

THE FRACTAL MURDERS
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"Mathematics would certainly not have come
into existence if one had known from the beginning that
there was in nature no exactly straight line,
no actual circle, no absolute magnitude."

Nietzsche

Chapter 1

I was having a bad day. I had gotten behind Ma and Pa Kettle on the road down the mountain and by the time I was able to pass them I was almost to Boulder. I blew past them, then blew my nose. I'd been fighting the Sinus Infection From Hell for a week. We were in the middle of Round Six and it was ahead on points.

The visitors' lots were full, so I parked my aging F-150 in a faculty lot. I ejected my Creedence tape, placed my "U.S. Government -- Official Business" sign above the dash, and set out for the math building. I no longer worked for the government, but I'd paid enough taxes during my legal career to consider myself an honorary employee.

I had spent seven years at the University, but that was long ago and I'd taken great pains to avoid math classes. Unable to find anything resembling a campus map, I finally asked directions. The first kid wasn't much help. But for the safety pin fastened to his left eyebrow, he looked like a neo-Nazi skinhead. He had no idea where the math building was and his surly demeanor suggested disgust at the notion anyone would want to find it. I shook my head and said a prayer for the gene pool.

The next man I approached was a foreigner, probably Nigerian. Skin black as coal, trace of a British accent. He was polite and possessed a wonderful smile, but sent

me on a trek which took me past the old fieldhouse -- where I'd spent many an afternoon running sprints -- and ended up at the Alumni Relations Office. I could've sought directions there, but I hadn't contributed to my alma mater since changing occupations and I feared some eager assistant might strike up a conversation that would end with a plea for my time and/or money.

The third time was a charm. She was a studious looking young woman with dark eyes who stared at her feet and talked to herself as she walked. She wore black jeans, a black vest over a gray T-shirt, and black shoes with crepe soles. Her hair was long, dark, and in need of conditioner. The lost daughter of Morticia Addams. She said she was a math major and gave me detailed instructions.

It was the first Monday in May. Seventy-six degrees and not a cloud in the sky. Frisbees flew, stereos blasted, and leggy coeds abounded. I recalled the night Scott and I had sculpted a giant snow penis in front of the Administration Building. Probably not the first college freshmen to engage in such foolery, but a fond memory nonetheless. It seemed like just yesterday, but more than twenty years had passed. Time passes more quickly as you age, but that's one of the disadvantages of growing up.

The math building, a three-story fortress, was right where dark eyes had said it would be. Not far from where I'd parked. I had expected it to be named the Chester Q. Hollingsworth Hall of Mathematics or some such thing, but the sign above the entrance read simply, MATHEMATICS BUILDING. It was a newer structure, but the design was consistent with that of most others on campus. Exterior walls consisting of long slabs of rough-cut Colorado sandstone, all capped with a red tile roof. This warm architectural

style dominated the campus and created an atmosphere reminiscent of a rural Italian village.

I entered unafraid. I was forty-one years old and nobody was going to ask me to bisect an angle or test my ability to solve a quadratic equation. That's one of the advantages of growing up. There aren't many, so I savored it.

The inside was about what you'd expect. The walls were covered with announcements and advertisements of every sort -- typing services, bands in town, something about the Gay and Lesbian Student Alliance, a sign touting an upcoming lecture by a visiting professor, and so forth. One bulletin board was devoted exclusively to graduate programs at other universities. It was plastered with glossy posters and brochures. A young man wearing a pocket protector and carrying a beat up briefcase studied them with interest. Probably the next Unabomber.

The lobby directory indicated the office of Jayne Smyers, Ph.D, Associate Professor of Mathematics, was on Level Three. I took the stairs two at a time in my gray summer suit, hit the third floor, and started down a narrow hallway. It looked and sounded devoid of life. I glanced in each open office I passed, but only one man looked up. Tall, blond, and in good shape. The nameplate on his door identified him as Stephen Finn, Ph.D., Assistant Professor of Mathematics. Papers covered his desk. He couldn't have been much older than twenty-seven, but his wire-rimmed glasses gave him a maturity beyond his years. "Can I help you?" he asked. Not hostile, but not friendly. My presence had broken his concentration.

"I'm looking for Professor Smyers," I said.

