down what he



experiences,” Orrin says. “I don’t have the quote in front of me, but it’s like, this felicity, this feeling I get.”

In fact, the quote from Dostoevsky goes like this:

For several moments, I would experience such joy as would be inconceivable in ordinary life. I would feel the most complete harmony in myself and the whole world, and this feeling was so strong and sweet that for a few seconds of such bliss I would give 10 or more years of my life—even my whole life, perhaps.

## Welcome, Parasite

This next story is also about something weird getting inside your body. It aired as part of an episode on parasites. It was paired with a piece on the problems caused by the hookworm epidemic in the American South, and appeared after a sort of greatest hits piece on nature's cleverest parasites, and before a piece on the parasite *Toxoplasma gondii*, which scientists say tends to manipulate the brains of rats so they get themselves eaten by the nearest cat.

I spent a little time in the main introduction to the collection explaining where this story came from. After reading about Worm Therapy in *Harper's*, I found Jasper on the Internet and called him at his house in California. He and I spent hours talking on the phone, and we ended up recording about three of them—a lot of tape for a piece that came in under twenty minutes, in the end.

When I first talked to him, Jasper was just several months into his life as a hookworm entrepreneur, and over the months we reported the story lots of things changed for him. When we first talked, he was working in Mexico. Later, he moved his operation up to his house in Santa Cruz. And when I reestablished contact with him before the story aired on *This American Life*, he had fled the country.

Much of Jasper's story stretches the bounds of believability, and I took great pains to verify as many of his claims as I could. I interviewed his aunt, who raised him in England. I interviewed his cousin, who joined him on his adventure to Africa—I reviewed pictures from that trip, as well, including a photograph of Jasper entering a rural latrine. I read countless scientific articles about the various benefits attributed to the presence of intestinal parasites. I interviewed four of Jasper's clients.

Most of this research didn't make it into the final piece. But like Hemmingway said, the final story should really only be the tip of the iceberg. More than any other story in the collection, this one is that.

I didn't get a chance to visit Jasper's home and spend time with him walking around town, visiting the doctor, eating dinner with his family, until after this piece was finished. It would have been nice to be able to include tape from that experience.

Now, for this story to make any sense at all, we really do have to start at the beginning. It's a story about a man named Jasper Lawrence, an American, born in California, but raised on a little farm in the southwest corner of England. And the most important thing to know about young Jasper is that he has allergies. Really bad allergies. And he's had them his entire life.

"On really bad days," Jasper says. "My eyes would swell up so much from pollen or airborne allergens that they would feel like they were swelling shut. I could feel my eyes squeaking in my sockets. It was an enormously uncomfortable feeling."

But he dealt with it.

"They were just allergies."

And he dealt with it for years.

"Ya know, you live with it."

But things got worse when Jasper was a little older.

"What changed for me in my 20s," he says, "was my asthma. At that time, I was living in Santa Cruz. I was recently married. We had cats that had been grandfathered in with the relationship. And I started a landscaping business. I really didn't—"

Wait, someone with allergies starting a landscaping business, that seems kind of, well, unexpected.

“Stupid is actually the word for it,” Jasper says. “And within six months or a year,” he starts to notice, “this really weird barking cough.”

Was there anything particular that brought this on?

“No. It was just sitting and breathing,” he says. “Cats certainly didn’t help.”

But the cats belonged to the wife, and the cats weren’t going anywhere.

“And during that period,” Jasper says, “my asthma got much worse, very, very quickly. By the time it was 1996, 1997, I was seeing specialists, having skin allergen tests, cycling through emergency inhalers, trying Cingulair and all these other drugs that were coming on the market. I was being hospitalized at least a couple times a year.”

Jasper describes his symptoms by saying:

Each day it gets just a little harder to get up the stairs. You can’t run at all. You can’t play with your children. You’re seeing stars in your peripheral vision. You’re afraid you’re going to pass out. Every breath is a violent struggle. And your mind is overtaken by an animal fear. You start to lose the ability to reason. You become filled with this almost violent terror that just wipes out the ability to think rationally.

By the year 2000, he was forty pounds overweight.

“I mean, I looked terrible,” he says. “I had dark eyes and pale, waxy skin. I had that allergic look. It was a really bad time.”

And so he decided, in 2004, to take a vacation. He describes it this way:

Yeah. I took my two daughters back to see my aunt, who had raised me. Very early in the visit, I was sitting at her kitchen table, and she asked me if I’d seen a BBC documentary about parasites and their connection with things like asthma and allergies and multiple sclerosis. And of course I hadn’t. But I went upstairs and got on the Internet, after lunch, and stayed on the Internet until perhaps two in the morning. I didn’t stop.

He's reading and reading.

"The work of all these researchers," he says.

One study after the next.

"Japan. Epidemiological studies. Africa. Animal models and multiple sclerosis.

This enormous weight of evidence."

Evidence that in the developing world, people don't really have asthma or allergies—they do, but not much. And what he discovers is that behind all this, to his shock, is an intestinal parasite: hookworms.

"Yeah," Jasper says, "I learned that asthma was 50 percent less likely in someone who had a hookworm infection."

So this just sort of, like, hits you?

"Oh yeah," he says.

What did you think when you read that?

"Oh, I immediately was determined to obtain hookworm," he says. "Immediately. I couldn't wait."

Just so we all know what we're talking about here, hookworms are very tiny worms, the size of a little hair. But if you take a microscope and you zoom way in, they have this big, circular mouth, brimming with pointy teeth—they're very creepy to look at. They remind me of those giant sandworms in *Dune*, the classic sci-fi film.

And the reason they have those toothy mouths is so that they can burrow up through your feet, ride through your blood stream and eventually end up down in your gut, where they start chewing on the inside of your intestines.

And this is what Jasper wants inside himself—wants them bad.

And so, did you just Google it?

“Yeah,” he says, “hookworms for sale. I figure, someone’s gotta be selling them.”

But Jasper didn’t have much luck.

“Nothing,” he says. “I contacted every laboratory supply company in the world, parasitology research centers, and all said the same thing: No. Various flavors of no.”

But he’d become obsessed with finding worms. He’s calling state health departments throughout the Southeastern United States, where hookworms were once extremely prevalent. All of them deny his requests. Finally, desperate and miserable, Jasper logs onto the World Health Organization’s website. If I can’t get the worms to come to me, he figures, I’ll go to them.

“I came to the conclusion,” he says, “that I was going to have to go to the tropics.”

So he looks up the English-speaking country with the highest rate of hookworm infestation. And he buys a plane ticket to Cameroon.

“My family thought I was nuts,” Jasper says. “I was middle-aged. I looked like crap. And here I was saying I was gonna go to Equatorial West Africa to infect myself with an intestinal parasite.”

So, fast forward a little. Jasper arrives in Cameroon, along the coast.

“Quite literally, and figuratively,” he says, “the armpit of Africa.”

He’s two hundred miles north of the equator; it’s extremely hot. He finds a guy to drive him around, and he and his driver would go to a village, get out of the car, walk up to these villagers and ask them to see the latrine.

“Just an open area of ground,” Jasper says, “usually with bushes so people can have a little bit of privacy.”

And here’s where the trip starts to get dirty.

“And I would go over to the area, remove my shoes and start walking. The first time I did that, I almost couldn’t do it. It must have been 110 degrees that day, a hundred percent humidity. And the stench, and the noise from the insects. It was so repulsive and so disgusting.

How many latrines do you think you visited?

“Oh, between thirty and forty.”

Jasper spent two weeks there, walking around in village latrines, and then he flew home.

“I got back from Africa in early February. So I was looking at allergy season coming up.”

And then one day in April, something happened that Jasper says made the trip worth it. Here’s how Jasper describes it:

That was such a good day. I got into my car and I started driving. And I had the window down; I felt the breeze blowing across my face. And in the past what they meant was very quickly my eyes would be itching uncontrollably, snot and phlegm was gonna be pouring out of every orifice in my face. And it didn’t happen. It didn’t happen. I just started screaming in the car. I was so happy. And I haven’t had an asthma attack since I went to Africa. I no longer have allergies. The vast majority of the benefit I’ve experienced has come from hookworm.

But it makes you wonder (makes quite a few scientists wonder, too): What exactly is the hookworm doing in there? Here’s how I understand it: The immune system that we learn about in elementary school is all about these attack cells that go after foreign

invaders and destroy them. And that's a big, important part of the immune system. But if the system were allowed to attack and destroy things unchecked, it could kill you.

In fact, there are lots of diseases where the primary symptoms are caused by the immune system attacking the body that it's really designed to protect. Allergies and asthma are just two of them. Some of the more serious ones are Type I diabetes, multiple sclerosis and Crohn's disease, in which the immune system actually starts attacking the inside of the intestines. There are about eighty of these diseases.

What scientists have found in lots and lots of mouse studies—and in some human studies to this point, too—is that once the hookworms get inside the gut and the immune system starts attacking, somehow hookworms actually stimulate this whole other side of the immune system, these cells that are designed to quiet things down and tell the attack cells to stop attacking—call them lullaby cells.

What lots and lots of scientists think, is that over thousands and thousands of years hookworms may have developed in tandem with the human immune system.

One of the guys who told me this is a doctor and researcher named Joel Weinstock at Tufts University Medical Center. He says it's a coevolution situation: "Parasites living within your body so long that your immune system changes."

And you end up with a scenario where everybody wins.

"Worm gets a home," he says. "There's food coming down the food pipe."

And in return, the human immune system gains some kind of positive, regulatory advantage. The worms help keep the immune system in check. So that if you happen to have a genetic glitch that causes your immune system to start attacking your own body—



like the ones the trip certain allergies or MS or Crohn's disease—the presence of the hookworms would keep things from getting too far out of control.

“And that's the gift,” Joel says. “You do something for the worm; the worm does something for you.”

And by that logic, what we in the West, in the richer countries, have done is we have cleaned ourselves up too much, that we don't have enough worms in us.

“They call it the Hygiene Hypothesis,” Joel says.

Basically, that we're too clean.

“We function like rainforests,” Jasper says. “We're ecosystems. And we've entirely eliminated a class of organism that coevolved with us, and our genetic predecessors, for millions of years.”

That's not to say being clean is a bad thing.

“I don't want to leave the impression that hygiene is bad for you,” Joel says.

“People can't go back to living in filth, kids playing in sewage by the river bank. But by improving our hygiene, you're also excluding organisms that may be important for making us well.”

So back to Jasper. He's feeling good, now that he has his worms. And he starts to wonder, could other people benefit from worms the way I did? Here's Jasper again:

It occurred to me that no one else was going to do what I did. It was too crazy. It was too frightening. It was too expensive. It was just a bad idea. I was extraordinarily lucky, looking back on it. I just couldn't see anybody else doing it. But if it did work, and the science was right, enormous amounts of people who were horribly sick could benefit from it.

So Jasper decides to open a clinic in Mexico. He knew there were people running bogus cancer treatment clinics down there and figured no one would give his worm therapy operation any trouble because “there was science to suggest it actually works.”

But starting a business takes money, and Jasper didn’t have any. As his worm obsession had distracted him further and further from his already struggling business, Jasper had sunken deep into debt. Jasper called friends and family to ask for seed money. He called everyone he could think of, and everyone turned him down. After weeks of making calls, Jasper contacted a childhood friend he hasn’t spoken with in 15 years and convinces the guy to lend him \$10,000. Jasper found a doctor, rented a modest row house in a relatively prosperous Tijuana neighborhood and traveled to Belize to pick up some more worms.

Now, the one thing that’s a little weird about this part of the story—okay, just one of several weird things—is how Jasper gets the hookworm he sells. When he went to Belize to pick up more worms, he brought them home with him in his own gut. He gets the worms he sells from himself, as in from his own bowels.

“Well,” Jasper says, “it’s a very easy organism to work with; it gets up and it walks out of it. So it doesn’t take an enormous amount of work to separate it from the feces. And having done that, I repeatedly wash them in solutions of antibiotics to make sure that anything that could live on them is killed.”

So in July of 2007, he launched a website, called his new company Worm Therapy and started promoting it around the Internet. For four grand, he says, he will inoculate you with hookworms. And then, he waited.

About a month later, Jasper started getting some bites, but mostly just from friends and family—and a not insignificant group of old business acquaintances he'd all but lost touch with. Jasper only charged his first four clients five hundred dollars—he says he dropped the price because he was working out the kinks in his process.

And he's infected several people for free—a friend in Santa Cruz who was broke, his six-year-old niece, his own children; in small numbers, Jasper says, hookworms are kid-friendly. Jasper says his first two clients, each of whom had been suffering from Multiple Sclerosis, have gone into remission. Jasper says he's also had success with Crohn's disease, in addition to allergies and asthma.

Todd Troutman was one of Jasper's first clients. For years Todd has suffered from terrible allergies. When a friend sent him a link to Jasper's website, Todd was doing freelance IT work and living in an RV, moving every few months in hopes of finding a town that wouldn't cause his allergies to flare up. He slept 15 hours a day. He avoided going outside at all costs, and when he did he wore a mask. He had seen four different allergists, and they prescribed shots and pills, but nothing helped. He had tried immune therapy, which failed.

