

L'affaire de l'anthrax et les doutes de *Wired*

Dans son numéro d'avril 2011, le mensuel *Wired*, le journal le plus tendance et technolâtre de la planète apporte ses grandes eaux au moulinet de Pièces et main d'œuvre.

Vous vous rappelez l'affaire de l'anthrax en octobre 2001 ? Juste après l'effondrement des tours du Wall Trade Center ? Ces envois de lettres empoisonnées faisant cinq morts aux Etats-Unis, déclenchèrent une panique mondiale et une intrigante déferlante de canulars. Rien qu'en France, trois mille fausses lettres empoisonnées furent expédiées, et analysées par les laboratoires militaires, en un an. C'est l'affaire de l'anthrax, la hantise de l'ennemi infiltré, invisible et reptile, qui, davantage que l'attentat suicide par des pirates de l'air, a justifié les sept ans de furie sécuritaire subséquente – lois, mobilisations, investissements, propagande, dispositifs d'alerte, de contrôle et de surveillance ; tous faits accomplis sur lesquels on ne reviendra pas, quels que soient la couleur ou le sexe du président américain. L'effet cliquet, mécanique, de ces raz de marée liberticides étant de supprimer les conditions mêmes d'un possible retour en arrière : Orwell le montre à propos de l'état des libertés dans le Royaume-Uni, l'Europe et les Etats-Unis, avant et après les deux guerres mondiales.

On a décortiqué toute cette intox dans *Le CRSSA, Fort Detrick et les Etats contre le bioterrorisme*, un chapitre lisible en ligne¹, et dans un livre paru en 2009 : *A la recherche du nouvel ennemi. 2001-2025 : rudiments d'histoire contemporaine*.²

On savait, les biologistes savaient, le FBI savait, le gouvernement américain et les autres savaient, dès novembre 2001, que l'anthrax militarisé, employé pour ces envois de lettres, venait d'un laboratoire militaire américain, en l'occurrence Fort Detrick. Le général Colin Powell savait, en février 2003, lorsqu'il brandissait la menace de l'anthrax devant le Conseil de Sécurité des Nations Unies, parmi les justifications à l'invasion de l'Irak. David Kelly, l'expert biologiste du gouvernement britannique, savait, quand trahi par les services de Blair le menteur - Blair/Bliar -, son nom lâché à la presse, il se suicida ou fut suicidé, le 17 juillet 2003. Peu à peu, au fil de sept années d'enquête – dix mille interrogatoires, des millions de dollars dépensés -, alors que le lobby scientifico-militaire, notamment biologistes et chimistes, extorquait des centaines de millions d'euros aux Etats pour leur « protection », tout le monde a su, autant que le FBI. On a su le nom de Steven Hatfill, un biologiste de Fort Detrick ayant travaillé pour l'armée rhodésienne juste alors qu'une épidémie d'anthrax frappait les zones de guérilla des indépendantistes du Zimbabwe. On a su qu'il était suspect d'avoir commis les attentats d'octobre 2001, comme les pompiers pyromanes allument des feux. Pour se faire valoir, eux, leurs emplois, leurs salaires, leurs budgets. On a su le nom de son mentor, de son meilleur ami et supérieur hiérarchique, Bill Patrick, un autre savant tueur de Fort Detrick, principal promoteur des armes biologiques aux Etats-Unis. Et puis curieusement, d'un coup, l'enquête s'est détournée et concentrée sur Bruce Ivins, encore un biologiste de Fort Detrick, jusqu'à le réduire au suicide, lui aussi, à moins qu'il n'ait été suicidé – lui aussi ? - en été, lui aussi, le 2 août 2008, quand les média et le public baillent de torpeur au soleil des bronzoirs de masse.

L'article de *Wired* ne revient pas sur le suicide (?) de Bruce Ivins mais sur sa personnalité et l'enquête du FBI. Qu'est-ce qui en a fait un suspect et pourquoi est-il mort ? Facile : Ivins avait

¹ http://www.piecesetmaindoeuvre.com/spip.php?page=resume&id_article=191

² *A la recherche du nouvel ennemi. 2001-2025 : rudiments d'histoire contemporaine*
Pièces et main d'œuvre (Editions L'Echappée, 2009)

toutes les caractéristiques du bouc émissaire. Il n'était pas comme les autres. Il faisait partie de la « communauté » - comme on dit - des biologistes militaires, mais à la marge. Vulnérable, fantaisiste, « hippie », ringard, inadapté social, amoureux pataud, blagueur lourdaud et on en passe. Il faisait suffisamment partie de la communauté pour être suspect de ses crimes, pour en porter le poids, il en était assez marginal, le clown, le bouffon, pour être sacrificable aux intérêts supérieurs et collectifs du groupe. Bien sûr, cela ne suffit pas à l'innocenter mais Noah Shachtman, l'auteur de l'article aligne dans sa conclusion quelques faits énormes. Les scientifiques disputent encore pour savoir si la lignée d'anthrax utilisée lors des attentats provenait bien des souches accessibles à Ivins. Matériellement, on ne sait pas où, quand ni comment, il aurait pu cultiver les quantités nécessaires à la commission des attentats, à l'insu de ses collègues. On n'a retrouvé aucune trace d'anthrax dans sa voiture ni chez lui, à peine une pincée dans son laboratoire. A la différence de Hatfill et Patrick, il n'avait aucun mobile, ce n'était pas un fanatique de la guerre biologique, plutôt un lunatique égaré. Bref, sa culpabilité déclarée par le FBI et confirmée par la justice américaine pour clore l'affaire *n'a jamais été démontrée*. Chute de l'article :

« Il y a une ironie dans le fait que le coupable était probablement un top expert en anthrax du gouvernement : depuis 2001, les E-U ont construit des douzaines de labos, dépensé à peine moins de 62 milliards de dollars, et levé une armée de chercheurs pour prévenir une seconde attaque bioterroriste. En fait, Washington a consacré la dernière décennie à former et équiper des centaines de gens comme Ivins.

C'est un scénario déconcertant. Mais il y a autre chose bien plus effrayant à contempler. Il y a encore la possibilité que le gouvernement ait eu aussi faux à propos d'Ivins qu'à propos de Hatfill. Si c'est le cas, l'expéditeur d'anthrax est encore dans la nature. Et cela veut dire que quelqu'un a lancé la plus meurtrière attaque biologique dans l'histoire des Etats-Unis – et s'en est tiré. » (traduction PMO)

L'auteur de cet article, reproduit ci-après dans le texte original – en anglais - est Noah Shachtman, assisté de Adam Rawnsley.

Pièces et Main d'œuvre
Grenoble, le 10 juin 2011

Anthrax Redux : Did the Feds Nab the Wrong Guy ?

By Noah Shachtman

Wired April 2011

Finally, the investigation was over. The riddle solved. On August 18, 2008—after almost seven years, nearly 10,000 interviews, and millions of dollars spent developing a whole new form of microbial forensics—some of the FBI's top brass filed into a dimly lit, flag-lined room in the bureau's Washington, DC, headquarters. They were there to lay out the evidence proving who was responsible for the anthrax attacks that had terrified the nation in the fall of 2001.

It had been the most expensive, and arguably the toughest, case in FBI history, the assembled reporters were told. But the facts showed that Army biodefense researcher Bruce Ivins was the person responsible for killing five people and sickening 17 others in those frightening weeks after 9/11. It was Ivins, they were now certain, who had mailed the anthrax-filled letters that exposed as many as 30,000 people to the lethal spores.

The FBI unraveled the mystery, officials said, thanks in part to the microbiologists seated at a U-shaped table in the front of the room. Among them was Paul Keim, who first identified the anthrax strain used in the attacks, and genetic specialist Claire Fraser-Liggett, who led the team that sequenced the DNA of the anthrax in the letters, tracing the spores back to their genetic match: a flask of superconcentrated, ultrapure anthrax held by Ivins. Several of the researchers at the table had previously counted Ivins as a peer and even a friend. Now they were helping brand him a monster.

Between the officials and the scientists, it was a convincing display. It had to be. Ivins had killed himself three weeks earlier. There would be no arrest, no trial, no sentencing. Absent a courtroom and a verdict to provide a sense of finality or some measure of catharsis, all the FBI could do was present its findings and declare the case closed.