"Four doors down on the right," he said with a forced smile. He pointed for me.

"Thanks," I replied. He did not immediately return to his work, and I felt his curious gaze as I continued down the hall.

I arrived at 3:20 p.m. -- five minutes late. She was seated behind her desk and immersed in an academic journal of some sort.

"Doctor Smyers?"

"Yes."

"Pepper Keane." She rose from her chair and extended her right hand. I shook it. She was as tall as me and thin as a rail. Thirtyish. Luxurious dark hair – straight, full of body, and worn short, but not so short as to be butch. She'd been blessed with high cheekbones and white teeth. Bright blue eyes. Small, firm breasts. Smooth, milky skin. She wore designer jeans and a white cotton blouse. Except for pink lipstick, I detected no makeup.

"Thank you for coming on such short notice," she said.

"I'm sorry I'm late," I replied. "It took a while to find a parking space."

"Yes," she agreed, "parking is a real problem here. Sometimes even the faculty lots are full." I smiled, said nothing. She motioned to two sturdy wooden chairs in front of her desk and said, "Please, sit down." Feeling liberal, I took the one on the left.

It was a typical faculty office. Small, equipped with an old metal desk and black filing cabinets. Linoleum floor tiles designed to resemble white marble were partially covered by a Navajo rug. Bookcases overflowed with textbooks and professional journals. She had made an effort to decorate it by placing cacti here and there. National Public Radio was barely audible on the small radio by the window behind her.

There was one poster. It proclaimed, "A Woman Without a Man is Like a Fish Without a Bicycle." I hadn't seen one of those in fifteen years.

"Would you like some coffee?" she asked. I noticed a small coffee maker on one of the shelves to her right. The kind that brews only two cups at a time. There was also an electric grinder and a package of gourmet beans. She bought her coffee at Starbucks. I usually buy mine at the Texaco.

"No, thanks."

"You sound like you have a cold. Can I make you some tea?"

"Really," I said, "I'm fine." I had downed forty-four ounces of Diet Coke on the drive down and didn't figure to need liquids for a while.

She poured some coffee into a mug and said, "It's one of my few vices." The mug boasted a colorful southwestern design featuring a coyote howling at the moon.

"Everyone needs a few vices," I said. She forced a smile and sipped her coffee.

"You're probably wondering what this is all about?"

"Well, Professor, I have to admit you've aroused my curiosity." She'd told me nothing on the phone, saying only that she would prefer to discuss it in person.

"I apologize for the secrecy," she said, "but I've never been involved in something like this." She paused. "Would you mind closing the door?" I reached back, gave it a good push, and listened as the latch found its place in the metal doorjamb. She took a deep breath, leaned forward, extended her long arms across the desk, and clasped her hands together. Her nails were short, but she wore polish and it matched her lipstick.

"Do you know much about mathematics?" she asked.

"Not much," I said. "I took calculus twenty years ago and it was the low point of my academic career." She forced another smile.

"My specialty," she said, "is fractal geometry. Do you know what a fractal is?"

"No."

"A fractal," she said, "is a type of geometric shape." She paused. "I don't quite know how to explain it to you." She tilted her head slightly, paused, then said, "Picture a coastline."

"Okay." I didn't know much about geometry, but I'd been a Marine officer for three years and I knew about coastlines.

"If we take a small section of that coastline, we can use a straight line to represent it on a map. But if we look closely at that section, we will see that it is made up of many small inlets and peninsulas, right?"

"Sure, and each inlet and peninsula has its own smaller bays and headlands."

"Yes," she said, "that's exactly right." She sipped her coffee. "And if we continue to look at smaller and smaller sections of the coastline, we'll find that this pattern is always present."

"Right down to the last grain of sand."

"Yes. That's the interesting thing about fractal objects; their pattern remains more or less the same no matter how closely you examine them."

"So a fractal is just a shape with a random pattern?" I took the white handkerchief from my pants pocket, blew my nose, folded it gently, and placed it back in my trousers.

"Not a random pattern," she said, "an irregular pattern. Strictly speaking, there's no such thing as a random pattern. The two words are inconsistent. It's an oxymoron, like military intelligence." I let that pass without comment, though my high and tight haircut should've suggested I had once served in uniform.

"You're saying the shape of a coastline is not random?"