Todd had filled his RV with air filters, and he was on the brink of buying a \$4,000 portable respirator, but after reading a few articles in scientific journals, Todd logged back onto Jasper's website and sent in his money. He didn't even call Jasper first.

“I was desperate,” Todd says. “It was all I could do to stay alive through the summer. I would have tried anything.”

In October of 2007, Todd drove to Tijuana to get his worms. Jasper dispensed a solution of water and hookworms onto a regular Band-Aid and attached it to Todd's forearm. Eight hours later, as the worms burrowed through his skin, he felt a terrible itch.

But by the next day, the itch had subsided and Todd removed the Band-Aid. The following week, Todd took a job with Cisco, the computer-networking giant, and moved into a house in San Jose. Two months later, his allergy symptoms had disappeared.

The stories Jasper and his clients tell sound too simple to be true. Insert worms, they say, and you're cured. Partly this is because the mechanics of the relationship between intestinal parasites and the human immune system is complex, and still not especially well understood.

In the year 2000 Joel Weinstock launched the world's first clinical trial in worm therapy. He invited volunteers suffering from inflammatory bowel disease to drink Gatorade stocked with whipworm eggs—which Joel says are far safer than hookworms, because they don't live as long. Six of the seven patients went into remission. Encouraged by the results, Joel conducted a larger test. Thirteen of 30 subjects showed substantial improvement. Next he experimented on volunteers with Crohn's disease, which also affects the intestines, and found that 21 of his 29 subjects went into remission.

Within months Joel began consulting with a German pharmaceutical company called Ovamed on a worm-egg capsule, in hopes of conducting a trial involving several thousand patients.

But there are no such studies on hookworms. And even Jasper admits he can't be entirely sure of the effects of his own treatment. Consider his website, where he makes

clear, among other things, that “this is experimental; one of the consequences of a new technology is a degree of uncertainty.” On the frequently asked questions page, he writes:

Question: Is it safe? Answer: A difficult question to answer. With hookworms, we use human hosts, so the organism crawling through your skin and into your bloodstream is only a few weeks removed from developing in the ovaries of a parent organism that feeds on the blood of another human. We can mitigate the risk of hookworm carrying fecal bacteria into your bloodstream, and we can use hosts that are tested for blood-borne pathogens, but there are mechanisms of vertical transovary transmission that may exist. Bottom line: do your research.

And that may be the biggest question behind all this uncertainty: Is it safe?

Only one scientist so far has tried to figure that out. David Pritchard, a parasitologist at the University of Nottingham, who in addition to studying parasites, examines the wound-healing properties of maggots, did a small safety trial in his lab a few years ago.

“Right,” he says, “we’ve got two safety trials under our belts, but we’ve yet to conduct the trials to show that therapeutic benefit results from infection with worms.”

All David and his colleagues have done is checked to make sure you won’t get sick and die if you put a load of hookworms in your gut.

“What we did,” he says, “was ten of us in the lab took worms at different doses. We were either given ten, twenty-five, fifty or a hundred worms, and then we had to report on the symptoms. And on the back of that study, we determined that ten worms were tolerated.”

But when David did this proof-of-safety study, he gave himself 50 hookworms. Which, he says, put him out of commission for a while.

“I felt pretty bad. Pain in the gut, really, ya know, you can feel them, cause they are biting on your tissues.”

Jasper, for his part, claims to have had as many as two hundred hookworms in his intestines.

The harsh truth, and the reason these worms have such a terrible reputation, is that if you have too many hookworms, they can cause serious side effects. There's diarrhea and nausea, of course. But the one that makes them a public health enemy is that they can give you anemia.

"If you have too many," David says, "you lose quite a bit of blood to these parasites."

"Well, if you take too many hookworms," Jasper says, "which you're not going to do if you come to us, the worst thing you're going to get is anemia. But it's not like you wake up one morning and you're drained of blood. It's very slow to develop, and it's very easy to deal with."

And another thing: The worms cannot reproduce inside the human body. They live inside you for five years, laying eggs that leave in your feces, hatch in the ground and, if you don't live in a sanitary place, may enter back through your feet. But Jasper says that isn't a problem here in the United States.

Jasper has sort of just gone for it. He's made a very cowboy move here.

"The scientific community, I think, they believe I'm premature."

Joel Weinstock is one of them. Too little is known about the way the worms might affect his patients. And there's the possibility that the worms will introduce other harmful agents like viruses.

“It’s not FDA approved,” Joel says. “It’s totally uncontrolled. You don’t know what it is. It could be the wrong organism. Or the wrong dose. There’s no consequence to him if it doesn’t go well. It’s dangerous.”

But I’ve talked to several clients—not just Todd—who had really severe allergies and asthma, and they say they’ve achieved these fantastic results. And Jasper also says he’s seen success with a few multiple sclerosis patients and several Crohn’s disease patients, too. In fact, things went so well at the lab in Tijuana, after the first year, Jasper moved the lab up to his house in Santa Cruz.

Now, all you have to do is send a check, and he’ll mail the worms right to you.

“People contact us,” Jasper says, “and we’ll have them complete a questionnaire, submit a recent blood test. Then we’ll ship them a dose and all the materials and equipment and the instructions necessary to infect themselves.”

How many people do you think you’ve infected?

It’s around 85 right now.

How is business?

“Business is adequate,” Jasper says, “but I honestly don’t know why I don’t wake up in the morning, with my front garden 20 deep with people with ulcerative colitis, Crohn’s disease, allergies. I just don’t know why I’m not completely buried.”

“Honestly, I thought I was gonna be *Time* Man of the Year, that I was going to help millions of people get better. I was going to be universally applauded as this savior of mankind. I was going to retire to live a life of splendid indolence in the Caribbean with my new wife until I die. I was going to live happily ever after.”

The way he sees it, people are scared. And they don’t need to be.

“People are coming from a point of view of what they learned in kindergarten about clean drinking water and sewers,” he says. “To them worms and parasites are so repulsive that there’s nothing good to be said about them.”

Jasper goes on, getting increasingly worked up:

What’s really, really frustrating about it is it’s so easily avoidable. All this suffering; it’s all so unnecessary. Honestly, I feel like I’m in one of those stupid movies where you’re the only guy who knows what’s really happening and you’re running around and everyone thinks you’re a complete lunatic. You’re the only one who knows the truth, and you can’t get anyone to listen. It’s like a bad dream. I can make you better. It’s simple; it’s cheap. I mean, for God’s sake, these organisms fall out my rear end everyday a half a million at a time. The raw material is human excrement, for God’s sake. All people have to do is open their minds. Are you really that scared of a little worm?

Now, there’s a coda to this one: One afternoon a month or so after we aired our story about Jasper, he got a knock on his front door. When he opened it, he encountered a man in dark slacks and a khaki jacket; the man flashed a badge.

“I’m with the FDA,” he said. “May I come in?”

“Sure,” Jasper said calmly. But in his head, he was already making plans.

On the one hand, Jasper says he kind of saw this coming.

“I was surprised it took them so long,” he says. “It’s not like I was stupid or oblivious or unaware or naïve. So I talked to him. And at that time they were just saying, your website needs to come down; you’re making medical claims, and you can’t do that.”

And then the FDA guy told Jasper something that surprised him.

“He told me, we’re still trying to figure out how to classify what you do,” Jasper says. “We don’t really understand it.”



After an hour or so, the man left, saying he'd be back in a couple days. On Friday, he returned, this time with another inspector, a woman in a lab coat. And something about their attitude, Jasper says, had changed dramatically.

"The whole tenor had changed," Jasper says. "Before you had this friendly guy, who actually, I think, quite liked us, and now all of a sudden, he can't even look me in the eye."

It turned out, Jasper says, that the FDA had classified the hookworm as "an investigational new drug." (I contacted the FDA to confirm this, but they refused to comment—I was able to confirm that an investigator visited Jasper.) As a new drug, the worm was subject to federal regulation. Even though the FDA never threatened Jasper with prosecution that day, the way he saw it, he'd been violating federal law for months. This terrified him.

"Plan B was to go and live in the tropics," he says. "And that's what we did."

Jasper had friends who had broken federal laws, he says, and one of them had his house raided by guys with bulletproof vests and automatic weapons. Logical or not, this is what Jasper saw happening to him. So as soon as the investigators left, Jasper and his wife, Michelle, started packing.

"We worked for 36 hours without sleep," he says. "Signed the car over to someone. Wrote out a letter of guardianship for my mother to deal with repatriating Michelle's children to England. Say goodbye to the children. Abandon the house."

They filled their bags with food and supplies for the tropics.

"Threw in a few sentimental items," Jasper says. "Got our passports."

And they split.

Jasper and Michelle rode a bus across the border into Tijuana and after that just kept going. Jasper asked me not to report on where he ended up. But he did say he was in the process of rebuilding his lab. Getting supplies and equipment was turning out to be more difficult than he'd anticipated, and I could tell he was frustrated. But the more he told me, the more I wondered, why don't you throw in the towel? What would it take to make you stop?

His response makes him sound like a crusader for alternative medicine:

Death, jail, maybe being forced to move again. What do I say to these people? Ya know, sorry, you're gonna be in a wheelchair. Or, sorry, you're gonna have to get your colon cut out. When you know you can help people who are suffering like that, in some ways, the decisions you make aren't really decisions. It takes on an inevitability. Life does not deliver what you want or hope or probably even deserve, on a regular or reliable basis. You deal with it and move on.

Last I checked, Jasper had moved on to a town in the United Kingdom. He still sells worms.

## The Luckiest Lobster

This piece came about as a result of a conversation Robert and I were having about “The Prometheus Tree,” the piece that follows this one in the collection. In the wake of the story about the old tree, we were wondering, why do old creatures seem special? And Robert mentioned he had heard about a customer in an upscale Manhattan restaurant demanding that a large lobster be removed from the tank in the lobby and sent back to the sea.

So I went poking around for the story, found it and quickly discovered a dozen of these sorts of stories. Lobsters, it turns out, have been rescued from Reno, Nevada; Cape Cod, Massachusetts; and even Vancouver, Canada.

What is it about old creatures that makes us feel they’re special? That they’re wise? Why do we feel affection for them? Why do some of us, sometimes, even feel an urge to protect them?

And I found a story that has a lot to say to that question. It begins in a small suburban supermarket. I heard about it from a lady named Bonnie Hazen.

“I’m a registered nurse,” Bonnie says. “And to just tell you briefly, what happened is I had just gone to our grocery store.”

Just any old day?

“Just any old day, nothing special about that day.”

And where is this?

“In McMurray, little McMurray, Pennsylvania. We’re about 15 miles south of Pittsburgh.”

It’s August of 1990.

“So I was looking around, ya know, admiring the new seafood department, and I noticed this tank.”

A lobster tank.

“And there were only two lobsters in the tank.”

One, she says, was really small; the other was enormous.

“This huge, behemoth that was just so massive.”

How big is big, in this case?

“He was, like, from the tip of my finger to my elbow.”

So she sees this big lobster, and she’s like, that tank is way too small—she thought the lobster looked cramped. So she goes over to the guy behind the seafood counter.

And she says: “What’re you gonna do with this big lobster?”

“And he kind of just let me know that it was a promotional for the new seafood department.”

In other words, this big lobster that would get sent around to different supermarkets when they wanted to attract attention.

“And I just made a few more inquiries and worked my way up to the store manager, and he referred me to the vice president of the chain

Oh, straight away?

“Oh yeah, oh yeah, because they couldn’t answer my questions. I probably was a little bit of a pain. Ya know, just asking, like, what’re you gonna do with him?”

And this is the moment where the manager of the store decides to do something smart. He thinks: Okay, we have this complaining lady, I think I can solve the problem.

And he decides to make her an offer.

“The bottom line was that I could have him, if I could arrange for him to return to Maine.”

Seems the guy thought all lobsters come from Maine.

“I’m like, okay, how do I do that?”

Which is a fair question.

And as weird as this seems, Bonnie’s experience is not entirely unique. At least that’s what the journalist Trevor Corson told me. And he should know—he wrote a book all about lobsters a few years ago, called *The Secret Life of Lobsters*. But it included some pretty juicy tales about the secret lives of the people who love and hate lobsters, as well.

“Some people may remember the story of Mary Tyler Moore,” Trevor says.

Most people might not, though.

“In 1994,” Trevor says, “Mary Tyler Moore developed a crush on a large lobster—a twelve pounder named Spike—in Malibu, California, in a restaurant called Gladstone’s. And she put up a thousand dollars for the right to rescue him.”

But it wasn’t that easy.

“Then Rush Limbaugh heard about this,” Trevor says, “and he called the restaurant and offered 2,000 dollars for the right to eat Spike.”

What happened? The restaurant refused to get between them. And it kept the lobster on display. For how long? Nobody knows.

Trevor says he’s read about dozens of these lobster-rescue stories. There was George, snatched by a diner from City Crab and Seafood in New York City and whisked

to the Atlantic with the help of PETA. Another New York lobster, Peter, escaped a seafood restaurant called Oceana.