No one involved that day expressed any doubt about Ivins' guilt. But things are not always as clear-cut as they may seem in an FBI presentation. Two years later, sitting in her office overlooking West Baltimore, Fraser-Liggett concedes she has reservations. "There are still some holes," she says, staring out her window in discomfort. Nearly 2,000 miles away in Flagstaff, Arizona, Keim has his own concerns. "I don't know if Ivins sent the letters," he says with a hint of both irritation and sadness. Even agent Edward Montooth, who ran the FBI's hunt for the anthrax killer, says that—while he's still convinced Ivins was the mailer—he's unsure of many things, from Ivins' motivation to when he brewed up the lethal spores. "We still have a difficult time nailing down the time frame," he says. "We don't know when he made or dried the spores." In other words, it's been 10 years since the deadliest biological terror attack in US history launched a manhunt that ruined one scientist's reputation and saw a second driven to suicide, yet nagging problems remain. Problems that add up to an unsettling reality: Despite the FBI's assurances, it's not at all certain that the government could have ever convicted Ivins of a crime.

It took weeks for anyone to realize the attacks were even happening. When Robert Stevens, a photo editor at the Sun tabloid, came down with chills while on vacation in North Carolina on September 29, 2001, neither he nor his wife figured it was a big deal. She went to spend the afternoon with their daughter; he rested on the couch. As Stevens lay there, thousands of spores were filling his lungs. Nestled in the respiratory sacs, the particles slowly came in contact with white blood cells called macrophages, which carried the bacteria into the lymph nodes in the central cavity of his chest. There, the spores began to germinate, shedding their tough outer layer and multiplying relentlessly. The bacteria unleashed two types of toxins into Stevens' bloodstream. One caused a fluid buildup in his central chest cavity, which squeezed his heart and shoved his lungs against his ribs, making it difficult to breathe. The other began killing off Stevens' macrophages, decimating his body's natural defenses.

Two days later, Stevens was feverish, short of breath, and red in the face. He and his wife started driving back to their home in Florida, with Stevens sweating in his seat. When they got there, Stevens'

wife took him, nearly incoherent now, to the hospital. On October 4, he tested positive for anthrax. He died the next day.

Both medical and public officials figured it was a freak but natural occurrence, maybe something Stevens picked up on a hike in the Carolina woods. Because anthrax was known as a potential biological warfare agent, the case grabbed national attention, but there seemed no reason to panic. “It looks like it’s a very isolated incident,” President George W. Bush told the country on October 9.

Three days later, an anthrax-loaded letter was found at NBC News headquarters. A week after that, the FBI recovered an identical-looking spore-laden letter from the offices of the New York Post. “09-11-01,” the letters read. “this is next / take penacilin now / death to america / death to israel / allah is great.”

By mid-October, four more people had been diagnosed with anthrax, and Leroy Richmond, a postal worker at the Brentwood Road mail facility in Washington, DC, was doing his best to convince his coworkers to relax. Mail handlers had little to fear as long as they took precautions, according to talking points distributed by the government, which Richmond read aloud to several fellow mail room employees. *Bacillus anthracis* will appear as a white powder that you should keep away from your face. So be careful, but keep doing your jobs, Richmond told his coworkers as he wiped away a sniffle. Everything is going to be just fine.

A few days later, Richmond barely had the lung capacity to walk across the floor of the mail room, which routes correspondence to the US Senate and dozens of federal agencies. His shoulders and chest ached like they had been hit with a bat. “Oh my God,” he thought. “This might be the last breath that I can take.” On October 20, doctors at Inova Fairfax Hospital confirmed that he had been infected with anthrax.

Richmond survived. His coworkers Thomas Morris and Joseph Curseen did not. The mailer was probably a spore-happy Unabomber type—a highly trained, educated loner, likely in the US biodefense community.

The letter that likely infected them was discovered in the offices of Tom Daschle, the Senate majority leader. The envelope had a Trenton, New Jersey, postmark and a return address that read in handwritten block letters, “4th grade greendale school.” An FBI team wearing protective suits placed the letter and envelope in ziplock bags. They then drove the package 50 miles northwest, to Fort Detrick, home of the military’s leading biodefense facility, the United States Army Medical Research Institute of Infectious Diseases—the famed USAMRIID.

John Ezzell, the bearded, Harley-driving head of the institute’s Special Pathogens Sample Testing Lab, was waiting to meet the agents. He spent a day studying the package, then sent it to the lab of Bruce Ivins, one of the institute’s most experienced anthrax researchers. As his fellow microbiologists watched from the hallway, Ivins shoved his double-gloved hands inside a biosafety cabinet containing the sample. He opened the bag and held it up with one hand. When he moved his free hand closer to it, the granules in the bag began moving toward his glove, drawn by a slight electrostatic charge. The microbiologists gasped; they were used to working with wet spores, which fell to the ground easily. But this anthrax was dry and ionized—it would stay aloft and spread like a gas. It was potentially lethal to anyone in the vicinity. “It’s unbelievable,” a colleague remembers Ivins saying. “I’ve never seen anything like that.”

Ivins measured the concentration of the sample. It came out to a trillion spores per gram—three orders of magnitude more dense than anything the USAMRIID researchers had ever grown. “These are not ‘garage’ spores,” Ivins later wrote in an analysis. “Professional manufacturing techniques were used.”

If anyone at USAMRIID knew about spore-growing, it was Ivins. After two decades at the institute, he had mastered the delicate balance of chemistry, heat, and time required to get anthracis to multiply in

just the right way. Ivins not only supplied spores to his fellow scientists at USAMRIID; many of the anthrax researchers on the planet relied, in one way or another, on his concoctions.

In addition to his anthrax expertise, Ivins was known as one of the odder characters in an institute full of odd characters. He'd show up to work in plaid bell-bottoms and flowered shirts that ran a few sizes too small for his soda-straw frame. He was a juggler, a unicyclist, and a weather junkie. At institute Christmas parties, Ivins was the one reciting the corny limericks. At the base gym, he was the one working out in dark socks and heavy boots.

Ivins grew up in the small town of Lebanon, Ohio, the skinny, science-nerd son of the local drugstore pharmacist. He went to school at the University of Cincinnati, where he met his wife, Diane, and earned a bachelor's degree, a master's, and a PhD—all in microbiology. After Ivins' postdoctoral work at the University of North Carolina, the couple moved to Maryland, where Ivins started working at USAMRIID in 1981. Two years earlier, an anthrax outbreak at a secret military microbiology plant in Siberia had killed at least 66 people, proving that the Soviets had been refining anthrax into a biological weapon. Ivins was assigned to start working on a new, more effective vaccine.

Ivins was a fixture in the institute's active social and intramural sports scenes. Diane largely stayed away, even though they lived just up the street from the base with their adopted kids, Andy and Amanda. (The Ivins family did not respond to repeated interview requests.) So it was Ivins alone who frequented the institute's volleyball games—not to play but to cheer and razz the refs. Then he'd go to the postgame drinking sessions, held at Fort Detrick's old officers' club, and nurse a single glass of wine while everyone else got sloshed.

Ivins liked to keep candy on his desk and would talk and talk and talk to anyone bold enough to grab a piece. When he got flustered—which was often—he'd stammer and flap his arms in hopes of making his point. If you found a lame joke or a picture of kittens in your inbox, you knew who to blame. He led what his friends called a “hippie Mass” at St. John the Evangelist Catholic Church in nearby Frederick, playing keyboards and acoustic guitar. He was a local Red Cross volunteer. Colleagues found him both smart and generous. “He had experience and was willing to share,” remembers Hank Heine, Ivins' friend and colleague in the tight-knit bacteriology division. “The first day I arrived, he said, ‘If there's any help you need, come see me.’”

Not surprisingly, then, when the FBI set up a small team after the initial attacks to help with the science of anthrax, they found Ivins eager to assist. Maybe too eager. While other USAMRIID scientists swore that no one there could have pulled off the attacks, Ivins suggested several current and former colleagues as potential perpetrators. “Rarely would a guy point the finger at his coworkers,” says Thomas Dellafera, the US Postal Inspection Service agent who helped lead the anthrax investigation. “But he did. This guy was rolling on his own mother.”