"Not in a mathematical sense," she said. "Each point on a coastline is linked with the points next door. If it were truly random, one point would have no relationship to the next. Instead of gradual curves, you'd see lines going all over the place. One point might be up here, the next might be way down there."

"Okay," I said, "I'll buy that." I waited for her to continue, confident that sooner or later the reason for my presence would become apparent.

"Did you study geometry in high school?"

"Tenth grade." I wondered what Mrs. Claggett was doing these days. Probably in the Aspen Siesta nursing home suffering recurring nightmares about Scott and me.

"The problem with traditional geometry," she continued, "is that triangles, squares, and circles are abstract concepts. You can't use them to describe the shape of things like mountains, clouds, or trees."

"Or a coastline."

"Or a coastline," she agreed. She was becoming more animated; she clearly enjoyed the subject. "Traditional geometry -- what we call Euclidean geometry -- has to ignore the crinkles and swirls of the real world because they are irregular and can't be described by standard mathematical formulas. Then, about twenty years ago, a man named Mandelbrot invented something we call fractal geometry."

"Fractal geometry," I repeated. I sensed the lesson was nearing its conclusion.

"Mandelbrot realized that although many natural phenomena appear to be chaotic, there is frequently a hidden order in them. In fact, he called fractal geometry the geometry of nature." Another sip of coffee. "No two coastlines are identical, yet they all possess the same general shape, so there is a certain order there. Do you follow me?"

"I think so."

"Fractal geometry provides a way to identify patterns where there appears to be disorder. It allows us to model and predict the behavior of complex systems. It's a language," she said. "Once you speak it, you can describe the shape of a coastline as precisely as an architect can describe a house." I doubted that.

"Give me an example," I said.

"Certainly," she replied, eager for the invitation. "One of the tools we use to compare fractal objects is the concept of fractal dimension. For example, the coastline of Great Britain has a fractal dimension of approximately 1.25, but the more rugged coastline of Norway has a fractal dimension of better than 1.56."

"I'll take your word for it."

"I'm sorry," she sighed, "I've probably told you more than you need to know. I hope I haven't bored you."

"No, it's interesting." Not as interesting as the way her delicate bra straps traversed her bony shoulders, but interesting nonetheless.

"This will all make sense in a minute. I promise." She sipped her coffee and I noticed a silver Navajo bracelet on her right arm. No wedding ring on either hand.

"Take your time," I urged. Despite my strong preference that people get right to the point, experience had taught me the best way to conduct an interview was to shut up and listen.

"As I said," she continued, "my specialty is fractal geometry." I noted the Ph.D. from Harvard on the wall to my right. "Last year I began working on a paper I intended to present at a conference this Fall. It's publish or perish, you know."

"So I've heard."

"When I completed my draft, I wanted someone else to critique it." She finished her coffee and set the mug to one side. "The last thing you want to do is publish a paper which contains a flaw."

"So you have your colleagues read it in advance to see if they can poke holes in it?"

"Yes, but my colleagues here wouldn't be much help. Fractal geometry is a rather narrow specialty, so I compiled a list of five of the most respected people in the field and attempted to contact them to see if they would be willing to critique it." Her slender neck became visibly tense and I thought she might be having trouble breathing.

"Are you all right?" I asked. She took a deep breath and nodded affirmatively.

"Mister Keane," she continued, "when I attempted to contact these people I learned that two had been murdered and a third had committed suicide."

"Over what span of time?"

"All within six months of each other," she said. "Do you know the odds against that?" It was a rhetorical question, but I had a hunch she could tell me the odds right down to the decimal point if she wanted.

"And you want me to find out if these deaths were related?"

"Yes."

"Did you report this to anyone?" I asked.

"I called the police."

"And they said it wasn't their problem?"

"Yes, because none of the deaths had taken place in Boulder. They suggested I call the FBI."

"Did you?"

"Yes."

"They do anything?"

"Not from my point of view," she said coldly. "Two agents from Denver interviewed me. I explained that the odds of it being a coincidence were astronomical. Six weeks later they told me they couldn't find any connection and had closed the case." Her nostrils flared. She was not a woman accustomed to being taken lightly.

"When was that?" I asked.

"About two weeks ago. I've been struggling with what to do ever since."