The owner of a fish market in Cape Cod agreed to release a giant lobster when a local elementary school told him he was setting a bad example selling such a big lobster. So he invited some of the students to help him set the lobster, who they named Seamore, free into the ocean. About ten kids showed up. After they dropped their lobster in the water, one of them asked: “Why didn’t we just eat him?”

Even Paul Watson, famous for his exploits terrorizing Japanese whalers aboard his ship *Sea Shepherd*, has rescued an old lobster, paying 277 dollars for a lobster he found in Reno to be shipped back to Maine.

But let’s get back to Bonnie’s story, because it turns out, Bonnie’s lobster rescue is the first one ever recorded. The original lobster rescue.

So it’s still 1990. Bonnie has left the supermarket, sans lobster.

And she’s at home thinking: “I, I didn’t know what to do.”

The next morning, she got on the phone.

“I started calling some of the local animal organizations,” she says, “Animal Rescue League and the ASPCA. Just locally trying to see if there was anybody out there that could help. And there really wasn’t; they’re more into mammals, dogs and cats.

They’d probably never even heard of such a thing.

“No, no. They basically told me, forget it.”

She’s on and off the phone all day.

“Oh, I was on the phone for hours.”

She got a little obsessed.

“But I had the time”—she was a stay-at-home mom—“and it was kinda fun.”

But Bonnie was running out of options; she had one idea left.

“I called the Cousteau Society,” she says, “because I was a member of the Cousteau Society, and they suggested I call our local newspaper.”

And that changed everything.

On Saturday morning, an article appeared in the *Washington Times*—McMurray is located in Washington County—beneath the headline, “Cruisin’ Crustacean.”

“Yeah, not cruising,” Bonnie says, “but cruisin, C-R-U-I-S-I-N.”

And it read: “McMurray woman talks supermarket into releasing large lobster.”

“I really didn’t talk them into it,” Bonnie says.

“Yes, it’s a long story,” the article begins. “It began Friday morning, when Mrs. Hazen entered the Giant Eagle supermarket. There in the store’s newly opened seafood section, she encountered Nick.”

Oh, the supermarket gave the lobster a name—Nick.

“Nick,” the article reads, “clearly the king of crustaceans was lounging in a large, circular saltwater tank, along with several lesser lobsters.”

“There was just that little one,” Bonnie says.

“Something in the way Nick moved,” the article reads, “spoke to Mrs. Hazen, so she spoke to several Giant Eagle employees. Mrs. Hazen, who describes herself as environmentally active, told them she thought Nick might be happier back home in Maine than on someone’s Corningware.”

“I really didn’t say that,” Bonnie says, giggling.

“Don’t worry, Mrs. Hazen was told,” the article reads. “Nick was a professional

lobster, seventy years old.”

“Well,” Trevor says, “we don’t actually know; there’s no way to technically age a lobster perfectly. Estimates are from fifty to a hundred years for those big suckers.”

“I’m not an environmental crazy,” the article quotes Bonnie. “I eat lobster, but I think they’re overharvested. Nick must be set free. They told me I could have Nick if I promised to take him to the ocean.”

The article concludes: “Mrs. Hazen has no money for such a trip.”

“Sounds like I’m destitute,” Bonnie says. “Anyway, I guess that’s what appeared then in the Saturday paper.”

And that could’ve been the end of it.

But: “Saturday morning we got an early phone call,” Bonnie says, “and there was this woman on the other end of the line. And she was saying she was in town for her dad’s funeral, and she was returning that afternoon to Maine.”

That woman was Toni Leone, an office manager at a staffing agency in Portland, Maine.

“So,” Toni says, “I figured I’ll just bring him back with me.”

Why would you even think to do something like that?

“Because he was a massive lobster,” Toni says, “in a teeny-weenie tank that, literally, he could barely move in.”

Now, there’s one other thing: Remember, Toni was back in Pittsburgh for her dad’s funeral. So I ask: Was this in any way an homage to your dad?

“Oh my God,” Toni says, “he loved lobster. He absolutely loved to eat lobster.”

To eat lobster?



“Yeah, he would eat them like crazy.”

But Toni says he also loved that his oldest daughter would do things that none of his other kids would ever do.

“Yep,” she says, “he would know that I would do something like that; he would expect me to do something like that.”

So, anyway, Toni and Bonnie, they’re on the phone. And at first Bonnie is a little suspicious.

“I said, are you sure you’re not just saying this to eat him? Cause, I mean, ya know.”

And Toni says: “No, I wouldn’t eat anything this big; he’s too old.”

“She reassured me,” Bonnie says, “and she sounded very nice, so we agreed to meet at Giant Eagle. So, of course, now I’m getting my daughter, my youngest daughter, and she’s saying, oh, we gotta hurry up; hurry up and dress; we gotta go to Giant Eagle.”

So Bonnie meets Toni at the supermarket.

“She had, I think, a two o’clock flight,” Bonnie says.

And when she got there, a television crew had set up camp in front of the store.

“I didn’t know there was gonna be a photographer there from our local TV station in Pittsburgh,” Bonnie says.

Anyway, Toni went next door to the local Murphy Mart, looking for something in which to carry the lobster.

“Toni bought the biggest Styrofoam cooler she could find,” Bonnie says.

“Which really still was a little too small for him,” Toni says.

“He barely fit,” Bonnie says.

“But we got him in there, taped it up as best we could,” Toni says.

Toni’s son Jason, age 12, decorated the cooler with some drawings and a message: *Get me to the Atlantic, my home, where I can freely frolic and comfortably roam.* And on top of the cooler, he wrote: *Atlantic or bust!*

And after that, Bonnie says, they “put him in a van, and away they went.”

“When we got to the airport,” Toni says, “we get up to the reservation desk, handed him to the stewardess, and she put him in a chair in first class.”

Who puts a lobster in first class?

“We were in coach,” Toni says. “This lobster is up in first class.”

So the plane touches down in Portland, Maine, where the wildlife police are waiting.

Is anyone able to determine, I ask Toni, what everyone here seems to have assumed, that this lobster comes from Maine?

“No,” she says. “In fact, it probably wasn’t caught here.”

Why do you say that?

“In Maine you can’t catch big lobsters like that,” Toni says. “That’s illegal.”

Trevor backed her up on this point.

“Because the big lobsters,” he says, “are the ones that make more babies.”

“They have size limits on their lobsters,” Toni says.

Which means Toni was bringing Nick back home to a place she could reasonably suspect was foreign to him.

“It’s a foreign country,” she says. “But he can make friends.”

So the next morning, Toni says: “The harbor patrol called and said, do you want

to go with us, we're gonna put him in the water."

So Toni and her son rush down to the docks. A newspaper reporter got wind of the story and met them there. And all three of them scrambled onto a Maine Marine Patrol boat, and headed out into the Portland harbor.

And according to the reporter: "Just after one p.m., as the marine patrol boat rocked in thirty feet of water, Toni Leone carefully dropped Nick over the side. She watched him sink in the choppy, fog-shrouded waters, and then grinned: 'I'm glad he made it. Isn't that nice?'"

It is nice. But here's the real question: When we look at our fellow creatures, and we decide: Who do we want to protect? We include some groups, and we exclude others. And oftentimes how we make that choice seems almost entirely arbitrary. For example, why would someone—Bonnie, Toni, anyone—want to save this lobster?

"Yeah, I mean, a lobster is not cuddly," Trevor says, "not by any stretch of the imagination. It's certainly not soft."

Perhaps there was some beauty to the lobster?

"I actually think that lobsters are very attractive," Trevor says.

Wait, really? Did you always think that?

"I have always thought, ya know, a lobster is like, they're muscular and curvaceous at the same time," Trevor says. "They're like Pop Eye arms, those claws. And then there's that nice, curving tail. And I just think—"

I think Trevor might have some hunky lobster calendar—Lobsters of 2008—and that's just kind of weird, if you ask me. I mean, that can't be the reason people keep saving lobsters over and over again. And if that isn't it, then what is?

“I think that it has partly to do with our obsession with longevity,” Trevor says.  
“When it’s one that big and that old, suddenly the rules are changed. Here is a creature that has made it through all the tests of life, and it deserves our respect now.”

And when you ask Bonnie to put it into words, she struggles a little.

“He was unique,” she says. “He was special. And I just felt that he just didn’t deserve to be in that tank at his age.”

Which makes sense. But is that all?

“Everything kind of converged at that moment,” she says. “That’s the only way I can explain it.”

She sighs heavily.

“I just kind of went with it.”

## The Prometheus Tree

This piece aired in an episode about mistakes. Alongside it was a piece on how Ted Kaczynski's psychotic nature may have been caused, in part, by a research project at Harvard when he was an undergraduate decades before he became the Unabomber. Also in the episode is a story about a massive forest fire that destroyed thousands of acres of land, hundreds of homes and killed a man. It's root cause? An effort to save a tiny bird called the Kirtland warbler.

The story about the tree, like the one about the lobster, got its start in a conversation Robert and I were having. Robert had heard about Don Currey many years before and had once taken a crack at reporting the story but gave up. We decided I would take a second run at it. This is that second run.

In Western Nevada, there's a mountain range locals call the Whites, and right in the middle of it is Wheeler Peak. You can't miss it—it's the second highest peak in the state. I learned about it from a writer I know named Michael Cohen, who lives just down the road from the mountain. He writes poems and essays about the landscape; his wife paints them. Together they create beautiful art about a beautiful place. But Michael told me a story about something horrible that happened on this mountain. And it begins with a grove of very old trees, way up on top of the mountain.

"You can see the trees from a distance," he says, "and their wood is so bright that it actually glistens in the sun."

They're called bristlecone pines.

I ask: Can you describe what they look like?

“Sure,” Michael says. “They tend to be shorter, broad at the base. They get very, very old, and as they get old they get tortured or gnarled.”

And they look kind of dead. In fact, they’re more dead than alive; the majority of a bristlecone’s tissue is dead wood. Only a thin layer around the outside of the tree is alive. And as this outer layer grows, it causes the tree to sort of twist up toward the sky.

“The overall effect,” he says, “is sort of electrical.”

They look kind of like what you’d expect to see in a Tim Burton movie.

And in addition to these trees, this story involves a scientist named Don Currey.

It starts in the summer of 1964.

“Don Currey,” Michael says, “was a graduate student from North Carolina. And he was young.”

How young?

“He was 30 years old.”

And he’d just gotten a big grant from the National Science Foundation to do some climate change research. Not climate change now, though, climate change thousands of years ago. Because he’d learned that you can sort of travel back in time by looking at old trees. I called up a guy named Ron Lanner, a retired Forest Service scientist, to learn more about the science Currey was doing, to learn more about his whole story.

According to Ron, you can “go back into the past using the spacing between tree rings, the annual rings.” You can use the tree rings “to determine whether it was colder at one time, or rainier at one period in the tree’s life.”

So Currey is up on top of this mountain, up among these trees, and he needs to find one that he can look inside, in order to see what the weather was like, way back in

the past. The older the tree, the further back you can look. And that's why he's come to Wheeler Peak—it's got some very old trees.

Scientists began studying the bristlecone pine in the 1950s, led by the work of a man named Edmund Schulman, a dendrochronologist at the University of Arizona. In 1958, in the pages of *National Geographic* magazine, Schulman announced that he'd found a grove of extremely old trees. He called it the Methuselah Walk, after one of the oldest specimens in the grove, which he aged at 4,600 years.

Schulman speculated that the trees “may be the oldest living things on Earth.”

This is the grove Currey had come to, so it wasn't hard for him to find a suitable tree.

“Five minutes of looking,” Currey told a reporter in a documentary film once, “was all that was involved.”

He said these words in a *PBS NOVA* documentary. Currey died recently, and this is basically the only time he ever talked about the story on tape. In the clip, he's sitting on the stump of a dead tree, atop a rocky mountain, the wind tousling his gray hair. He's stout, wearing a navy fleece jacket and hiking boots.

“Literally,” he says, “the first old tree that we climbed to.”

“He found a tree,” Ron says, “that he described as looking super, super old.”

So Currey takes out this special drill, which scientists use to take, like, a core sample to look at the rings—looks like an old-time hand drill, essentially, but longer. Currey presses it up against the tree.

“Gives it a good push to get it through the bark,” Ron says.

And he starts twisting it in.

“Clockwise,” Ron says, “into the tree.”

But he wasn't having much luck.

“The normal approach to coring the tree wasn't working,” Currey says.

It becomes harder and harder for him to turn this thing into the tree.

“And eventually,” Ron says, “the bit of his drill broke off in the tree.”

And this isn't just any drill; he ordered it from Sweden. And the whole time, he's thinking, if I can't get this thing out of the tree, I'm screwed.

“That would mean the research project would be lost for the year,” Michael says.

So at this point, he kind of lumbers back down the mountain, dejected.

“He managed to find the district ranger,” Ron says, “and told him the problem.”

“He was sitting on the steps of the Forest Service station,” Currey told the *San Francisco Chronicle* years later. “They'd just gotten milkshakes or something and were just cooling off.”

And Currey says, guys, my drill, it's stuck in the tree. What should I do?