Ivins regularly emailed friends and acquaintances about the burgeoning investigation—including a former UNC grad student he had known named Nancy L. Haigwood. One picture Ivins sent Haigwood, now also a microbiologist, was particularly unsettling: It showed Ivins holding petri dishes filled with anthracis—without wearing gloves. Haigwood was already thoroughly unnerved by Ivins: He had shown an excessive fascination with both her and the rules and rituals of the Kappa Kappa Gamma sorority she advised back in school, and he had foisted all manner of unwanted attention on her ever since. For example, she had long suspected that Ivins was the one who, years after graduation, spray-painted a fence at her boyfriend's house with a red kkg in Greek lettering. When the American Society for Microbiology later emailed a plea to its members asking for help on the case, Haigwood thought of Ivins. “At that exact moment, that awful moment, I knew it was him,” she says. She reported her feelings to the FBI. The bureau sent out two agents but didn't seem all that interested in Haigwood's intuition at the time.

The Scientists

Investigating the 2001 anthrax attacks required an unprecedented scientific effort—one that was mostly conducted by US anthrax researchers. A few of the key players:

Hank Heine

One of Ivins' closest friends in USAMRIID's bacteriology division

Paul Keim

Identified the attack anthrax as a strain used in many US labs.

Pat Worsham

Identified the four mutants produced by the attack anthrax.

Claire Fraser-Liggett

Led the genetics team charged with "fingerprinting" the anthrax.

Sitting on the hood of his Toyota SUV on the edge of the tarmac at Flagstaff Pulliam Airport, Paul Keim watched the Arizona sky change colors as the sun went down. A microbiologist at Northern Arizona University, Keim supervised one of the largest collections of anthrax on the planet, more than 1,000 samples in all. That afternoon, he had received a call from the FBI directing him to the tarmac to receive one more specimen: anthrax-infected spinal fluid extracted from the first victim, photo editor Robert Stevens. At about 7 pm, a Gulfstream corporate jet landed, coming to a stop near where Keim was parked. While the jet's engines died down, a blond woman stepped out, strode across the runway, and handed Keim a box. He took the box and drove straight to his lab.

Keim was well-known among anthrax researchers for having developed a DNA test that could tell one form of *Bacillus anthracis* from another. By looking at certain sections of the anthrax genome, Keim could find telltale patterns of repeating nucleotides that would indicate a given strain. Ten hours after the tarmac handoff, Keim had finished his analysis of the anthrax that killed Stevens. The signatures indicated a particularly lethal stock known as Ames. The strain was mainly used in biolabs around the US to test vaccines and therapeutic treatments. The attack anthrax, in other words, was very likely US-grown.

When tested, samples from the subsequent attacks also proved to be Ames. It was the investigators' first big break. Actually, it was their only break; from every other angle, the case looked nearly impossible to solve.

Unlike in a traditional murder case, the victims had little in common. The letters themselves were clean—no fingerprints or human DNA. The exact location of the letter drops was unknown. It was enough to drive postal inspector Dellafera mad. Because the attacks used the mail system, Dellafera, who led a seven-person mail theft unit before the attacks, was placed on the case leadership team. Now the Connecticut native was interviewing hundreds of postal workers to see if they had noticed any suspicious envelopes. Nobody had. Soon it became clear that this wasn't just a whodunit. It was a wheredunit, whydunit, and howdunit, too.

Classifying the killer anthrax as belonging to the Ames strain gave the investigation something to go on, but it was helpful only to a point. Tracing the attack anthrax to its source would require far more precision. More than a dozen labs—and thousands of researchers—worked with Ames anthrax. And distinguishing one Ames isolate, or sample, from another was tough; they were all nearly identical genetically. Every Ames isolate in circulation originates from a single heifer that died in Sarita, Texas, in 1981. If spores were the equivalent of bullets, Keim knew the caliber of the murder weapon. But the bullets could have been fired from any of a thousand different guns.

To have any hope of finding the equivalent of ballistic markings for this anthrax, scientists would have to go beyond Keim's tests, which examined just eight regions of the genome, with a few hundred base pairs each. They'd need to decode the entire anthrax genome, some 5.2 million base pairs. So they turned to Claire Fraser-Liggett.

Dark-haired, with a square jaw and model's cheekbones, Fraser-Liggett helped pioneer the field of genome sequencing. In 1995, she and her fellow scientists at the Institute for Genomic Research published the first complete sequence of a bacterium. Her then-husband, J. Craig Venter, led the private-sector effort to sequence the entire human genome in the late 1990s. By the time of the anthrax attacks, she and her team had already unraveled the genetic codes for dozens of microorganisms—including the bacteria that cause Lyme disease and syphilis. And they were already working on anthrax—an Ames sample from Porton Down, a British biodefense lab.

Fraser-Liggett's team immediately set out to fully sequence the anthrax taken from Robert Stevens' spinal fluid. The hope was that even a few unique nucleotide sequences could further identify the specific isolate of the Ames strain that was used in the attacks. In 2001, though, genetic sequencing was still so difficult and expensive that the process could take months.

Meanwhile, the attacks continued. On October 28, a 61-year-old hospital stockroom worker named Kathy Nguyen became so ill so quickly that she could barely speak by the time she got to the emergency room. She died three days later, shortly after being diagnosed with anthrax. Nobody could figure out how she got infected. Maybe one of the anthrax letters had brushed against a hospital package somewhere along its route and left spores behind. Then, two weeks after that, a spore-filled letter addressed to US senator Patrick Leahy was found in a pile of quarantined mail.

That same day, 94-year-old widow Otilie Lundgren checked into the hospital with a slight cough and some weakness. It was nothing major, but the doctors decided to keep her overnight for observation. She lived alone in the small, rustic town of Oxford, Connecticut; she didn't get a lot of company. Four days later, doctors confirmed that Lundgren had anthrax. She died the next day.

The CDC warned that “tens of thousands and maybe more letters [could] be potentially at risk for some level of cross-contamination.” The country, still shell-shocked from 9/11, plunged further into panic. Every newsroom in New York and every office in DC became a jury-rigged biosafety lab. People stormed doctors' offices demanding ciprofloxacin, the powerful antibiotic used to counter anthrax; some drove to Canada when US pharmacies ran out. Then the hoaxes started. One antiabortion extremist mailed 554 powder-filled letters to abortion clinics all over the country. On December 4, newly appointed homeland security chief Tom Ridge declared that he was again placing the public “on general alert.”

FBI director Robert Mueller held daily—and sometimes twice-daily—meetings on the investigation, demanding progress reports at every turn. “Who was going to be a brave enough soul to come in and say, ‘I got nothing?’” one FBI veteran recalls. But nothing is pretty much what they had.

To Pat Worsham, one of Ivins' colleagues, the rush of events felt like “the world had gone mad.” A bookish anthrax specialist with a measured, librarian's air, she was used to USAMRIID's placid, well-regulated pace. Now she found herself at the center of a frenzied national bioterror investigation.

Worsham had made her reputation in the scientific community by studying anthracis variants, work that was key to the development of a vaccine. So it made sense that one of the institute's technicians, Terry Abshire, would decide to email Worsham a photo of a petri dish covered with strange-looking anthracis colonies. Abshire had let spore colonies from the letter to Leahy grow for two to three days longer than researchers normally do when culturing anthrax. When she pulled the dish out of the incubator, she noticed that many of the colonies had a yellowish color instead of the usual light gray tone. And they seemed to have affected the sheep's blood that lined the dish, turning it a sickly green.

Worsham studied the picture, but she wasn't sure what it meant. So she grew a second batch from the Leahy letter and, sure enough, it produced several funny-looking yellowish colonies, too. Ultimately, four predominant morphs were identified. Two had a bull's-eye shape, almost perfectly round. A third was a little smaller and more irregular. The fourth was mostly translucent. Worsham later grew colonies from the spores that coated the letters to Daschle and the New York Post. The same mutated colonies appeared again.