"Did you know any of the victims?"

"I knew Carolyn Chang. We met at a conference in San Francisco a few summers ago, and we took in some of the sights together."

"Did you stay in touch after that?"

"Not really," she admitted. "We exchanged Christmas cards, that's about it." We were silent a moment, perhaps both recalling the names and faces of people who had briefly been friends but had long since been consigned to memories.

"And," she said suddenly, "she sent me a note last year complimenting me on something I'd written for one of the journals. That's the only time someone ever took the time to do that." She seemed on the verge of tears, and I wondered how long it would take her to remove a tissue from the ceramic dispenser on her desk. Like her coffee mug, it boasted a colorful southwestern design.

"Did you know the others?"

"Only by reputation," she said. She started to reach for a tissue, but caught herself. She would not cry. "I'd read some of their papers," she continued, "and seen their names in professional journals. You have to understand, these were some of the most brilliant people in the field. Professor Fontaine's textbook is the Bible of fractal geometry."

"You never met them or spoke with them on the phone?"

"No."

"Ever correspond with them?"

"No." I leaned back and laced my fingers together behind my head.

"You said you had planned to ask five experts to critique your paper?"

"Yes."

"And three are dead?"

"Yes."

"Who were the other two?"

"Norbert Solomon at LSU and Mimi Townsend at MIT." A math professor named Mimi?

"Did they review it?"

"Yes."

"Anyone else?"

"I've asked several others to look at it. I still expect to present it this Fall." I closed my eyes for a moment to process what I'd learned.

"How many people in this country would you say are experts in fractal geometry?"

"I think most major universities now offer at least one course in the subject." My years as a trial lawyer had so conditioned me that my first instinct was to rise and object to her answer as non-responsive. But I didn't. She wasn't on the witness stand and I was no longer practicing law. I re-phrased the question.

"Would it be correct to say that not everyone who teaches a basic course in fractal geometry is an expert?"

"Yes, I suppose that's true."

I leaned forward. "How many people really know this stuff?" I asked. "How many people know it well enough to critique your paper or write a textbook?"

"Gosh," she said, "I don't know. Fifty?"

"Okay," I said, "can you think of anything which distinguishes these three from the other forty-seven?"

"Well," she said, "Fontaine was certainly one of the best known people in the field."

"And the others?"

"They were all highly regarded."

"Any other connection?" I asked. She opened a folder on her desk and removed some papers.

"It may not be anything," she said, "but each of them attended or taught at Harvard." She handed me three biographies she'd apparently copied from some sort of Who's Who in Mathematics. I studied them.

"It doesn't appear there was any overlap," I finally said. "Fontaine left Harvard while Carolyn Chang would've still been in high school." She finished her coffee and poured more.

"Yes, I noticed that." Her intellect recognized the significance of the fact, but her voice told me the Harvard connection concerned her.

"I'm sure many experts in fractal geometry spent time at Harvard," I said.

"I keep reminding myself of that, but it hasn't stopped me from having some sleepless nights." I suspected guzzling high-octane coffee late in the afternoon wasn't helping the problem, but I kept that to myself.

"Okay," I said, "each of these people taught fractal geometry, each was highly regarded, and each spent time at Harvard. Aside from those things, can you think of any other connection?"

"No," she sighed, "I've been racking my brain about that, but I just can't come up with anything." I closed my eyes and massaged my temples.

"So," I finally said, "three math professors are dead, two of whom you never met."

"Yes."

"But you're willing to spend your own money to determine if there's a connection?"

"There *is* a connection," she shot back. "Besides, if I don't do it, who will?" I thought for a moment. The same logic had governed my actions more than once.

"How did you pick me?" I asked.

"I was impressed by your ad. Law degree. Federal prosecutor. I didn't see any other investigators with those credentials."

"It doesn't mean I'll find anything."

"Mister Keane," she said, "I understand that people in your line of work can't promise a specific result, but this was not a coincidence. Three mathematicians with expertise in a very esoteric branch of geometry all die of unnatural causes within six months of each other? Fat chance."

"You should've been a lawyer," I said. I reached for my briefcase and removed my clipboard.

"Does that mean you'll take the case?"

"I'll look into it. If I conclude you're wasting your money, I'll tell you."