And the district ranger, a man named Don Cox, tells him, don't worry, Don. If you really need the data, we'll just cut the tree down. Three decades later, in a memo about that day, Cox wrote: “I knew that to be scientifically accurate in determining the age of a massive tree, it was necessary to have a cross-section, and that coring alone was not acceptable.”

“They had cut down bristlecones all over the place,” Currey told the *Chronicle*, guessing that the Forest Service had felled maybe a hundred trees already. “I was amazed at the desecration.”

And with that in mind, Cox figured, this is just one ordinary, unremarkable tree.



“I reported this tree was like many others and was not the type that the public would visit,” Cox wrote in his memo. “I felt that this tree’s best purpose would be to serve scientific and educational programs.”

So Cox decides to send some guys up the mountain to cut it down. He loads up a mule with some gear—chainsaws, ropes, pulleys. And he starts rustling up a crew, including a guy named Mike Drakulich, a part-time Forest Service employee and owner of a nearby motel called the D-Bar-X Ranch.

When the crew arrives at the tree, Mike refuses to cut into it. According to his widow, Mike lays his hand on the trunk of the tree when he sees it.

“I’m not cutting this tree,” he says. “It’s too old.”

But the rest of the crew goes on without him. They start slicing into the tree. It takes a while to cut it down, because the wood is extremely dense, full of knots and gnarls. But eventually, the tree falls over.

And once it’s down, they start cutting it up into pieces.

“They cut some slabs out of the lower part of the tree,” Ron says.

Currey would later write, in the sanitized language of a scientific report: “To facilitate compilation of a long-term tree-ring chronology for the Wheeler Peak area, one of the larger living bristlecone pines was sectioned.”

A month or so later, the Forest Service sends a few guys back up the mountain to fetch a few pieces of the tree that had been left behind—Fred Solace, Harvey Tibbs and Roy Goodman, all Forest Service employees. Snow falls softly on the rocky peak when they arrive. They load a cart with several hunks of tree and start making their way down.

A mile or so into the hike, Solace starts to complain that he is too tired, and after a while the other men hoist him into the cart with the tree wood.

Eventually, they stop at a creek bed to rest and lift Solace down to the ground. As soon as they put him down, Tibbs recalls, Solace turns his head to one side and says, “Oh my God.” And right there, he dies.

“He died in my arms,” Tibbs says.

Meanwhile, back in North Carolina, Currey is getting ready to count the tree rings. He throws one of the slabs the Forest Service guys cut from the tree onto a big desk and gets out a magnifying glass, because the rings are really small. Then he starts counting. And as he counts, he’s making little marks.

“Pinholes or pencil-marks,” Ron says, “every fifty or a hundred years.”

By the end of the first day of counting, he gets back to a thousand years. Imagine that, a thousand years—it’s the Dark Ages; we’re in Europe eating raw possum.

Day two. By the middle of the day, he gets back to Jesus—the Roman Empire, gladiators, centurions. But even at that point, he’s only halfway finished. He keeps counting.

Currey from the *NOVA* documentary again: “We could begin to see that we were getting over 4,000 years, over 4,500, over 4,600. And we ended around 4,900 years.”

“It had 4,844 annual rings in it,” Ron says.

And he estimates that the tree is probably even older than that. It had been cut about a foot above the ground, meaning there were older rings he hadn’t been able to count. Currey later wrote: “Allowing for the likelihood of missing rings and for the 100-

inch height of the innermost counted ring, it may be tentatively concluded that WPN-114 began growing about 4,900 years ago.”

And at that point, in the summer of 1964, the oldest tree anyone had ever found was 4,600 years old—the one Schulman had found in 1958. In other words, Ron says: “He had himself the oldest tree ever.”

But he had killed it.

“And you gotta think,” Currey says in the *NOVA* documentary, “I’ve got to have done something wrong. I better recount. I better recount again.”

And he did. He counted those rings over again five times—took him weeks to do it. He got a slightly different number every time. But every one of those numbers was higher than 4,600. And at that point, it was clear. The world’s oldest tree was dead.

When the locals backing Nevada found out, they were devastated.

“It was truly, it was horrifying,” Michael says. “It was like a family tragedy.”

People had given these trees names.

“There was Buddha and Socrates,” Michael says.

“Methuselah,” Ron adds.

And Ron says they’d called Currey’s tree, the Prometheus Tree. The guy who named that particular tree was so angry that he wrote an article for a big national magazine, calling Don Currey a murderer.

“All across the country,” Ron says, “it was a tremendous uproar.”

Saying what exactly?

“About killing the world’s oldest living organism,” Ron says.

And that's the thing: This wasn't just the world's oldest tree; it was the world's oldest anything. It was older than the oldest sponge, which was something like 1,500 years old; older than the world's oldest animal, which is some sort of oyster that's 405 years old; older than any other living things on the planet.

So where does that leave Currey? Well, right after this happened, Currey pretty much stopped doing research on trees. He basically studied salt flats for the rest of his career—big, treeless salt flats. And aside from that little NOVA clip from before, he hasn't really ever gone on record talking about this. I talked to dozens of his friends, family, colleagues and former students, and he didn't talk much with them about it either. Can't blame him, really.

But Michael told me about this one moment: He was being interviewed by a television reporter about his salt flats research.

"This would have been in probably the late 80s, early 90s," Michael says.

Years and years after the whole tree incident.

"And all of a sudden," Michael says, "out of a clear blue sky, the television reporter asked him, oh, aren't you the Currey who killed the world's oldest tree? He was completely ambushed. And Currey just turned his back and ran away."

## The Origins of Goodness

This piece will air in December 2010 as part of an hour on altruism. The show will also tell the story of a famous mathematician who, after proving that all goodness can be explained away by mathematical logic, went on an altruism bender that ended up driving him crazy. It also features several stories about winners of the Carnegie Hero Medal, which is given to ordinary people who put their lives at extreme risk in order to save another person—specifically we tell the stories of a woman who saved someone from an attacking bull, a man who pulled three young men from a burning car and a New Yorker who dove onto the subway tracks to save a young man who was having an epileptic seizure.

All of those stories do more to raise questions—primarily: why does goodness exist in a selfish world?—than answer them. This piece is my attempt to deliver some answers. You will meet a biologist crammed into a bottom of a cavernous tree in Costa Rica. You'll experience a computerized battle royal between good and evil. And you'll enter the miserable trenches of World War I.

But before all that, consider the cheetah, the fastest land animal. Uniquely designed to chase down gazelles on the African savannah, it can reach speeds to 70 miles per hour. How did it get that way? Darwin's theory of natural selection tells us that today's cheetah is what it is because over millions of years it outcompeted all the other sorts of cheetah that cropped up—not to mention all the other species of large predators. In the abstract, this is an easy idea to think about. But think about what that really means.

Here's how the evolutionary biologist Richard Dawkins puts it: "The cheetah is the end product of a sort of evolutionary arms race, in which thousands, millions of

animals have died. The shaping, the carving of the shape of a cheetah has come about through millions of unsuccessful cheetahs starving a dying.”

In his book, *River Out of Eden*, he writes: “In the minute it takes me to compose this sentence, thousands of animals are being eaten alive. Others are running for their lives, whimpering with fear. Others are slowly being devoured from within by rasping parasites. Thousands of all kinds are dying of starvation, thirst, disease. It must be so.”

“The sheer number of deaths,” he goes on, “the number of violent deaths, is horrifying. And yet it’s got a sort of savage beauty.”

Or you could just say it’s savage.

“Darwin himself was worried by all this,” Dawkins says. “He recognized the total horror of the suffering in nature. It was one of the things that actually made him lose his faith.”

But if that’s the way nature works, then how is there goodness in the world? Why do creatures share and show kindness to one another? Most biologists will tell you that the vast majority of kind acts you see in nature are the result of something called kin selection, in which a creature helps another creature only because the two share genes. The more genes you share, the more sensible it is to put yourself at risk for someone else. Dawkins first popularized this idea, in his book, *The Selfish Gene*.

But it’s an old idea: When asked in 1865 if he’d dive into an icy river to save his brother, the biologist JBS Haldane famously said: “No! But I would save two brothers or eight cousins.” His reasoning? He shares roughly half his genes with a brother and one eighth with a cousin. The way he saw it, risking his genes would only be worth it if he was likely to save an equal number of them in a collection of relatives.

You could say making that kind of calculation is crass, even inhuman. But the truth is, scientists have demonstrated quite clearly that, for the most part, this is how it works in nature. But let's consider a case that complicates things.

This is a story about vampire bats. I heard it from a named Jerry Wilkinson. These days, he's chair of biology at the University of Maryland, but when this story happened, back in the 1970s, Jerry was still a graduate student. And he'd gone down to Costa Rica to study vampire bats—specifically, the common vampire bat, which feeds on mammalian blood.

And the part of the country Jerry ended up in was just crawling with this bat.

“Because I was on a cattle ranch,” he says.

And at night, the bats would fly all around sucking blood from the cows. But in the daytime, they went to sleep inside these big, hollow trees.

“So big,” Jerry says, “I could crawl inside them.”

And so each morning, Jerry crawled inside the tree, where the bats were hanging.

“Maybe 20 would be a large group.”

And they were pooping on him.

“The poop is like tar. And we wore respirators, because there was a fungus problem. And we used binoculars to see them up close.”

Despite all the hassle, Jerry says he crawled into the tree every morning for weeks. And eventually, he says, he noticed something about these bats that doesn't at all line up with the pictures most of us probably have in our minds of vampire bat behavior.

The bats, he says, “behave quite a bit like primates.”

They're friendly—playing, wrestling, grooming each other.

“And they’re obviously being nice to each other,” Jerry says.

And eventually, after lying in the tree for months, Jerry witnessed a behavior that simply shocked him, something nobody had ever seen bats do in the wild.

“Yes,” he says, “but it was one observations, so it didn’t mean much yet.”

What happened, basically, is this:

One bat, Jerry says, would sort of “sidle up to another bat.”

Wrap its arms around it in a sort of vampire bat hug.

“And try to lick at the mouth of the bat it’s hugging.”

And then, something amazing happened.

“You can see the tongue of one bat going into the mouth of the other bat.”

Like a kiss. But what’s really happening is that the one bat is giving some of the blood from its belly to the other bat—regurgitating it like a mother bird. The one bat is sharing with the other one. And nobody had ever seen this before.

This was the late 1970s, and Dawkins had literally just published his book, *The Selfish Gene*, which made the point that this kind of behavior basically had to involve relatives. But Jerry had a hunch something else was going on.

So he set up a little experiment. He goes out one night and catches some bats.

“I took animals I knew were not relatives,” Jerry says.

Just friends.

“I brought them into my house at the time,” he says. “Got a lot of blood from the slaughterhouse.”

Put the bats in a little cage.

“And then every night I’d take one bat out, starve them a little.”



And it turns out a bat can't go very long without a blood meal.

"Three days," he says. "Three days at most, and then they're dead."

So you've got this bat, she's been kept out of the cage all night, and she's hungry.

"Then put the bat back in," Jerry says. "And typically she will beg from more than one individual."

And every time.

"She gets fed by someone," he says.

And Jerry repeats this with a different bat each night.

"I just kept track of who fed whom," he says. "I went through everybody at least once. And while I was there, I was up all night every night, so I wasn't doing a lot of analysis."

But a few months later, when Jerry got back to graduate school, he checked his data.

"I looked at the patterns," Jerry says, "and discovered that the bats were reciprocating."

So let's say we have one bat named Agnes and another one named Sally. If on the first night, Agnes fed Sally, then on the second night, Sally fed Agnes. This happened without fail, over and over again. And the amazing thing about it is that Agnes fed Sally not because she was related to her, but because Sally had fed her the night before.

"Right," Jerry says. "And I was thrilled I'd found something suggesting it wasn't all just about relatedness."

Friends trump family. And Jerry says this idea—which scientists had started called reciprocal altruism—was brand new, so new that nobody had shown it actually

exists in nature. And Jerry says when he published his findings, they landed pretty hard.

“I gave talks all over the place,” he says, “and there was a surge of interest in trying to find cases like this.”

But the weird thing is: Nobody really found anything.

“I don’t think it’s unique,” Jerry says, “Chimps do it.”

Humans do it.

“But I do think it’s probably rare,” he says. “Vampire bats have this particular situation with blood.”

It’s hard to get blood, and if a bat misses a meal, it won’t last long before it dies.

“If bats didn’t share blood,” Jerry says, “they wouldn’t have made it.”

And as interesting as this bat case is, it doesn’t tell me very much about the creature I’m most interested in: humans. How does goodness emerge in us? Why do we cooperate with people we’re not related to, if deep down, we’re just selfish animals like all the rest?

And when I asked that question to a Cornell mathematician I know named Steve Strogatz, he told me a story about some experiments that were done back in the late 1970s, by a guy named Robert Axelrod.

In those days, he was a professor of political science at the University of Michigan. And it turns out he still is. So I got him on the phone for this one, too.

One of the things on every political scientist’s mind in the 60s and 70s was the relationship between the United States and the Soviet Union. And Axelrod was very curious about why the two superpowers couldn’t just work things out.