Worsham, cautious by nature, didn't want to jump to conclusions. "OK, they look alike," she told colleagues. "They may not be alike." But she suspected that they were unique to the attack anthrax, which might make them the kind of identifying characteristic investigators were looking for.

The FBI, meanwhile, turned to a more conventional investigative technique: behavioral profiling. It parsed the anthrax letters with Talmudic precision, looking for anything that seemed out of place. The letters' evocation of September 11, "09-11-01," used the American style of placing the month before the day. The "Allah is great" line at the end of the letter seemed inauthentic; a devout Muslim would have begun the letter that way and used the phrase "Allahu akbar." Profilers concluded that the mailer was likely a sort of spore-happy Unabomber—a highly trained, highly educated loner, probably in the American biodefense community. In public, he'd be nonconfrontational, they advised. Instead, he preferred to harass people anonymously. Neither the recipients of his letters nor the mailbox into which he dropped them were chosen at random. The letters had a Trenton postmark, so, the profilers said, the mailer probably lived or worked nearby.

Investigators in New Jersey drew up a list of 621 mailboxes that fed the Trenton area's main mail-processing facility. They started with the most isolated boxes, figuring a local resident would choose a place where they wouldn't be seen making an envelope drop. Under cover of night, the team swabbed box after box for anthrax residue. Box after box came up negative.

Separately, FBI agents were asking biodefense specialists whether they could imagine anyone as a potential mailer. One name was mentioned regularly: Steven Hatfill, a physician who had previously done virology work at USAMRIID. Hatfill was familiar with anthrax; he had gone to medical school and done his internship in southern Africa, where he had seen patients with skin infections caused by anthrax. At the defense contractor SAIC, he showed PowerPoint presentations that sketched out a biological terror attack. The scenario: anonymously mailed envelopes packed with anthrax. In the months before the attacks, he had been filling prescriptions for Cipro.

But the thing that made Hatfill a standout in his field was that he was essentially a jock among nerds, a high school wrestler and former soldier. While his colleagues limited their publishing to academic periodicals like *The Journal of Infectious Diseases*, Hatfill appeared in the conservative political magazine *Insight*, pretending to cook up biohazards in his kitchen as a way to dramatize the threat of homegrown pathogens. Out of thousands of current and former biodefense workers, Hatfill became the focus of the FBI's attention.

Ivins, meanwhile, was becoming the investigators' trusted ally, walking them through the minutiae of the anthrax life cycle. On January 22, 2002, he drew a diagram that illustrated why mutants were showing up in the attack spores—and why that was important.

Anthrax isn't a typical bacteria. It's almost immortal. As a spore, anthracis can survive in a dormant state for decades, perhaps even centuries. When it happens to enter an animal, it springs back to life and starts reproducing. Like all living things, anthracis produces mutant offspring as it multiplies. But those mutants have trouble going dormant. When the anthrax loses its host, many mutants die out and the bacteria returns to a near-pure state. It's almost as if the law of evolution doesn't apply.

The way the scientific community handles anthrax further inhibits the mutation process. Ivins, for example, kept anthracis batches that were pure, strong, and "just a slant away," as he put it, from the original strain taken from that Ames cow. Then Ivins individually picked what he judged to be the

healthiest colonies to pass on to other researchers. In other words, when anthrax scientists used Ivins' spores, they limited the possibility of mutation. They simply kept returning to 1981 over and over again.

The anthracis found in the various letters was totally different from his stock, Ivins explained to investigators. Worsham had shown that the attack anthrax produced all kinds of mutants when cultured. This meant that those spores were already the product of generation after generation of culturing and reculturing, unlike his straight-from-the-cow stuff; only the extra turns of the evolutionary cycle could explain the weird growths. "Daschle' ≠ B.I. cultures," Ivins wrote on the diagram, referring to his own initials. Agents jotted down his analysis, which seemed perfectly logical—if a little confusing—at the time. They also noted his suggestion to try genetic analysis to show the difference between his anthrax and the anthrax used in the letters.

Of course, for genetics to be helpful, the FBI would need to collect a comprehensive cross-section of anthracis samples to have something to compare the attack anthrax to. So this is what they decided to do. They set up one storehouse for samples at Keim's lab and another in a locked facility at USAMRIID. Scientists from around the world were asked to send in a bit of every Ames anthrax sample in their possession. Ivins and Worsham, among others, were asked to provide input for the submission guidelines.

The procedures included a reminder not to pick just individual, healthy colonies—even though that was standard practice for lab work. Scientists were told to take a representative mix from each sample, to catch any stray mutants. Ivins finished handing in his samples in April 2002.

Included in Ivins' submissions was an unusually potent batch of Ames spores—a mix he first created in 1997. It was the result of 164 liters of anthrax from 35 different production runs, distilled into a single liter that was nearly pure. The flask was marked RMR-1029.

That same month, Ivins did something that surprised everyone. For some reason, he decided to start testing his office and biocontainment labs for spores. This was a major breach of USAMRIID protocol. Specially trained testing teams were supposed to handle suspected contaminations.

On April 18, Ivins told his bacteriology division colleagues what he had done. They promptly freaked out. In addition to being unsafe, Ivins' actions could be read as an attempt to cover up potential evidence. "Bruce," his friend and coworker Jeff Adamovicz told him, "you don't understand what this makes you look like."

The next day, USAMRIID held an institute-wide town hall meeting to discuss Ivins' actions and launch a facility-wide spore hunt. "I am now forbidden from being a 'cowboy,'" Ivins emailed a friend later. "I can't think for myself, and I can't do anything without everybody up and down the line questioning me about it. I'm sure it's punishment."

The FBI decided to have a talk with Ivins. They had more than just the testing to ask him about. They also had discovered that Ivins liked to spend an inordinate amount of time alone in his suite of biocontainment labs, located in the windowless concrete bowels of the institute. Why lock yourself inside for so long? "I don't think anyone has any idea how peaceful and quiet it can be here after hours," he wrote in an email to a friend after the questioning. "In the evenings [suite] B3 may as well be Mars."

Despite all this, the bureau's major interest was still fixated elsewhere. Investigators were digging into the background of Steven Hatfill and finding inconsistencies. Hatfill, for example, claimed he had a PhD; in fact, the degree was never awarded. If he was misrepresenting something like that, they thought, maybe he was keeping other secrets.

In June 2002, agents asked Hatfill if they could swab his apartment for spores. When they arrived, they found the place surrounded by camera crews. News channels carried the event live. Even though the search came up empty, on August 6 attorney general John Ashcroft went on the Today show to declare Hatfill a “person of interest” in the anthrax case.

Two days later, after testing more than 600 mailboxes in central New Jersey for anthrax, investigators finally found one in Princeton with spores inside. Contrary to what the profilers had predicted, it was at a busy intersection on the northwest corner of Princeton University’s campus, surrounded by traffic day and night. Agents passed pictures of Hatfill around the neighborhood, asking whether the guy looked familiar. Nobody recognized him.

In February 2003, anthrax became part of the rationale for invading Iraq. Colin Powell went to the United Nations Security Council, in part to discuss the potential bioweapon. “Less than a teaspoonful of dry anthrax in an envelope shut down the United States Senate,” he said. “Saddam Hussein could have ... enough to fill tens upon tens upon tens of thousands of teaspoons.” Two weeks later, Tom Ridge told Americans to buy duct tape and plastic sheeting to protect themselves from a bioterror attack. Four weeks after that, the invasion of Iraq began.

As the war got under way, Hatfill’s life was unraveling. He had been fired from his job at SAIC, and a replacement gig at Louisiana State University fell apart under Justice Department pressure. He spent his days “remodeling every room in my girlfriend’s apartment,” he says. “It took months.” Suicide was “never an option,” he later told a reporter from The Atlantic, but at the time, he was under extreme emotional and mental strain. In August 2003, Hatfill sued the Justice Department for violating his constitutional rights and privacy. After Vanity Fair and The New York Times published articles suggesting Hatfill was guilty, he also sued Condé Nast (which owns wired as well as Vanity Fair) and the Times.