"I appreciate your concern for my money," she said coldly, "but let me worry about that."

"I was just trying to --"

"I'm sorry," she said, "I didn't mean to be rude. Obviously, I don't have unlimited resources. But these deaths are connected. And if you accept that, it follows that evidence of that connection exists."

"Assuming that's true," I said, "it doesn't follow that I or anyone else will find it." She pondered that.

"One thing is certain," she said. "We won't find it if we don't try." I gave in to a slight smile and that, in turn, brought a smile to her pink lips, but this pleasant moment was cut short by two quick knocks on the imitation walnut door.

"Come in," she said. The door opened. It was Stephen Finn, Ph.D. He stood about six-three and possessed a sinewy build. Maybe one hundred eighty pounds. Blond hair, parted on the left. Green eyes. Blue veins criss-crossed his forearms like roads on a map, and I guessed he was an athlete of some sort -- a cycling enthusiast or perhaps a mountain climber. He wore a white alligator shirt, tan slacks, and cordovan loafers.

"I'm sorry," he said with another forced smile, "I didn't know you were with someone. I just wanted to see if we were still on for tonight?" The question was directed to her, but intended for me. He was marking his territory, claiming some form of ownership.

"Yes," she said, "I'll meet you at seven." She did not introduce us and I made no effort to introduce myself. Clearly curious about my business with Jayne Smyers, he studied me briefly, apologized again for interrupting, and closed the door behind him.

"I won't take much more of your time," I said.

"That's all right," she said, "I want to give you as much information as I can."

We talked another twenty-five minutes. She told me what she knew about the three deaths and gave me some news clippings she'd obtained when she'd first discovered them. I asked if she'd received any threats since discovering the deaths, and she said no. She also assured me she had not received any unusual phone calls or letters. I told her I didn't think she was in any danger, but gave her a pamphlet Scott

and I had written on security for women. I requested a copy of the article she'd wanted the victims to review and she provided one. Eventually we came to the subject of fees.

One of the many things I'd hated about practicing law was having to constantly keep track of my time. No matter how accurate my records, there was always some asshole complaining he'd been billed fifty dollars for what was invariably described as a "two-minute conversation."

"I have sort of a Zen approach to fees," I said. "You and I will agree on a retainer. I'll keep track of my time and expenses. We'll talk about it from time to time. If you think I'm charging too much, you can fire me. If I think you're not paying me enough, I can quit."

"Interesting," she said, not quite sure how to respond.

"It requires a certain amount of trust," I admitted.

"It requires a great deal of trust."

"Look," I said, "I'd make more money if I charged by the hour, but whenever I do that I seem to spend half my time generating paperwork to justify my fees and the other half wondering if the client can afford to pay me to do what needs to be done. That leaves very little time for investigation."

"That leaves no time for investigation," she corrected. I smiled to signify she'd made her point. In the future I would refrain from using fractions in my figures of speech.

"If you'd be more comfortable with --"

"Will two thousand dollars be enough to get started?" She retrieved her purse from the floor beside her, removed a maroon checkbook, and began to write.

"More than enough," I said, "but I don't want your money if you're not comfortable with the arrangement."

"I'm comfortable with it," she said as she handed me a check.

"Good." Not surprisingly, her checks featured scenes from the southwest; this one depicted a pastel orange sun setting behind a cactus-covered canyon. I folded it in half, placed it in my shirt pocket, returned the clipboard to my briefcase, and stood up. "I want to read what you've given me and do a little digging. I'll call you in a few days to let you know what I've learned."

"I'll help you any way I can," she said as she rose from her chair. "I feel better just knowing someone will be working on this." She extended her hand and I shook it.

"By the way," I said, "who else knows about this?"

"Just Mary Pat," she said, "my graduate assistant."

"That's it?"

"That's it," she assured me.

"Let's keep it that way."

"Certainly."

"One more thing," I said, "do you recall the names of the two agents you spoke with?"

"Just a moment," she said, "I have their names right here." She opened the top drawer of her desk and retrieved two business cards, the gold seal of the Federal Bureau of Investigation visible on each. "Special Agent Gombold and Special Agent Polk." My expression must have changed when she said their names.

"Do you know them?" she asked.

"Yeah," I said, "I know 'em."