In general, he says, “why countries don’t get along as well as they could.”

More than that: “Under what conditions would people who only cared about themselves cooperate with others.”

He was trying to explain why bad, or even mean people might be nice.

“Well,” Axelrod says, “I would say selfish people, why even selfish people might be nice.”

And he says around this time, a number of scientists who were also interested in these kinds of questions had started thinking a lot about this thought experiment called the prisoner’s dilemma, which is named after a situation you often see in TV cop movies, where two prisoners are arrested for a crime, and the cops put them in separate interrogation rooms, hoping to get one guy to throw his buddy under the bus.

But that version of it can get a little confusing. So to make this scenario totally clear, Steve told me a slightly different version, thought up by another mathematician named Douglass Hofstadter.

“Let’s say you want money,” Steve says, “and I want diamonds. Like maybe you’re a fence and you’ve got these hot diamonds.”

A fence, by the way, is a person who takes stolen goods and sells them.

“Yeah,” Steve says, “so you say you’ll leave your diamonds somewhere in the woods. And I say I’ll leave my money someplace else in the woods.”

But as it turns out, Steve and I are pretty selfish guys. This is important. So when it comes time for us to make our little exchange, things don’t quite go as planned.

“Maybe I show up in the woods and I leave an empty bag,” Steve says. “That’s good for me—really good for me.”

But on the other hand, if I can get away with leaving Steve a bag of rocks, then

that's good for me. And Steve says, in this scenario, it's actually always best for him to leave me an empty bag; it's always best for him not to cooperate with me.

"If you do leave me the diamonds," Steve says, "then I get diamonds for nothing. And if you don't leave the diamonds, I'm still better off leaving an empty bag, because I don't want to be a chump and leave money for nothing.

"So either way, whatever you do, I should leave you an empty bag."

But this assumes, of course, that I can't hunt Steve down and hurt him.

"That's an important point," Steve says. "I want to distinguish between when we play this game only once, versus maybe we want to have a long relationship and do this once a month for the rest of our life."

If we want to do that, Steve says, things change.

"Everything changes."

Because if you think about it, Steve says, if he always left an empty bag in the woods, and I always left a bag of rocks in the woods, "we will have had this annoying drive into the woods," and gotten nothing for it.

Nobody wins.

"Nobody wins," he says. "We would be better off not doing anything."

And that's assuming I don't just get mad and go rob Steve's house.

Whereas, if we were to cooperate, Steve says, "we'd both be happy.

"You'd get your money and I'd get my diamonds."

And the big question this Prisoner's Dilemma thing lets you examine, Steve says, is: "How do you get that? How do you get cooperation in a world full of egoists?" Which is basically what Axelrod had been wondering about the United States and the Soviet

Union. Only problem was, nobody knew the answer.

At the time, Axelrod says, “there were a number of different ideas.”

All different strategies designed to extract the benefit of cooperation, but to avoid getting screwed by the other guy.

“But nobody knew the best way to play.”

Right about the time Axelrod was thinking about this stuff, he says, “I learned about computer chess.” Because in the mid-1970s, programmers had started holding “tournaments where different programs would play each other.” He says it occurred to him that he could set up the same kind of a tournament for the Prisoner’s Dilemma.

“And invite the people with these different ideas to play with each other.”

So Axelrod invited fourteen of the world’s most preeminent political scientists to submit programs for his tournament. Each program would play one-on-one matches against each other program. And the tournament would last until every program had played two hundred rounds against every other one. The rules were simple. In each round, the program has a choice of two possible moves.

“You can either cooperate,” Steve says.

Like you can be nice—leave your money or your diamonds out in the woods.

“Or what the game theorists call defect.”

You can be a jerk—leave an empty bag or a bag of rocks.

And Axelrod set up this simple scoring system, sort of quantifying the benefit of the various outcomes.

“If I sucker you,” Steve says, “I get five.”

Steve leaves an empty bag and I leave the diamonds. He gets five. And I get zero.

Now, if we both act like jerks—“we drive out to the woods,” Steve says, “and we both left empty bags,”—then, we both get one. We tie. But it’s this low one-point tie, which in a way, is kind of a loss. Because if we both did what we promised to do, we would have gotten three points each.

So all these political scientists come up with their strategies, hire computer programmers to write some code and send them in to Axelrod. This is the 70s now, so they’re basically sending in punch-cards. Axelrod’s computer took up a whole room.

“It was just a generic trophy,” Axelrod says, “a guy holding up a cup, with a plaque saying, you won the computer tournament.”

But since the tournament happened inside a computer, it’s a little hard to picture how it went down, from one round to the next. So let’s imagine it, just for a moment, as sort of a boxing match.

We drop two programs in the ring.

“One of them I’ll call Jesus,” Steve says, “and let’s say the other program is the Lucifer program. And so, round one, each program makes its move. The Jesus program says, I’m gonna be nice. I’m gonna do you a solid. And the Lucifer program does something bad.”

And at the end of the round, Steve says, “Lucifer gets five and Jesus gets zero.”

And when it’s between Jesus and Lucifer, Lucifer wins every single time.

“Right,” Steve says, “Lucifer is gonna win. He’ll get five points every round. Jesus will keep turning the other cheek for a big zero.”

And by the end of two hundred rounds, Jesus has zero and Lucifer has a thousand.

“But the thing is,” Steve says, “in Axelrod’s tournament, people did not submit

Jesus. It has a certain predictability.”

The programs they did submit were all complicated.

For example, Steve says, “there was this one program called Tester. Tester would try to see what you were like. It would start by being mean, do that until you retaliated, then back off and say, woah, hey man. Until it throws in another unprovoked mean act.”

Another one was called Massive Retaliatory Strike.

“Whenever anybody did anything bad,” Steve says, “it would retaliate for the rest of the game.”

And Axelrod says that almost all of the programs were crafty like this. And in the computer, they ended up being these long programs.

“Thousands or tens of thousands of lines of code,” he says.

And so Axelrod enters them all into the computer and let’s them start playing rounds against one another—hundreds and hundreds of rounds. His computer is unsophisticated and slow, so this takes weeks.

And as Axelrod is watching this, he has a hunch. He suspects that the one of the most complicated programs will win.

“In the computer chess tournaments,” he says, “it was the very sophisticated programs that did well. The ones that saw all the previous moves and considered every possible next move.”

But: “The amazing thing is,” Axelrod says, “the simplest program of all won.”

And this little guy was unparalleled in its simplicity.

“Had just two lines of code,” Axelrod says.

Even had a simple name: Tit for Tat.

It goes like this: “On the first move,” Steve says. “I will be good.” Tit for Tat cooperates—always cooperates on the first move. “And on the next move,” Steve says, “I will do to you whatever you did to me on the previous move.”

“So if the other player has just cooperated,” Axelrod says, “it’ll cooperate. And if the other player has just defected, it’ll defect.”

And there are two more aspects to this program that will be important.

First, Steve says, “it only fights back that one time.”

And second, it’s consistent; it always sticks to these basic principles.

I ask Steve if we have any idea by how much Tit for Tat won.

“It was at the top,” he says, “but not way at the top.

“Turns out that out of the fourteen programs that were in there, there were eight programs clustered near the top,” Steve says. “But here’s what’s amazing, then there was a big gap.”

Number nine scored much worse than those top eight.

“And here’s the crucial point,” Steve says, “all eight of those programs had one thing and only one thing in common. They were all nice. Nice is a technical term in this game. Nice means I never am nasty first.”

Think about what that means: It’s nice first. So if it plays Lucifer, it’s going lose that first round. In a way, Tit for Tat is kind of a chump.

“Tit for Tat, if you think about it,” Steve says, “never beats anybody. The best it can do is tie.”

Because even if it doesn’t lose that first round—if it meets another nice program, that is—it’s still only going to tie. It never suckers anybody and gets that big five-point



win. But on the other hand, if it meets a mean program, it only gets suckered on that first turn—after that it just mirrors everything the opponent is doing.

“That’s right,” Steve says, “it doesn’t take any guff.”

But that still leaves open the question: How does Tit for Tat win the whole tournament? And the answer is that it turns out most of those programs that get the big five-point win also end up getting suckered—getting some zeros. And they also end up with a whole lot of one-point ties—the one you get if you both do the mean thing. Meanwhile, Tit for Tat is chugging along racking up three-point ties.

“It elicits cooperation,” Steve says, “if the opponent has any inclination to cooperate.”

And it never really gets its butt kicked.

So I ask Steve: Do you think that this logic explains then why there is occasionally gentleness and goodness in the world? Or is this just an abstraction?

“Well, that’s the question,” he says. “How deep is this in trying to understand the origin of altruism and kindness? This changes how you look at the world. If altruism didn’t come from God but from evolution.”

I stop him there: Evolution?

“So Axelrod actually did an evolutionary version of his tournament,” Steve says. “That is he had these programs get a chance to reproduce copies of themselves according to how well they did.”

When I ask Steve how that played out, he says: “So, imagine you have a world of Lucifers, and there are a few Tit for Tat players out there.”

What Axelrod discovered, after running this new version of the tournament over

and over hundreds of times is that if you have enough Tit for Tat programs—if you have some small but significant core of them—they can survive.

And not only survive, he says: “They can actually invade and take over the world, even if the world starts horribly mean.”

Because if you think about Tit for Tat, Steve says, “every time they play with each other,” they cooperate and score three points. “Whereas when all the Lucifer programs play,” they’re mean to each other, and they score just one point.

“These nasty programs just end up killing each other off,” Axelrod says.

I ask Steve: So you could begin with a world made up primarily of ferocious, evil creatures, but if you have enough of the nice guys, they’ll get together and soften the world?

“That’s what Axelrod is saying.”

And maybe the most remarkable thing about Tit for Tat is how familiar it is.

“What always gave me chills,” Steve says, “is that we see this version of morality all over the world.”

Think about those rules Tit for Tat lives by.

“Ya know,” Steve says, “be upright.”

Nice on the first move.

“But retaliatory.”

Fight back if somebody hurts you.

“Forgiving and clear.”

Only fight back once, and be consistent.

“I mean, that sounds a lot like what Moses told his people,” Steve says. “That

sounds a lot like the Old Testament. It's an eye for an eye, but not ten eyes for an eye. And to think that it isn't handed down by God, but that it's from biology, I like that argument, personally.”

But what strikes me about all this is that it somehow seems beyond biology. There's a logic to it that seems to disregard your genes. And in a lot of ways that makes more sense to me than all the kin selection stuff.

Still, this is just a computer simulation, and it makes you wonder, does this kind of morality ever emerge spontaneously in the real world? Like, does it exist among real humans outside of the Old Testament?

After he finished the computer tournament, Axelrod asked that question, too.

“And I read a review in a sociology journal of a book called *The Live and Let Live System in World War I*,” he says. “And it was all about how in trench warfare in World War I the soldiers were often quite restrained. It turned out they wouldn't work as hard as they could to kill the other guys.”

Which sounds unbelievable.

“Well here's a quote from a letter,” Axelrod says, opening the book, “this was from the British side.”

It was written in November 1914.

The quartermaster used to bring the rations up each night after dark. They were laid out and parties used to come from the front line to fetch them. I suppose the enemy was occupied in the same way. So things were quiet for that hour for a couple of nights. And the rations parties became careless because of it, and laughed and talked on their way back to their companies.

“And so both sides caught on that if they didn't interrupt the other one, then they wouldn't be interrupted,” Axelrod says.

And for this to make any sense at all, we have to go back a few months. I visited a historian to get some context. Stanley Weintraub is a retired history professor from Penn State University, and he wrote a book about this whole situation, called *Silent Night*.

“The war began in July 1914,” Stan says.

And by the middle of the fall

“There was practically a stalemate.”

Because what happened, Stan says, is that after the Germans tried to invade Paris, the British and French pushed and pushed and pushed them back, until they get to a place called Flanders.

“Which is the area where France and Belgium meet,” Stan says.

When they got there, the conditions changed drastically.

“The weather turned bad.”

The sun disappeared and it rained day after day.

“Heavy rains,” Stan says. “Then it became icy. Then slush. Then snow.”

The problem with Flanders, Stan says, is that “the land is very low, that is, it had been swampy.” And all the ground that once was solid once, just started melting, “turning into mud. They couldn’t move, quite literally.”

This was the beginning of mechanized warfare, so they had big machine guns and cannons and primitive tanks. They had horses and carriages. Everything got stuck.

“And the troops dug in.”

Hunkered down in these muck-hole trenches

“Full of water.”

It was freezing cold, since you couldn’t have fires.

“Because a fire meant you could be observed.”

Spotted. And shot at.

And on top of all that, Stan says, “the trenches were also filled with rats.”

So you’re in this trench. You’re shivering. Dirty. Dodging rats day and night. And you’re hungry. So it made sense, Stan says, “to stop firing to have breakfast or lunch or dinner. And then begin firing again.”

Consider this letter, from a British soldier:

It would be child’s play to shell the road behind the enemy’s trenches, crowded as it must be with ration wagons and water carts, into a bloodstained wilderness. But on the whole there is silence. After all, if you prevent your enemy from drawing his rations, his remedy is simple: he will prevent you from drawing yours.