In public, the bureau defended its actions. But the more the anthrax unit investigated Hatfill, the less convinced some agents became of his involvement. The Cipro prescriptions, the magazine photo, the flawed résumé—none of it made him a killer. “He fits the general profile,” special agent Brad Garrett told colleagues after one interview. “But I don’t see any real evidence.”

Meanwhile, Fraser-Liggett’s team was still hard at work trying to come up with a DNA signature for the attack anthrax. To do this they were sequencing not only the anthrax taken from Stevens’ spinal fluid but also the original Ames strain (taken from Keim’s collection), which could allow them to pinpoint genetic markers unique to the attack spores. The team spent months shearing off DNA segments, tagging those segments with fluorescent dyes, scanning them with a laser, and then using advanced algorithms to reassemble the base pairs.

By October 2003, they had the results. “Oh shit,” Fraser-Liggett said when she saw the outcome. “There isn’t a single difference.” As far as the tests could tell, all of the nearly five and a half million base pairs were the same, and in the same order. Because of the natural and man-made processes that slow anthrax’s evolution, the attack bacteria was essentially pure Ames. The whole idea of using this new DNA fingerprinting technique to find the attack spores seemed like a dead end.

There were still a few options left. The best of those was to analyze the mutant anthrax colonies—those yellowish, rounded, and blood-busting specimens—that Pat Worsham had spotted. There was a chance that these mutants might contain larger, more detectable genetic differences that would allow scientists to distinguish them from pure Ames spores. If so, those morphs might produce a usable DNA fingerprint. The Fraser-Liggett team launched a new, laborious round of sequencing. “Not all hope was lost,” Fraser-Liggett says. But she wasn’t optimistic.

For the time being, however, the FBI decided to rely on Worsham’s eyes. Investigators started bringing samples from the FBI’s Ames repository to her, which she would culture, then check for mutants.

One sample caught her attention. It had the bull's-eye-shaped variants and all the other mutants, too. Because it was labeled with an anonymous code, Worsham didn't know where the spores had come from. But the FBI knew it was a subsample of Bruce Ivins' lethal RMR-1029 batch, which Ivins had previously provided to the Battelle biodefense lab in Ohio. And this meant something didn't add up.

If the Battelle sample produced mutants, Ivins' RMR-1029 sample should have as well—they were supposed to be virtually identical. But the RMR-1029 from Ivins tested clean. Investigators wondered if, despite instructions to the contrary, Ivins may have picked off a few healthy colonies rather than a representative sample of the RMR-1029 flask. Or maybe he hadn't submitted RMR-1029 at all.

In December 2003, while conducting an inventory of one of USAMRIID's biocontainment suites, investigators discovered 22 undocumented Ames anthrax samples. They began to fear that the repository they had spent nearly two years assembling might have gaping holes in it. So for the first time, the FBI decided to scour USAMRIID for any vials they had missed.

The institute staff fumed at the search—ongoing experiments would be disrupted, they shouted. Heine, Ivins' coworker, decided to exact a bit of revenge on his FBI handler. While the agent was collecting samples in his lab—dressed in full protective gear—Heine handed her a vial and told her it was a deadly plague strain. The vial started shaking in the agent's gloved hand. Heine cracked up. "They were entirely dependent on me to identify everything in every box," he says. "I could've held up a critical piece of evidence, said it was something else, and put it aside. There's no way they would've known."

During the search, investigators took Ivins' primary RMR-1029 store—not just a sample of the stuff, all of it. They skimmed a small amount into a vial, labeled it with an identification number, and sent it to Pat Worsham down the hall for analysis.

Later, on the patio of the old officers' club, Heine, Ivins, and the other scientists in the bacteriology division had a couple of beers and tried to laugh the whole thing off. Each one would joke about how the other was really the anthrax mailer.

Over the following days, Worsham grew fresh cultures from the seized RMR-1029 spores. Unlike the cultures from the sample that Ivins had supplied back in April 2002, this time the same bull's-eye-shaped morphs she had seen in the Leahy, Daschle, and Post letters appeared. So did the smallish, irregular colonies. Like the Battelle sample, it seemed to be the same stuff as the killer anthrax.

Investigators were talking to Ivins' coworkers and digging into his archived emails. They learned that women made him feel awkward. He also didn't like talking on the telephone. More seriously, Ivins worried in an email about having "paranoid personality disorder" and feared that he might be schizophrenic, as well. The idea that a man handling some of the world's most lethal pathogens might be mentally ill was not a comforting thought. (It isn't clear whether Ivins actually suffered from these ailments. His medical records are still sealed.)

On March 31, 2005—after more than two dozen interviews—investigators decided to challenge Ivins more forcefully. They asked why he hadn't submitted all his anthrax samples to the repository; he had no good explanation. They asked him about the "cowboy" spore hunts in his office; he said he was just being careful. They told him they were copying his hard drive. He was concerned—he asked what the FBI does when they find something like child pornography on a computer.

Investigators also pressed Ivins about his personal life. He responded that he had stopped taking antidepressants. "He internalizes his negative emotions and, as a result, suffers from ulcers and irritable bowel syndrome," an FBI interview summary noted. "When asked whether his psychological condition had ever caused him to do anything which surprised him ... Ivins offered that he does not 'act out' and has never hit his wife."

It was a devastating conversation for Ivins. Even the investigators were worried about the impact. The next day, an agent asked Ivins if he'd make it through the weekend. "I'm not going to jump off a bridge or anything like that," Ivins said. But he was going to start taking his meds again. A few days later, he hired a lawyer.

Meanwhile, Fraser-Liggett's team had genetically sequenced the four telltale mutants that grew out of the killer anthrax. They were all 99.99 percent identical. But that tiny fraction of difference—less than a thousand base pairs—was enough to give each mutant a unique genomic signature. If a batch of anthrax tested positive for these four morphs, it meant that it was provably identical to the attack anthrax. Before, researchers had relied on Worsham's discerning but still subjective eye to tell them which strains looked similar to the morphs in the killer batches. Now they had the kind of hard genetic data they could take to a judge and jury.

Along with other labs, Fraser-Liggett's team quickly developed streamlined tests to detect each one of the mutants. They then began the labor-intensive process of running these tests on every anthrax isolate the FBI had collected from labs around the world. In a warehouse-style lab, 75 researchers worked split shifts six days a week, testing and retesting the samples. None of them had any idea what the results meant; all the samples were coded, and all the groups were compartmentalized from one another. They toiled without any sense of progress.

Even as they plunged ahead with the new genetic tests, they continued to search for other ways to identify the source of the killer anthrax. Fraser-Liggett's team and others spent more than a year trying to track a contaminant found in two of the letters. The search did not yield any useful forensic information. Repeated attempts to reverse-engineer the powdered attack spores flopped. So did efforts to use trace amounts of tin and silica found in the attack powder to discern where the spores were made.

Eventually, FBI director Robert Mueller seemed to lose patience with the whole thing. President Bush frequently teased him about the case during his intelligence briefings. "Bob, how's that anthrax investigation coming along?" Bush would ask sarcastically. Mueller had no good answers. In 2006, the agent in charge of the case was replaced.

Edward Montooth, a two-decade veteran of counterterrorism and homicide cases, was brought in to run the investigation. He cultivated a relaxed, slow-going demeanor among outsiders, coming across as a sort of clean-shaven midwestern Columbo. An agent named Vince Lisi was chosen to be Montooth's deputy. Blue-eyed with a ruddy quarterback's face, Lisi had no tolerance for shifty suspects or slow-moving investigations. Dellafera, the postal inspector, remained on the leadership team, thanks in part to his ability to grasp the details of everything from anthrax fermentation to forensic psychology to envelope fibers.

And boy, were there details. Anthrax repository submissions. Genomic fingerprinting. Thousands of interview transcripts. In the unit's office, sandwiched between a chain hotel and the freeway in suburban Tysons Corner, Virginia, there were rooms filled with files—as many as 400,000 documents. It seemed impossible to get through them all. "I came home with a headache every day for a year," Montooth says.

On the other hand, the list of potential suspects was now short enough that it could fit on a single page, thanks to the emerging DNA results. The search for the anthrax mutants wasn't finished, but once decoded, the results pointed directly at RMR-1029 and its subsamples. This, in turn, meant that scientists with access to that material were the people worth considering. Guys like Bruce Ivins, in other words. "The science absolutely drove this," one former senior FBI official says. "It changed the focus completely."

The investigating unit gathered in its makeshift meeting area—a training room with acoustics so bad agents had to shout to be heard. Lisi, Dellafera, and Montooth barked out the new plan: Start with RMR-1029 and its subsamples. Figure out who had access. Cross as many names off the list as you can.

The person left at the end is the killer. “Don’t assume anything. Either prove to us they’re guilty—or prove to us they’re not,” Lisi said. “No more happy talk. Even for the people who helped us.”

Investigators scoured the phone records, email accounts, and laboratory access-card records of US anthrax scientists with possible access to RMR-1029 in an effort to determine their whereabouts on the days in the fall of 2001 when the letters were mailed. They reviewed anthrax transfer records, lab notebooks, and scientific publications to get a sense of how the scientists used their anthracis. “If you knew how to grow up large quantities of bugs, the FBI was on you all the time,” Heine says. Pat Worsham—who found the telltale mutants—was among those aggressively interrogated.

Worsham was able to exonerate herself, but other names were harder to cross off. Heine had a bunch of RMR-1029 subsamples. John Ezzell, head of USAMRIID’s Special Pathogens Sample Testing Lab, was perhaps the only scientist at USAMRIID who worked with dry spores—albeit dead ones. But it would’ve been highly unusual for Ezzell or Heine to keep a store of bugs in their freezers. One of the many lab technicians or scientists who shared cold-storage space with them would have noticed a stockpile, the agents theorized. Ivins, as a designated spore-grower, had plenty of reason to keep large quantities of anthrax. On top of all the other red flags, Ivins had little to no verifiable alibi for the critical days in question.

Ivins, Heine, and their coworkers would still blow off steam at the old officers’ club. Sometimes Ivins’ buddies would needle him about being the new leading suspect. “Bruce, what have you done now?” they’d ask sarcastically. Sometimes they shouted curses at the FBI agents they were sure must be listening in. They kept going to their volleyball games. Ivins kept emailing around corny jokes.

Interest in Ivins continued to grow. Agents began looking for old evidence that might point to him. That led them, finally, back to Nancy Haigwood, Ivins’ grad school colleague who had called as early as 2002 to say that she thought Ivins was the anthrax mailer. They had all but ignored her then. Now they encouraged her to email Ivins while they monitored the thread. It wasn’t hard to get a reply: Ivins always wanted to know more about Kappa Kappa Gamma, her old sorority. Maybe they’d even talk about how odd it was that the one anthrax-laden mailbox in New Jersey was right next to Princeton’s KKG offices. (Neither Haigwood nor the FBI will discuss the details of these exchanges.)

Around the same time, the US attorney’s office asked Ivins to testify before a grand jury about the scientific aspects of the anthrax case. In a strictly legal sense, he wasn’t an investigative target, they explained. Ivins agreed and, starting on May 7, 2007, testified for two days without a lawyer. The questions about his handling of anthracis—and about his personal life—sent him into a tailspin.

“They accused me of diluting, altering or adulterating an important preparation of anthrax material,” he emailed a friend, almost certainly referring to his flawed RMR-1029 submission in April 2002. “Do you realize that if anybody gets indicted for even the most remote reason with respect to the anthrax letters ... they face the death penalty?”

He also began talking about leaving USAMRIID. And maybe more. “I’ve been inside, cooped up for almost all of my life, I want to spend eternity outside,” he wrote in another email. “I look like I’m 90 years old. I feel older than that ... I guess I should have started on [the antidepressant drug] Celexa years earlier. Also caffeine and alcohol.” The former lightweight had become a heavy drinker.

In August, Fraser-Liggett’s team presented its final DNA fingerprinting report to the bureau. The results were somewhat conflicting. Some samples initially tested positive for the telltale morphs, then negative in a second exam. But of the 1,059 viable samples in the FBI’s Ames anthrax repository, eight regularly produced all of the mutants. One of those eight was Ivins’ RMR-1029 flask. The other seven were its subsamples. This ruled out Hatfill, who did not have access to RMR-1029 during his time at USAMRIID. (Later, the Justice Department agreed to pay Hatfill a \$5.8 million settlement and issued an official letter exonerating him. Condè9 Nast also agreed to an undisclosed settlement. The New York Times case was dismissed.) And while dozens of other scientists did have access to the RMR-1029

subsamples, they were being slowly crossed off the list. As each alibi and exculpatory story checked out, the investigators gravitated closer to Ivins.

The FBI wasn't ready to make a move, though. It had the genetics, but the DNA fingerprints went only so far. There were still those seven subsamples and those occasionally inconsistent results. If this were a more traditional murder case, investigators would now know which store sold the gun and to whom it was registered—but not who fired it. Montooth, for one, was worried. He once lost a murder case because the jury didn't buy the DNA evidence. "Just like a gun in possession doesn't mean homicide," Montooth says, "science alone isn't going to convict him."

Nor would a jury convict Ivins because of his unexplained hours in the lab, his suspicious office swabbing, or his botched April 2002 submission of RMR-1029 to the FBI Ames repository. The agents still had no witnesses to the mailings, no confession, no obvious motive—just complicated science, some hard-to-explain coincidences, and odd behavior.

In a series of meetings, the agents debated whether it was finally time to search Ivins' home. They decided to consult with outside forensic psychiatrists. The doctors said Ivins was probably the type to keep a souvenir of the crime, but they warned that he was a fragile man who had already been pushed very, very hard. On September 25, Ivins showed up at work with a black eye. He joked that he ran into something—his wife's fist. A month later, he talked about his new favorite cocktail, tequila and Ambien.

"The psychiatrists told us: When you go overt, you will have cut him from all his life rings. Things could get tough," Montooth says. "So, were we concerned? Hell yeah." But they didn't have much choice. The search was scheduled for November 1, 2007.

When the day came, two FBI agents caught up to Ivins at the entrance to USAMRIID. Ivins asked if he needed his lawyer. Nope, they answered. Just come into an office and listen to what we've got to say.

You've been trying to fool us for a long time, they said. You knew as far back as early 2002 that your RMR-1029 anthrax was close, really close, to the killer spores: same strain, similar kinds of mutants. You knew back then that we were looking at those mutants, seeing if they'd lead back to the attack anthrax. You knew that we wanted to do DNA fingerprinting; heck, you even suggested we do that. And now we know that you screwed up your RMR-1029 submission.

The genetic analysis of the mutants came in, Bruce. RMR-1029 and the attack spores: They match. Perfectly. That stuff you gave us in April of '02? That stuff you called RMR-1029? It doesn't match. And we know why. You were supposed to give us a full sample back then, mutants and all. Instead, you picked off single colonies so those morphs would never show.

Ivins offered all kinds of excuses. He hadn't understood the submission guidelines. He hadn't gotten how important RMR-1029 was. He even absurdly claimed he wasn't really an expert on anthrax. Each lame explanation only frustrated the agents further. To rattle Ivins, the agents asked what they call a change-up question—a deliberately provocative non sequitur. Tell us about Nancy Haigwood's husband, an agent said.

Ivins' house was a microcosm of the case: lots of suspicious, freaky material but no evidence of a crime.

Ivins pushed away from the conference room table, crossed his arms and legs, and told the investigators he was taking the Fifth. He refused to respond to any further statements.

At about 8 pm, Ivins said he was leaving. Actually, you probably shouldn't, the agents answered. We've got people talking to your wife and kids. We've got agents searching your office, your cars, and your house. It's going to take a while. We've booked hotel rooms for you and your family. Want a ride?

Dellafera, the postal inspector, was waiting at the institute's entrance. He and Ivins had known each other since the beginning of the case. They drove over to the Hilton Garden Inn, with Ivins in the passenger seat. Dellafera asked Ivins: Are you worried about the searches? Yes, Ivins answered. I do things a "middle-aged man should not do." Then Ivins told him about a bag in his house filled with the women's clothes he liked to wear.