And when Axelrod read about all this stuff, he says, “I thought, gee, this sounds very familiar.” He thought, this isn’t so different at all from Tit for Tat. But here it is out in the real world. And he found more and more examples of reciprocation.

“Well think about snipers,” he says. “If my unit is always trying to shoot anybody that sticks their head up and they’re doing the same thing, from the point of view of the individual soldier, they’re worse of than if they sort of let the other guy get a hot meal.”

It spread from the soldiers on the front lines to the guys further back.

“The artillery,” Axelrod says, “started to shoot between the lines instead of on the lines between major battles.”

In other words, these guys shot to miss.

I ask Axelrod: So if the general says tomorrow, at tea time, I want you to shoot those Germans. That’s an order. What do these guys do?

“Well, they’d say, oh gee sorry, General, I missed. I’ll try harder next time.”

Which sounds incredible, but it’s true.

“There are so many letters,” Axelrod says. “Like take snipers. They’d shoot at a tree over and over again, showing that in fact, they were really accurate. If they wanted to kill you, they’d get you.”

Consider this letter, from a German soldier:

The way the war was carried on in the Champagne was really ludicrous. At 7:22 a.m. half a dozen coal boxes of the six inch variety landed in a bunch at our front line; at 7:25 six of ours returned the compliment. Promptly at noon each side sent over a heavy mortar shell. By way of an evening blessing there was a mutual exchange of coal boxes beginning precisely at 7:22. When the exchange of compliments was due, we retired. On the other side of No-Man’s-Land things were presumably just the same. It was all very comfortable.

The snipers even shot patterns in buildings to prove they could shoot the other guys if they wanted to. But at the same time, every time they did that, they demonstrated their choice not to shoot to kill.

“Exactly,” Axelrod says, “and the same thing with artillery that shot between the trench lines. And that of course gives the other side the incentive to not shoot at them.”

And what ended up emerging is this tension between commander and soldier, where the commanders want to do dark deeds, and the soldiers keep quietly rearranging the furniture so they don’t do dark deeds.

“Right,” Axelrod says, “and one of the aspects of the theory is that this can only happen where there’s long-term interaction, where you know you’re gonna be facing the same people day after day.”

Soldiers on both sides wrote about the unwritten laws of the trenches: “All patrols are much averse to the death or glory principle. ... For either side to bomb the other

would be a useless violation of the unwritten laws that govern the relations of combatants permanently within a hundred yards of each other.”

And as the soldiers on each side spent more time in the trenches; as they got dirtier, colder, hungrier; as they heard stories about other small truces the cooperation spread up and down the trenches.

A British soldier wrote about an interaction with some Germans:

We suddenly confronted a German patrol. We were twenty yards from each other, fully visible. I waved a weary hand, as if to say: what is the use of killing each other? The German officer seemed to understand, and both parties turned and made their way back to their own trenches. Reprehensible conduct, no doubt.

Oftentimes cooperation popped up when soldiers tried to bury their dead.

Another British soldier wrote:

A most extraordinary thing happened. Some Germans came out and held up their hands and began to take in some of their wounded and so we ourselves immediately got out of our trenches and began bringing in our wounded also. The Germans then beckoned to us and a lot of us went over and talked to them and they helped us bury our dead. This lasted the whole morning and I talked to them and I must say they seemed extraordinarily fine men. It seemed to ironical for words. There, the night before we had been having a terrific battle and the morning after, there we were smoking their cigarettes and they smoking ours.

Officers who visited the trenches were stunned. A British officer wrote:

When going round the trenches, I asked a man whether he had had any shots at the Germans. He responded that there was an elderly gentleman with a bald head and a long beard who often showed himself over the parapet. “Well why didn’t you shoot him?” “Shoot him,” said the man, “Why Lor’ bless you sir, ’e’s never done me no harm.” A case of the live and let live, which is certainly not to be encouraged. But cold-blooded murder is never popular with our men.

And new soldiers fresh to the war found the sound of the front disturbing.

A British soldier wrote: “There was an uncanny stillness in the air, broken

occasionally by some spasmodic firing. It was very difficult to imagine that this place had any connection with a world war—it seemed too quiet.”

But Axelrod says it wasn't always quiet. He showed me another British letter: “I was having tea with Company A, when we heard a lot of shouting and went out to investigate.”

The British and German guys were standing up on the rims of their respective trenches, talking to each other. And then, according to the letter: “Suddenly a salvo arrived, but did no damage. Naturally, our men got down and started swearing at the Germans. When all at once a brave German got up on his parapet and shouted out: We're very sorry about that, we hope no one was hurt. It was not our fault, it was the damn Prussian artillery.”

In other words, some guys behind the front line, who didn't know the Saxons had this arrangement launched some missile over everybody's heads.

“So they apologized for this misunderstanding,” Axelrod says.

And what's interesting about that little exchange is that it isn't quite Tit for Tat.

“In Tit for Tat,” Axelrod says, “you always defect when they other guy does.”

And you do it immediately. But what happened here it something else. And according to Steve: “It turns out that being a little more forgiving, that in some situations does better.”

Because pure Tit for Tat can become sort of an echo chamber of retaliation. If you follow eye for an eye out to the end, you end up with a world full of blind people. And so Axelrod says, it's actually better to scale Tit for Tat back a little.

“Say 10 percent of the time you don't defect right away,” he says. “If you just



sometimes let it go, then what happens is these echoes will stop.”

And this is especially important, Axelrod says, “when there’s concern about misunderstanding or misimplementation.” When you know the other guy might have just fired that missile accidentally, which in real life is always possible.

“Yes,” Axelrod says. “I call that generous Tit for Tat.”

But where this whole World War I story gets really interesting is in the winter.

“The Germans had a tradition of tabletop Christmas trees,” Stan says, “a yard high at most. Real trees.”

This is December 1914. And throughout the month, truckloads of these little trees had been arriving at the front.

“Hundreds and hundreds of trees,” Stan says.

And by late December, the Germans had lined their trenches with these little trees. And at night, the German soldiers

“Lit candles on them, singing Christmas carols,” Stan says. “The Christmas carols were often familiar to both sides. A song like Silent Night is a German song, so Stille Nacht is sung in German and sung in English.”

And when the British soldiers heard the songs—they were less than a hundred yards away in most places—Stan says they climbed out of their trench.

“Crawled forward,” Stan says, “to see what was going on.”

I stop Stan: Wait, this sounds crazy. This is where I start to think you’re making this stuff up.

“It does sound crazy,” Stan says, “and that’s why for decades it was thought to be myth. But we know it to be true, because we have the letters.”

Like take this one, for instance from a British soldier to his wife:

We had been calling to one another for some time Xmas wishes and other things. I went out and they shouted “no shooting” and then somehow the scene became a peaceful one. All our men got out of the trenches and sat on the parapet. The Germans did the same, and they talked to one another in English and broken English. I got on top of the trench and talked German and asked them to sing a German Volkslied, which they did, then our men sang quite well and each side clapped and cheered the other.

Soldiers on the German side wrote similar letters to their people back home:

I shouted to our enemies that we didn’t wish to shoot and that we [should] make a Christmas truce. I said I would come from my side and we could speak with each other. First there was silence, then I shouted once more, invited them, and the British shouted, “No shooting!” Then a man came out of the[ir] trenches and I on my side did the same and so we came together and we shook hands—cautiously!

And once the soldiers on each side agreed on having a truce, No Man’s Land turned into a big party. And Stan says the guys from each side started “exchanging food and trinkets. Troops had received lots of Christmas presents. Such things as plum puddings. Barrels of beer. Soldiers took buttons off their uniforms and traded buttons. Even helped bury the dead.”

They even played soccer with each other.

“It sounds incredible,” Stan says, “but we have the company morning reports, saying we played the other side and won three to two.”

And Stanley says this Christmas truce held out along hundreds of miles of the Western Front, and that in some places it lasted for more than a week. Even though they were at war, when these guys met each other, they realized they weren’t so different.

In fact, Stan says, it turned out that before the war tens of thousands of Germans “had worked in England as taxi drivers or barbers or in other trades. Some of them had girlfriends in England; some of them had wives.”

One British soldier wrote about one day during the truce, when a German soldier called out to him.

“I remember you,” Stan says he shouted. “I used to cut your hair. You need a back and sides trim.”

The German soldier had been the British guy’s barber before the war.

“And the British soldier,” Stan says, “sat down on an ammunitions box and the German barber gave him a back and sides trim. This is a case of encountering someone you actually knew.”

As much as the cooperation in the trenches had to do with Tit for Tat, Stan says, the influence of culture is important, too. You don’t see this kind of behavior in any other wars. This is a unique moment in history, Stan says.

“Americans and Japanese could never have had something like this happen in World War II,” Stan says, “because the cultures were different, and the language was impossible. We could not have had a Christmas truce with the Iraqis or the Afghans; they don’t celebrate Christmas; they don’t speak our language.”

And if the stories about the bats and the Tit for Tat math explain that it isn’t all about family, that we can redraw the lines of who we want to cooperate and who we don’t, based on some deep, fundamental logic of reciprocation; this is saying, maybe there are some limits to how we redraw those lines.

Maybe we can’t just put them anywhere.

“You had to want to party with them,” Stan says.

And as beautiful as that might seem to us, for the guys running the war, this was a problem. “Could these guys who knew each other now fight anymore?” Stan says. “And

the generals decided they couldn't risk it."

Their solution? Get rid of the friendly guys.

"The generals removed guys from the front line and replaced them with reserves," Stan says. And gave them strict orders: no more fraternizing with the enemy.

On the British side, a memo came down from a general saying: "The Divisional Commander wishes it to be clearly understood by all ranks that any understanding with the enemy of any description is strictly forbidden. No communication is to be held with him and any attempt on his part to fraternize is to be instantly repressed."

And then, just to make everyone knew the truce was over, Axelrod says, they did something else: "The generals would say, okay, you guys go out on a raid, and I want you to bring back a prisoner or a corpse."

Prove to us, in other words, that you're really fighting these guys.

"And that," Axelrod says, "messed things up royally."

"In 1915 and 1916," Stan says, "there were immense casualties, as many as 50,000 in a day."

Because suddenly you had confusion. Like, on one side, you might have guys thinking a truce is still on, and on the other, raiders. And when a friend gets shot by someone you feel you know, it's different than being shot by an impersonal enemy.

This German soldier writes about watching several men who just lost a friend: "His comrades lay in wait a long while behind the parapet to take vengeance. It is remarkable how little they grasp the war as an objective thing. They seem to regard the Englishman who fired the fatal shot as a personal enemy. I can understand it."

And this breakdown of the truce created some staggeringly tragic moments,

moments that make you question everything that happened at Christmas. You look at the Christmas truce, and you start to think, maybe humans aren't just like the other animals. Maybe we have some inherent goodness deep inside us, something biology can't explain. But then you read about this next scene, from a British soldier's letter home to his parents, and you think, maybe we aren't like the other animals; maybe we're worse.

The soldier wrote that his company posted a band at the rim of their trench:

At six minutes to midnight, [the band] opened with "die Wacht am Rhein." It continued with "God Save the King," and "Rule Britannia," each tune being played for two minutes.

Then, as the last note sounded, every bomber in the battalion, having been previously posted on the fire-step, and the grenade-firing rifles, trench-mortars, and bomb-throwing machine, all having registered during the day, let fly simultaneously into the German trench.

The Germans had been tricked.

"And, as this happened," the letter concludes, "the enemy, who had very readily swallowed the bait, were clapping their hands and loudly shouting, 'Encore!'" "

## Home is Where You Say It Is

This piece on Centralia, Pennsylvania, aired as the third section of a show on cities. The show also explored the science of a city's personality, pace and size; and it dug deep into the story of the giant tunnel that, two thousand feet below the surface of Manhattan, provides water to all the people in New York City. This piece investigates the question: How does a city die? We actually had one guy we interviewed tell us that cities never die, which might be an overstatement. Still, though, why does it often take so long for a city to disappear?

There is a road in Eastern Pennsylvania called State Route 61, and for two hundred miles or so, it twists through the hills from which the people of this region have drawn coal for generations. It's a smooth, winding, country road, broken every 12 miles or so by a small-town intersection. But in one place, right about the middle, it takes a hard turn and whips right past a town it once passed straight through. If you were to stop at that turn, which few people do, you'd see, well, you wouldn't see much at all. Earlier this fall I drove out there with Jad, my friend and the co-host of the radio show I work for, to see if we might find an answer to our questions about how a city ends.

It's a Monday and we park on the gravel shoulder of Route 61, where we meet a guy named Tom Hynoski. Tom is the fire chief in town, and I'd asked him if he might show us around a little—the Hynoski clan is one of the few families left in town. Tom pulls up behind us on the shoulder of 61; he's driving a battered, yellow Ford pickup, painted the yellow of a municipal vehicle.

“Probably the best place to go is up on the hill up there,” Tom says. “You can look over everything. Should we do that?”

We say, sure.