The two passed a few minutes in awkward silence. Ivins still looked nervous, uncomfortable. He said he didn't want to be labeled a mass killer. I'm not a terrorist, he said. I can't believe you think I'm the anthrax mailer.

Dellafera said he empathized. He told Ivins that the mailer never meant to hurt anyone: The envelopes were taped shut, and the letters told people to take penicillin. Ivins didn't answer. He just rocked in his seat, staring at the floor.

While Dellafera and Ivins checked Ivins into the hotel, teams of FBI agents drove slowly, one car at a time, up to Ivins' home. They went in quietly; Montooth didn't want another media circus. Inside, there were piles of clutter everywhere: bank deposit slips, VHS tapes of *The Mary Tyler Moore Show*, classical music cassettes. The agents collected it all, hoping for something—anything—that would tie Ivins to the mailings. Finally, around 5 am, Montooth called it off. "We got dust bunnies," he says.

Montooth, Dellafera, and Lisi tried to stay upbeat. The agents did find some odd items: fake hairpieces, letters to politicians and the press (the same sorts of people who got the anthrax mailings), three pistols, a handwritten note about drawing "first blood ... and last." Ivins even wrote a song celebrating deceased space shuttle astronaut Christa McAuliffe—one of his many fixations. In some ways, the discoveries were a microcosm of the whole case: lots of suspicious, freaky material but no direct evidence of a crime.

On the day of the search, Ivins' security clearance was revoked, severely limiting the kind of work he could do at USAMRIID. He became convinced that Heine, his close friend and colleague, had fingered him as the anthrax mailer. Heine hadn't, but the suspicion drove a wedge between Ivins and his drinking buddy.

The two scientists stopped talking to each other, even though they were still working together on projects. When they needed to communicate, they did so through their boss. Bowling nights and beers at the old officers' club were out, of course. Heine even skipped the division Christmas party so Ivins could go, but Ivins didn't show up either.

About a week after the search, a surveillance agent spotted Ivins at around 1 am in his long underwear, throwing out a copy of Douglas Hofstadter's classic book *Gödel, Escher, Bach*. Ivins had lots of books in his house. Why throw out that one?

The book contains a lengthy section dealing with codes—specifically, nucleotide bases that make up DNA, represented by the letters A, T, C, and G. Investigators had long believed that at least two of the anthrax mailings contained a code, too. Some of the As and Ts were bolded, and the misspelled word penacilin had a bold A in the middle. Maybe Hofstadter's coding was the answer.

The agents knew that groups of three bases—called codons—will reliably form certain amino acids, which can also be represented by letters. When they lifted out just the bolded letters, investigators got TTT AAT TAT. The amino acids that form from these codons start with the letters P, A, and T. It was the first name of a female colleague that Ivins seemed to have a peculiar interest in: Pat Fellows. The letters that officially represent these amino acids are F, N, and Y. Maybe that meant "Fuck New York"; investigators knew Ivins hated New York City. In the end, though, they could only guess at the meaning.

As the case focused on him, Ivins was coming unmoored. His colleagues would find him slumped in his chair, staring into space. Every once in a while, he'd blurt out unprompted: "I could never intentionally kill or hurt someone." For their next interview with Ivins, investigators decided not to ask about the mailings and instead planned to focus on the weird stuff, the personal stuff.

On January 16, 2008, they all met at the US attorney's office in downtown Washington. Lisi opened up with a question about Kappa Kappa Gamma, the sorority Ivins had been so interested in for so long. "Oh, it's not an interest," Ivins answered. "It's an obsession." Ivins detailed that obsession as the investigators tried to hide their shock. Ivins talked about how he broke into KKG houses in the 1970s and stole their coded ritual book and cipher. How he sold copies of that book through the mail. How he set out to learn everything about Nancy Haigwood once he found out she was a Kappa. How he vandalized the property where she lived.

Lisi asked Ivins if his wife, Diane, knew about any of this. Not a clue, Ivins answered. She didn't track his comings and goings.

It was the kind of answer Lisi, Montooth, Dellafera, and US attorney Rachel Lieber wanted to hear. If the case went to trial, Ivins couldn't use his wife as an alibi for the mailings. Not after he'd bragged about disappearing all the time without her knowledge. They liked Ivins' other answers, too. He admitted to multiple felonies with the vandalism—ones he traveled far to commit. And he repeatedly used the word obsession, which might spook a jury inclined to sympathize with Bruce Ivins, Red Cross volunteer.

A second interview, on February 13, started along similar lines. Ivins described his fascination with bondage, beginning with blindfolding his teddy bears at age 5 or 6. Then Lisi asked about a more sensitive subject. He took out the diagram Ivins had drawn in January 2002 explaining the differences in anthrax strains. In it, Ivins showed how his purer-than-pure anthrax samples were so completely different from the attack spores. Ivins said he didn't remember drawing it. Lisi assured Ivins he had and asked him to reinterpret it on the spot. Ivins just read the names and places on the diagram out loud.

A little over a month later, on March 19, at 2:09 pm, Diane Ivins called 911. Her husband was unconscious after too many pills and too much liquor.

Ivins spent a few days at a local hospital. When he returned to work, he struggled. Then, in May, Ivins checked into a mental health facility in Cumberland, Maryland, and spent four weeks there. But the drinking and pill-taking continued.

On June 5, Ivins spoke on the phone with a friend. Ivins complained of waking up in his clothes, looking at the keys beside the bed, and thinking: "Oh shit, did I drive somewhere last night?" The friend asked Ivins if he might have committed some terrible act. Ivins didn't say no.

Instead, Ivins told his friend, "I do not have any recollection of ever having done anything like [the anthrax attacks]. As a matter of fact, I have no clue how to, how to make a bioweapon, and I don't want to know." The friend suggested hypnosis as a recall tool. Ivins said, "What happens if I find something that, that is, like, buried deep, deep, deep ... if I found out I was involved in some way?"

A few days later, agents had their final interview with Ivins. The intention was to nail him on key aspects of the case, "what we needed for prosecution," Dellafera explains.

Yet the talk turned strange and personal once again. Lisi took out Gödel, Escher, Bach. Ivins said he had a dog-eared copy of the book at home. Lisi asked about DNA and codes. Ivins answered that he wasn't much of a "gene jockey." (This from a guy who once emailed around a joke that went: "Biopersonals ... Lonely ATGCATG would like to pair up with congenial TACGTAG.") Lisi wondered why Ivins hated New York so much. Ivins said it dated back to a microbiology conference

there in the late '60s. A waitress was rude and threw his lunch on the table. Lisi asked Ivins whether he remembered what he'd had. Sure, Ivins answered: spinach salad.

Yet Ivins' memory quickly failed him when it came to details about the anthrax investigation. Ivins said he couldn't remember why the FBI wanted to build an anthracis repository, or what they wanted to do with the samples, or whether he prepared his submissions himself.

Ivins was attending therapy sessions, but they didn't seem to be helping his mental state. In July 2008, he posted a comment on a YouTube clip of a reality TV show, *The Mole*, suggesting that one of the female contestants ought to have a hatchet brought "down hard and sharply across her neck, severing her carotid artery and jugular vein." On July 9, Ivins went to a group therapy session and said he had a plan to end all this government harassment. He said he had access to a .22-caliber rifle, a Glock handgun, and body armor. He would kill all his coworkers and everybody else who had wronged him.

The next day, the addiction counselor, Jean Duley, called the police and told them of the disturbing outburst. Officers were dispatched to USAMRIID, where Ivins was attending a briefing on a next-generation plague vaccine. He seemed stressed, his colleagues said, but not crazy. The cops arrived and took Ivins away. He left the institute quietly and never went back.

The police didn't arrest Ivins but rather took him to Frederick Memorial Hospital for evaluation. Two weeks later, on July 24, 2008, Ivins returned home. That afternoon, he made two separate trips to a local store, picking up a bottle of Tylenol PM each time. That night, his wife left a note on his bedside. "I'm hurt, concerned, confused, and angry about your actions the last few weeks," she wrote. "You tell me you love me but you have been rude and sarcastic and nasty many times when you talk to me. You tell me you aren't going to get any more guns then you fill out an online application for a gun license."