So we go up on the hill with Tom. And when we get up there, we find another Tom. Turned out this is the Tom we had actually asked to show us around town. This is Tom Dempsey. Our first Tom just happened to see us on the side of the road, got curious and decided to take us to the top of this hill. There are many Tom's in this part of Pennsylvania. But these are the only two in Centralia.

"I'm the former postmaster here," says Tom Dempsey.

Anyhow, the four of us—two Toms, a Pat and a Jad—stare down into this valley that used to have a town in it.

"Full of houses," Tom Hynoski says. "It was all streets with homes on them over here."

Now, Centralia is just trees.

"Right down here was the borough high school," Tom Dempsey says, pointing to a little patch of trees.

"Over here," Tom starts to say.

Just more trees.

"Here's Saint Ignatius Church," he says. More trees. "There used to be a playground right at the bottom of this little hill right here. You can still see the bars." And it's true, you can— but just barely. Too many trees.

And this is where things get a little strange; right next to the swing set, where kids used to laugh their little heads off, there's a hole in the ground.

"Right there I can see some steam coming out of the ground," Jad says.

The hole is spewing steam. Jad and I would later discover, when we got close to it

that the steam was incredibly hot. When I was a kid, my dad and I used to hold our hands close to the campfire and describe how hot it was by counting. If we could hold them there for five seconds, it wasn't a very hot fire. A two second fire was a good fire. I couldn't keep my hand in front of the Centralia steam hole for more than a couple seconds. Something deep down in the earth was producing some real heat.

“Where exactly is the fire?” Jad asks Tom.

“Underneath us,” Tom Hynoski says.

“Like how far?”

“Here? Fifty feet, maybe.”

“So fifty feet down— ”

“If it is.”

“The smell doesn't bother you guys?”

“What smell?”

“You can smell,” Jad says insistently, “it smells like burning tires here.”

“Nah, I don't smell it,” Tom Dempsey says. “Maybe it's a little oil from Tom's truck over there.”

No way the smell originated at Tom's truck, which was parked a good 50 yards from us at this point.

“That must be from New York that's stuck in your nose or something,” Tom Hynoski says.

“Oh, come on,” Jad says.

But the one thing even the Toms can't deny is that underneath our feet, there's a web of coal mines that stretches for miles.



“Forty miles in each direction,” Tom Hynoski says, “maybe thirty miles.”

And somewhere in those mines, is a fire that’s been burning for 40 years, and has either destroyed this town.

Or not. Depending on whom you ask.

After we come down off the hill, Jad and I visit a lady named Mary Lou. She lives in a narrow, white row home in the next town over, Ashland. We sit down in her living room, which is packed with antiques and other trinkets. It has thick, pink, shag carpet. And the air is thick with the scent of potpourri.

“My name is Mary Lou Gaughin. I’m 82 years old. And I lived in Centralia most of my adult life.”

“What year were you born,” Jad says, “if you don’t mind me asking?”

“What year was I born? 1927.”

Mary Lou Gaughin grew up in a town not too far from Centralia, a tiny, little farm town called Bernville. And when she got to Centralia, she says, everything was different.

“Well, that was like moving to the city,” she says. “It had a legion. It had a drug store. It had” a couple thousand people. “Lots of bars was in Centralia. Somebody told me one time there were 22 barrooms in Centralia. I don’t know if that was true, cause I didn’t frequent barrooms at that age.” And all these places that she just mentioned were right on top of each other. So when you were walking around, you’d see people all the time.

“Just take, for instance,” Mary Lou says, “you go to the post office after work. You had to walk to the post office, cause your mail wasn’t delivered. So I’d go up to the post office, I’d get my mail, and you’d meet people in the post office. You’d meet people

coming out of the post office. Tommy would be there sometimes. Tommy Dempsey would have a story. I would be an hour until I got home. A whole hour. This is how Centralia was.”

Later, Tom walks us over to where the Post Office used to stand.

“You’re pointing into a forest,” I say.

He points to a field of tall grass beside the Post Office forest.

“Now this was a good football field here. Now it’s all growing in; nobody’s cutting the grass; there’s bushes growing in.”

“It’s hard to imagine this stuff,” Tom says.

“It’s impossible,” I say

Tom says we should know what happened on Memorial Day, 1962. He walks us over to a gravel pit with patches of grass pushing through the rock here and there.

“This is where the borough used to dump all their garbage,” he says. “Now the fire started, I’d say just about right here where I’m standing now.”

Tom is standing on a little patch of yellow grass.

“Like, right here,” he says.

“How did it start?” Jad asks. “Do we have any idea?”

The most likely scenario, Tom says—we also heard this later from a journalist named Joan Quigley, who grew up near Centralia and wrote a book about the town called *The Day The Earth Caved In*—is that, people used to heat their homes with coal, and maybe somebody threw their ashes into the garbage, which then ended up on the dump. And the hot ashes caught the whole thing on fire.

“Furniture, rugs, kerosene cans,” Joan says.

Which, Joan says, wasn't that unusual.

"Some of the former firefighters said, ya know, the dumps caught on fire all the time."

And usually the fires just fizzled out on their own. But this one, for whatever reason, before it did, wandered a little bit. And it found its way over to an old exposed coal vein, basically an old strip mine that should have been covered up, but wasn't.

"So there was just a big, open cavity," Joan says.

And the fire crawled in there.

"Hit that coal vein," Tom says.

And lit the whole thing up.

"Fire trucks came in here and they hosed down the fire till they thought it was out," Tom says. "And then they left. Following day somebody says, oh, we see smoke and steam coming up out of the ground up there. So they tried they next day to get the fire out and they couldn't very well do it. They weren't getting it."

Because at that point, it was too late.

We go back to Mary Lou's house, because it turns out, the first place that fire camped out, was right under her garage—more a carport than a garage, really—which sat just a few yards from her home where she laid her head down to sleep each night.

"I wouldn't know where to start with this mine fire," she says. "I wouldn't know where to start."

After the fire got under her garage, she says, it kind of took over her life.

"I have some photographs."

She pulls out these two gigantic scrap books. Each out must be three feet thick.

They have tattered blue covers, and when she opens them newspaper clippings and old photographs flutter down onto the carpet.

“My goodness, are these your scrap books?” Jad says. “It’s gonna take four men to lift this book.”

And the scrapbooks document in painful detail how the mine fire split this town in two.

“This is how intense I was with that mine fire,” Mary Lou says.

She heaves open the book and she shows us this picture of three people crouched on the street in front of a hole.

“This is my husband, my son and me,” Mary Lou says.

Her husband is holding a thermometer.

“We dropped this down like a fishing pole,” she says.

“Oh, like you’re ice fishing,” I say.

“Yeah.”

This, Mary Lou says, was their way of measuring the temperature of the fire below.

“And what did it read?” Jad says.

“It was pretty high,” she says.

“Like a hundred degrees high?” Jad asks.

“Eight hundred and fifty,” Mary Lou says, “something like that.”

“What?!?” Jad says. “Under your house?”

“No, this was on the street,” she replies.

But the street right in front of her house.

“And the garage was right, as you can see here, the garage was right there,” Mary

Lou says.

She shows us another picture of her standing in her garage in front of a trench that the local fire department had just dug, and inside that trench, you can see flames.

“Oh, we used to go out at night and watch, ya know, the glowing and the embers,”

Mary Lou says.

Joan told us the fire up there got so bad—what with the heat and the smoke and the gases seeping up into people’s living rooms—that some of Mary Lou’s neighbors got government money to leave their houses.

“They were the first people bought out,” Joan says.

But Mary Lou stayed.

“Never once, at the beginning,” I ask her, “did you think, oh, maybe we should just get out of here?”

“No.”

“Like, there’s a fire under our—”

“No. I never wanted to go. No.”

She did exactly the opposite. She shows us an old picture of a bunch of men, wearing business suits, gathered in a little crowd outside Centralia town hall.

“This was my husband, and this was a big official, and this was a big official.”

Mary Lou dug in her heels, started writing letters, trying to get people to help her convince the town to make the investment needed to put the fire out. She shows us copies of all the letters she wrote, dozens of letters, long handwritten paragraphs on pastel colored memo paper. And beside them, brief responses typed on thick linen paper with letterheads bearing the seal of the State of Pennsylvania.

“Congressmen Nelligan, Mustow,” she says. “We wrote letters to him, we talked on the phone with him. I couldn’t tell you all the Congressmen we talked to. Four Governors. All the Harrisburg officials. And they were promising everything but the sun. But it never happened.”

And the way Joan tells it, Mary Lou didn’t only have trouble getting big government officials motivated. She even struggled in town.

“Other than the people who lived on that street,” Joan says, “many, many people in town didn’t have to worry or even think about the mine fire.”

“Nobody believed the fire was even serious in Centralia,” Mary Lou says. “My husband, myself and Helen Womer.” Helen was Mary Lou’s next-door neighbor, and one of her very closest friends and allies.

“Oh,” I say, “so everyone else was kinda like, oh, whatever—”

“It’s uptown,” Mary Lou says, “the fire is uptown.”

All that changed on Valentine’s Day, 1981, because of a guy named Todd Domboski, who at the time was just a boy.

“A twelve-year-old boy,” Joan says.

“I was 12,” Tom says.

He was playing outside.

“In his grandmother’s backyard,” Joan says.

“And I noticed some small wisps of smoke coming out of the ground,” Todd says.

“So he over to take a look,” Joan says.

It was winter and Todd would say later that seeing steam seep out of the yard wasn’t all that uncommon. But that day, when he and his cousin had taken a break from

working on a friend motorcycle, they'd thrown a few firecrackers into the yard. And even though the grass was wet with snow, Todd worried he'd lit his grandmother's lawn on fire. So he walked over, as he said, just to take a look.

"As I bent down to investigate," Todd says, "I noticed that my feet were starting to sink in; it was really soft."

"It was like quicksand," Joan says.

"The more I tried to struggle," Todd says, "the more I was just opening the hole larger."

"And he wound up sliding," Joan says.

"To my thighs, to my waist," Todd says.

"Until he was," Joan says.

"I was under," Todd says.

"All the way underground," Joan says, "surrounded by hot steam."

"The smoke was so intense," Todd says.

"Smells like rotten eggs," Joan says.

"Well I was screaming for my cousin," Todd says.

"And his cousin heard him and came running over," Joan says.

When his cousin got to the hole, he'd say later, all he could see was Todd's blaze orange hunting cap—typical winter headgear for a kid in Eastern Pennsylvania. Todd was clinging to a root; his cousin reached in and grabbed him by the wrist.

"Plucked me out like a flower," Todd says.

And Joan says nothing was the same after that day.

"What happened to [Todd] changed everything," she says.

Because suddenly, reporters were everywhere.

“Reporters from the *Evening Herald*,” Todd says.

“National news media,” Joan says.

Everybody pointing their cameras at Todd.

“I seen smoke,” Todd told a television reporter later that very afternoon, “so I went over to see if it was the mine fire, and when I did I just fell right through.”

And doing stories about this town that was on fire.

News anchors went on television and pronounced things like: “Beneath Centralia the underground coal fires still burn hot.” And: “Centralia is an inferno.” And: “Parts of Centralia look like the outskirts of Hell.”

And Joan says: “That attention would focus on what had to happen for the town.”

It wasn’t long, Joan says, before some of the younger residents—“a very small, informal group of young parents,” she says—organized a march, “down Locust Avenue, down the main street in town. A couple dozen [people]. With red ribbons around their arms and their wrists. And they walked two-by-two down the main street in Centralia, like striking miners.”

Mary Lou glared at them as they passed.

“I was bitter,” she says. “I was bitter. They claimed they were for helping the town to be saved, but they weren’t.”

The way she saw it, what they were really for, was getting out.

“They were looking for funds to get relocated.”

She even hated their name: Concerned Citizens Against the Centralia Mine Fire. She thought, how are they the concerned citizens? She’s the concerned citizen. She’d



been fighting the fire for years.

“The media was there taking video,” Joan says.

Cameras filming the marchers looping red ribbon over everything—tree branches, cars, lamp posts, street signs, porches. And Mary Lou’s neighbor, Helen cut the ribbons down.

“We fought so hard,” Mary Lou says, “trying to save Centralia. Why are they wanting to do this?”

Why, she thought, are they trying to tear the town apart?

People like Mary Lou and Helen Womer,” Joan says, they started telling people, “No, no, no, here’s why it’s safe. Here’s why you should stay.” And while parents from the so-called concerned citizens group were on TV complaining about gases—one mother, though tearful eyes, told a reporter, “this could be a death house”—Mary Lou, Helen and a few others started up their own committee. They called it the United Centralia Area Mine Task Force.

They got on TV themselves. And in the community, they started putting flyers.

“Fact sheets,” Joan says.

And handing them out door to door.

At town meetings, the dueling committees would get up there and make their case. Get yelled down.

“Would it get—” I start to ask Mary Lou.

“It’d get rowdy,” she says.

Take, for instance, what happened to David Lamb. He ran a motorcycle shop in town and he was also a member of this Concerned Citizens organization. And one

morning, at about 4 a.m.

“He was sleeping in an apartment,” Joan says.

Specifically, he was up in apartment above his shop. His son, who was 10 at the time, was sleeping in the next room over. And below them, in the shop, were two dozen motorcycles, several with gas and oil in their tanks. And as they slept, Joan says, a car drove up in front.

“And someone threw a Molotov cocktail through his plate glass window.”

Lamb and his scrambled out a fire escape, unharmed, but the shop was destroyed.

Several months later, Lamb appeared in a documentary film, sitting on a park bench, looking exhausted and sad. In it he explains that he didn’t know who attacked his shop, but in a town this small, odds are it was somebody he knew pretty well.

“Families fighting against families, neighbors against neighbors,” he tells the interviewer. The mine fire, he says, “split the town apart.”

In her living room, Mary Lou shows us an article from the scrapbook, with a quote from a police officer, saying the attack on the motorcycle shop was probably “related to Lamb’s activities as an officer of Concerned Citizens.”

“Wow,” Jad says. “This is no joke. This is like the Sopranos, but worse.”

“This, this, this was really, it was really bad.”

And in the midst of all this chaos, Congress started considering a bill that would basically let them buy the town.

A television news reporter at the time explained: “Some observers believe that for about fifty million dollars, Centralia could be totally bought out.”

So the mayor decided, let’s hold a referendum.

“And the issue,” Joan says, “was stay or go.”

In the weeks leading up to the referendum, Mary Lou and Helen again went door to door, talking to people they’d known their whole lives—the ladies they saw at church, the men they saw at the Post Office, friends and family, all of them. And almost everyone they talked to told them to their faces: I’m staying.

“I really want to stay,” Joan says. “My mother wants to stay.”

For his part, Tom tried hard to remain neutral: “I still had to see them all everyday.”

On August 11th, 1983, the mayor held his referendum. And late that night, behind an image of the whole town standing in a crowd outside Centralia town hall, a news anchor reported: “Shortly before 10 this evening, Centralia’s mayor announced the results.”

The mayor stepped to the podium. He looked small and a pallid in the glare of the spotlight the television people had aimed at him, and he stepped to the microphone timidly, like a middle school choirboy forced to sing a solo against his will. What civic leader wants to be forced to make his citizens *vote* on whether or not to let their town keep being a town? But then again, what town ends up with a mine fire beneath it?

The mayor coughed into the microphone.

The votes have been tallied, he said.

“There’s 545 votes cast. Two hundred voted to stay; 343 voted to relocate.”

The crowd was silent, their heads already hanging low. The vote itself was an occasion sad enough. Nobody was especially pleased about the results, even the citizens who’d been lobbying for money to leave town. The ones who wanted to stay, they were

devastated.

“Oh I was crying, yes,” Mary Lou says, her scrap book in her lap. “In my heart I never thought that would happen. Never.”

“You thought that everybody would—” Jad begins.

“Would want to stay. Maybe 40 people might decide to leave, or maybe 30. But that was devastating to know that so many people wanted to move. It was.”

And when you look at her scrapbooks, everything stops after that day.

“Yeah, this is just thrown in papers,” she says, flipping through a ream of empty pages. Tattered clippings, folded all different directions, slip out of the book and onto the floor. Unlike the beginning of the book, nothing is taped in, organized and dated with thick black marker.

“It just stops so abruptly,” I say.

“I was mad and disgusted,” Mary Lou says. “I didn’t want to do no more about it. That was the end.”

And almost immediately after that vote, Congress bought out the town, and people started packing up and leaving, filtering out to nearby towns.

“Lemme see where that is,” Mary Lou says, flipping through the last few intact pages of the scrapbook. “I have some that has the big numbers on it.

Mary Lou tells us that when you decided to leave, a demolition crew would come to your house and paint a big number on the front of your house.

“Big red letters like this,” Mary Lou says, point to a photograph of a narrow, white row house, not at all unlike the one we’re sitting in.

“Looked like blood was dripping down.”

“It’s like you were marked,” Jad says.

And what would happen, Mary Lou says, is when your house was marked, your neighbors would see it, then they’d get nervous and suddenly their houses would be marked. And then suddenly the whole block would be marked.

“And I knew every one of them quite well. I stopped talking to some of them.”

She’d see them on the street, she says, and look the other way.

“I didn’t like any of them.”

And one day, in the fall of 1987, these divisions caused something to happen that is just kind of, like, mythically bad. It involved a married couple—the wife had lived in Centralia her whole life; her husband had lived there since he was ten years old.

But, Joan says: “As a couple they were divided. One wanted to stay; one wanted to go. It was the wife who didn’t want to leave.”

“And the husband,” Mary Lou says, “well, he was a shovel runner, and he wanted to take the money you get for relocation and get out.”

“Their neighbors were moving,” Joan says, “had moved. The houses around them were being torn down. And they had to make a decision.”

And all we really know is that at some point they started to argue. And it escalated.

Until: “He stabbed her to death with a kitchen knife,” Joan says, “and then drove up to an old stripping pit and set himself and his car on fire.”

And when Joan told this to Jad and I, we asked her if, on any level, there’s anything that makes sense about that to her? Why couldn’t people let this place go?

“It is very primal,” Joan says.

Beyond that, she couldn't really say why. And when we get to this question with Mary Lou, who hung on long after the murder, after that referendum, after the town was basically empty, she can't really say much either.

"I have no idea what kept me there," she says. "I have no idea."

"You have no idea?" Jad says.

"Uh uh. I just didn't want to move."

Our last visit in town is, again, with Tom Dempsey, the former postmaster. Before we get there, though, he explains that today, eleven people live in town.

"There's Tom Hynoski," Tom says. "His mom and his cousins."

Tom lists a few others, and Jad and I ask if they might visit with us.

We're curious to ask what it is that keeps these people living, literally, on top of a fire. What's it like living in this kind of a town? Is it a community at all anymore? Does it retain any of the spirit that Mary Lou says she loved so dearly?

We knock on the door of former mayor Lamar Mervine. No answer. We'll find out later that he had died a few months before—his son had been looking after the house, but he lived most of the time in Harrisburg.

Across the street, we see a string of four row houses—it's strange seeing row houses in such a short string. We knock there; again, no answer. Then a lady drives up in a minivan; she drives up slowly. She's frowning as she steps out of the car, a grocery bag in the crook of her arm.

"What do you want?" she asks in a tone confirming what her frown suggested.

"We're interesting in talking with some of the people who live here in town," I say. "We've talked to some people about what Centralia used to be like, and we're

curious about what it's like to live here now."

She shakes her head.

"I can't talk to you."

"How come?" I ask.

"Paper reporters come around and make us out to be crazy," she says.

I cut in to tell her we're different.

"That's what they all say," she says. "I had one come around last fall and wrote a story about my son being the only trick-or-treater in town, like we're some kind of big joke for everyone."

She shoulders past us and walks into her house.

We drive to the house of Carl Womer, husband of Mary Lou's former neighbor and fellow town-saving crusader. He's unloading racks of pansies from the trunk of his car when we pull up.

"Go away," he says, before we even get a word out.

"Um," I start to say. "We just—"

"I know who you are," he interrupts. "Everybody be coming around asking about Centralia. My wife lived that fire. And she's gone now. I'm through talking about it. You can go on and find someone else for your story."

We hear roughly the same thing from John Lokitis. John was the most recent resident to leave town. He's 37 years old and works as an accountant for the state police. This means he commutes an hour to Harrisburg everyday. He lives in the house his grandparents grew up in—and remained in until they died—and he hasn't changed much about it since they left.

He has their furniture, and the same pictures remain hanging on the wall. A meat sliver his grandmother bought in the 40s still sits on the kitchen counter. There's an ashtray with a pipe in it on an end table between two La-Z-Boy chairs, which is strange since John doesn't smoke.

“That's my grandfather's pipe,” John says

His grandfather has been dead for twenty years. But his pipe still sits there. It's as if the home has been frozen in time. John even heats the place with a small coal-burning stove—he gets the coal for the stove from a small mine in his backyard, a mine his grandfather dug in the 1940s.

Until last year, when he left, John mowed the grass that has cropped up on the plots where the high school, the grocery store and the church all once stood. He hung flags on the telephone poles—poles no longer strung together by telephone wires—on Memorial Day. And every Christmas, he dug out the garland and the big, glittery light-up signs and posted them on the barren poles, as well.

“I never had any desire to move,” Lokitis tells us. “This was my home.”

But last year, the state finally evicted him. Technically, the whole town is condemned—none of the people who live there now own their homes. In fact, the town doesn't even have a zip code anymore; the state merged it with Ashland about five years ago. The town still has a council—it has three members and a mayor, leaving just a handful of voting citizens—but since the state doesn't technically recognize the town, their power is limited.

And given all that has happened, John says, talking about it anymore just doesn't seem worth it. He spent 20 years fighting to keep his home—and to keep the town



together. That's over now. It hurts, he says, even to think about it.

When we visit John's father, also John Lokitis, he opens the door when we knock, but starts closing it again before we have time to say, good afternoon. And with that, we're starting to get discouraged.

At the last home we can find in town—we're not even sure who lives here, if anyone lives here—Jad approaches the door, but before he has the chance to knock, a tiny dog pounces at the inside of the screen, barking wildly and baring its teeth.

If that's not a sign to call it a day, I don't know what is.

After all that rejection, we meet back up with Tom, and he takes us to our last stop: Saint Ignatius Roman Catholic Cemetery. The cemetery is just a few feet away from the hill where we started, and it's a really strange contrast.

The hill is barren, covered in black rock—standing on it, you feel, literally, as if you're standing on a pile of coal. All around you plumes of steam seep from cracks in the Earth. A caustic odor—the smell of burning tar—burns in your nostrils. It's a miserable place, and it makes the news reports that called Centralia “the outskirts of Hell” seem less hyperbolic and more, well, accurate.

But on the other side of a narrow road, you find the cemetery. Green grass grows between plots shaded by old oak trees. Flowers and ribbons adorn all but a few of the graves. It's a weekday when we visit, and I see three minivans parked throughout the cemetery, clusters of elderly people kneeling beside them, laying flowers beside headstones. Memorial Day was last weekend, and tiny flags flutter near at least half the graves. This place smells of fresh cut grass.

And in fact, Tom tells us, the fire does not burn beneath this spot—something

about the composition of the bedrock. All around the cemetery, the Earth is stripped of life. And here, weirdly, in this place of death, grass and flowers and trees flourish. We ask Tom if he thinks there's anything more to that dynamic than the composition of the bedrock. He says no.

We step across the road, from the steamy coal-pile Hell, into what might as well be woodsy Vermont.

Tom takes us on a little tour.

"This is my grandfather and my grandmother," he says, pointing at two large, plain-hewn, granite stones. Tom has four generations buried here.

"Do you know how many people are here?"

"Oh, there's over 3,000 burials in this cemetery alone."

"Three thousand?"

"Yes, plus."

And the thing is, Tom says, even the people that left, fled that fire, continue to come back and be buried in this cemetery, which means this place, this cemetery, is the only thing in Centralia that's still growing. And suddenly, how Joan put it earlier—

"It is very primal."

Made sense.

"One man told me," Joan says, "that he was born in the same room as his father. And his father was born there, too. I can't get that anywhere else, he said."

In a place like Centralia, Joan explained, "you can experience your life on a multi-generational plane."

Which means, in a sense, this town will never die, as long as this cemetery is here.

“This is where my great-grandparents are buried,” Tom says, pointing at what looks to Jad and I like a blank patch of grass.

Tom gets down on his knees.

“You can’t even read their name on here,” Tom says, yanking out some large patches of grass and dirt.

Jad and I kneel down beside him.

“This, here?” I ask, pointing.

“You have to dig it out,” Tom says, tearing up more sod.

“Oh, it’s under the dirt.”

And there we see it, a dark gray headstone, the sort that doesn’t sprout too far from the earth even when its new, the sort that evidently sinks down into the dirt after a hundred years or so. Tom is digging more fiercely now.

“D-E,” he points at the letter, “Gotta get this up outta here, somehow. See, it’s sinking into the ground. There it is,” Tom says. “I can see a DEM. There’s the S.”

“I see,” I tell him, grabbing a piece of grass myself now and yanking it out.

## Appendix: Hyperlinks to Radio Stories

1. A Man Without Words

<http://www.radiolab.org/2010/aug/09/>

2. Mister Memory

<http://www.radiolab.org/2010/apr/05/limits-of-the-mind/>

3. The Magical Tumor

<http://www.radiolab.org/2010/may/17/magic-tumors/>

4. Welcome, Parasite

<http://www.radiolab.org/2009/sep/07/sculptors-of-monumental-narrative/>

5. The Luckiest Lobster

<http://www.radiolab.org/blogs/Radiolab-blog/2010/jul/12/the-luckiest-lobster/>

6. The Prometheus Tree

<http://www.radiolab.org/2010/jun/28/be-careful-what-you-plan-for/>

7. The Origins of Goodness

This piece will air (and appear online) in December 2010.

8. Home Is Where You Say It Is

<http://www.radiolab.org/2010/oct/08/dying-embers/>