At approximately 1 am on July 27, 2008, Diane Ivins woke up to check on her husband. He wasn't in bed. She went to the bathroom and found him on the floor, in his undershirt, lying in a pool of what looked like his own urine. "He's unconscious. He's breathing rapidly. He's clammy," she told the 911 operator. The local police and the emergency medical technicians arrived at the same time. The police and Diane counted the pills left in the medicine cabinet while the EMTs brought Ivins out on a stretcher.

They rushed him to the hospital. The doctors thought he might have overdosed and promptly ordered that a breathing tube be put down his throat.

Blood tests showed the acetaminophen level in Ivins' blood was 10 times higher than what is considered safe. A massive dose of Tylenol was overloading his liver. Few ways to die are more agonizing—the abdominal pain alone is excruciating. Doctors administered an antidote, N-acetyl cysteine. But it was too late.

At 8 o'clock, a nurse woke Ivins up and asked, "Did you intentionally try to commit suicide?" Ivins nodded and attempted to remove his tubes. The nurse had him restrained. Doctors tried to talk Diane into transferring him to another facility for a potential liver transplant. He doesn't want to be saved, she said.

On July 29, 2008, at 10:47 am, Ivins died. There was no suicide note. Instead, he had merely taken his wife's letter and scrawled a response on the other side. He then scratched out a few of the words and left it on the nightstand. "I have a terrible headache. I'm going to take some Tylenol and sleep in tomorrow," he wrote. "Please let me sleep. Please."

Over the next year and a half, the Justice Department produced a 92-page "investigative summary" of its case against Bruce Ivins, released thousands of pages of documents, agreed to independent reviews by both the National Research Council and the Government Accountability Office, and officially declared the case closed. It was an extraordinary and unprecedented effort to prove the guilt of a man

who was never arrested for any crime. But the document dump is in many ways unsatisfying, since it covers a single suspect—Ivins. Even the people who worked on the case acknowledge it has holes.

Fraser-Liggett and her team of geneticists have a new suite of offices and labs in a recently opened West Baltimore biotechnology complex. Hanging on her office wall, near pictures of her prized poodles, are framed copies of her articles in the prestigious science journal *Nature*. She's proud of her colleagues, like Jacques Ravel and David Rasko, who, while working on her team, helped pioneer this new science of microbial forensics during the anthrax investigation. As she talks about the case, however, Fraser-Liggett becomes uneasy. "It's as if somehow we—meaning those of us here who were involved in doing all this work on genetic mutants—were somehow fully supportive of the FBI's conclusions," she says.

The cross-dressing, the sorority obsession, the bondage—"it would be very easy to get sucked into all of this because, you know, it makes for a great tabloid-type story," she says. "Ivins was a bit peculiar. But one of our civil liberties is to be peculiar."

There are still unresolved scientific issues surrounding the case, she points out. RMR-1029 was a witches' brew of 35 different production runs. Maybe the mutants came from one or more of those original component batches and therefore showed up only on particular tests.

Nobody knows for sure, because RMR-1029 was never reverse-engineered. "It raises some very important questions," Fraser-Liggett says. "Let's repeat this experiment. Let's go back and see if we can re-create what was in RMR-1029."

The National Research Council report also casts doubt on whether the killer spores really were descendants of Ivins' RMR-1029 flask. The FBI resampled RMR-1029 a total of 30 different times, the report found. They could get all four telltale morphs on only 16 occasions.

Further, the FBI says that only eight samples in its Ames repository were genetic matches to all four morphs of the killer spores—and that the scientists with access to those isolates were thoroughly scrutinized. But the National Research Council found that the FBI's collection can't be fully trusted: Too many of the samples were intermingled or descended from other labs' anthracis to provide a truly representative cross-section of Ames anthrax. This may also be a reason why nearly one in 10 samples in the repository tested positive for at least one mutant.

Paul Keim, who helped assemble the FBI's Ames collection, still wonders how much to trust an anthrax repository that relied on scientists (and potential murder suspects) submitting their own samples. "We don't know if people did it correctly, and there's no real way to control for that," Keim says.

Even if everyone was aboveboard, it's unclear whether the FBI accounted for every last anthrax sample. Each time Ivins gave his colleague Hank Heine a batch of spores for an experiment, for example, Heine would save a milliliter or two, in case the experiment went wrong. "It's just good scientific practice," Heine says. "I had numerous samples of RMR-1029." It's hard to imagine he was the only scientist with such a collection. Because the subsamples were so small and largely undocumented, it took the FBI nearly three years to stock its repository—plenty of time for a researcher to dispose of an incriminating batch.

Then there's the problem of figuring out when Ivins could have grown the spores. In an email to colleagues on April 23, 2004—unrelated to the investigation and long before he became its prime suspect—Ivins estimated that it would take 60 hours to brew up 500 billion spores. Each anthrax letter contained up to four times that amount. This means that making enough spores for the mailings would have required between five and six months. It would have been nearly impossible for Ivins to do that much work without others noticing. It may be odd to rely on Ivins himself for these numbers, but his colleagues do not dispute his estimate. The National Research Council report does theorize that it could have been done more quickly, but its findings were inconclusive. "The time might vary from as little as

two to three days to as much as several months,” the report reads. “Given uncertainty about the methods used for preparation of the spore material, the committee could reach no significant conclusions regarding the skill set of the perpetrator.”

This raises another significant problem with the case. USAMRIID veterans debate whether Ivins had access to the kind of gear required to dry and mill the spores. Even if he did, some argue, he wouldn't have known how to use it. Ivins' wet-spore experience didn't translate to dry stuff, Heine and others say.

Montooth acknowledges that he isn't sure how Ivins would have done all that growing and drying. “But it almost doesn't matter,” he says. Investigators know which days in September and October the envelopes were mailed. That was the actual murderous act. The anthrax could have been slowly assembled and processed for months or years before that. Ivins' alibis for those autumn days are virtually nonexistent.

There are still other problems with the case against Ivins. The killing spores were so volatile that they cross-contaminated piles and piles of mail. Yet spores were never found in Ivins' house or his car, and only a handful were discovered in his lab. There's no evidence of any trip to Princeton to mail the letters. And just because the killer spores were descendants of a USAMRIID flask, there's no guarantee a USAMRIID scientist was actually the mailer. In fact, the FBI was never able to prove where the attack anthrax was cultured. “It would've been very easy to take the anthrax out, to steal some,” a former USAMRIID officer says. “Anybody could do that.”

Finally, there's the matter of motive. The Justice Department asserts in its investigative summary that Ivins mailed the letters to gin up support for an anthrax vaccine, offering a few ambiguous emails and comments to friends and investigators as proof. If there's any further, credible evidence to support this notion, Wired couldn't find it in the thousands of pages of case documents released by the government or in the hours of interviews conducted with the investigators. Montooth concedes it's a placeholder rationale at best. For someone as deeply disturbed as Ivins, he argues, simple rules of cause and effect don't apply, especially not in matters as grave as murder. “You cannot think of this in one dimension or layer. It's not that simple,” Montooth says. “You're never gonna know a single cause or motive for why it was done.”

But despite all these flaws, the circumstantial evidence remains compelling. It could just be a coincidence that the killer spores were ultimately traced back to a single parent flask and that this flask just happened to be overseen by a depressed scientist with occasional violent fantasies. It could just be a coincidence that this same scientist screwed up his anthrax submission to the FBI—even though he helped develop the submission protocols. It could just be a coincidence that his after-hours work spiked right before the mailings. But put all of those coincidences together and something stronger than happenstance emerges. For the Justice Department, it's enough to prove Ivins was the anthrax mailer.

There's an irony in the fact that the culprit was likely a top government anthrax expert: Since 2001, the US has built dozens of labs, spent just under \$62 billion, and hired an army of researchers to prevent a second bioterror attack. In effect, Washington has devoted the past decade to training and equipping hundreds of people like Ivins.

It's an unnerving scenario. But there's something much scarier to contemplate. There's still the possibility that the government was as wrong about Ivins as it was about Hatfill. If that's the case, the anthrax mailer is still at large. And that means someone launched the deadliest biological attack in the history of the United States—and got away with it.

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