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TexasMonthly.com

May 2010

Weird Science

Testimony from forensic experts can be the most persuasive evidence presented at trial, but often juries don't realize that the analysis of hair, fire, and even fingerprints may not be so scientific. And as the story of deputy Keith Pikett, master of the dog-scent lineup, shows, investigations can sometimes lead to the greatest crime of all: putting innocent people behind bars.

by Michael Hall

Quincy, the amazing bloodhound, sniffed the air around the body of Sally Blackwell, who lay half-naked in a field just outside Victoria. Blackwell, a supervisor for Child Protective Services, had been missing for a day when a county-road crew found her in a brushy field on March 15, 2006. She had been strangled with a rope, which was still on her body. Quincy's handler, Deputy Keith Pikett, held the leash and surveyed the scene, which was teeming with officers from the Victoria Police Department, the Victoria County Sheriff's Office, the Department of Public Safety, and the Texas Rangers. It was almost seven o'clock and would be getting dark soon.

A few hours earlier, Sam Eyre, a sergeant with the Victoria police, had called Pikett, who lived in Houston and worked out of the Fort Bend County Sheriff's Office, about two hours away. Pikett (pronounced "Pie-ket") was something of a star in law enforcement circles. For years he and his dogs—Quincy, James Bond, and Clue—had helped find missing children and escaped convicts, and they had investigated murders all over the state, including one in Victoria in 2003. They had worked with the FBI, the ATF, the Texas Rangers, and the state attorney general's office, and they had helped solve hundreds of crimes with Pikett's version of a technique called a scent lineup, in which his dogs matched an odor found at a crime scene to the person who left it. His dogs were so good at sniffing out the bad guys, he said, that they had made only five mistakes in fifteen years.

Standing in the field, Pikett, a lean man of 59, took out a couple of gauze pads. He knelt down and wiped one on Blackwell's body; the other he wiped on the rope. Then he held the first up to Quincy's nose. "Seek," the deputy said.

Quincy took off, with Pikett on the other end of the leash. An excited cry went up from the other investigators, who jumped in their vehicles. Eyre ran alongside Pikett, while Pikett's wife, Karen, followed in an SUV with James Bond. They cruised down Hanselman Road, a two-lane blacktop, for about half a mile, then took a hard left at Loop 463. Quincy loped along, her head bobbing between the air and the pavement. She crossed under U.S. 59 and led the officers up a wide overpass that went over Business 59. Pikett stopped, put Quincy in the vehicle to rest, and took out James Bond. He pulled the scent pad out of a Ziploc bag and held it to James Bond's nose. Again they were off.

By this point they were inside the Victoria city limits. James Bond, younger and faster than Quincy, took a left at Airline Road into a suburban neighborhood called Cimarron. The twenty-month-old bloodhound jogged through the quiet streets, finally stopping on Laguna Drive at Blackwell's house. A truck from a local TV station was parked across the street. It had been a five-and-a-half-mile journey from the victim's body to her home, but the dogs weren't finished. There was a killer to catch. So Pikett held one of the scent pads to Quincy's nose, and she took off again, turning onto the first street, Navajo Drive. At this point, Sheriff T. Michael O'Connor told Eyre that a "person of interest" in the case, Michael Buchanek, lived on the street. Buchanek had gone out on a couple of dates with Blackwell, and he had been questioned that morning. Now Quincy led Pikett and Eyre down Navajo, around a long bend, up a driveway, and to the front door of a brown brick home. It belonged to Buchanek.

He was not your typical suspect. The divorced father of two had been an officer with the sheriff's department for 24 years. He'd run the SWAT team, taught firearms classes, and had some experience with police dogs, rising to the rank of captain before retiring, in 2004, and taking a job with a contractor training police officers in Iraq. He had asked O'Connor to care for his children if anything happened to him while he was overseas and even left his friend a signed document granting him power of attorney. Buchanek had returned in late 2005, but only after being injured when a suicide bomber attacked his hotel.

The law enforcement officers all reconvened at ten o'clock at Cimarron Express, a nearby convenience store, buzzing with excitement about the break in the case. What was next, they asked the deputy? To be certain of the connection and to have probable cause for a search warrant, Pikett suggested a scent lineup. All he needed was a scent sample from Buchanek. O'Connor told Pikett about the document Buchanek had signed two years earlier; it was still sitting in an envelope in O'Connor's desk drawer. Pikett said that that would do, so O'Connor retrieved it. Pikett wiped a pad across the signature and put the gauze in a bag.

Some time before midnight, at Pikett's direction, detectives set up six paint cans twenty feet apart in the parking lot of the police station. Five of the cans contained scent samples from five other white males as foils; in the sixth was the scent pad that had been wiped along Buchanek's signature. Pikett then held the scent pad from the rope to the nose of James Bond and walked him along the cans. According to Pikett, James Bond "alerted" on the one that held Buchanek's scent. Pikett did the same with Quincy, using the scent pad from Blackwell's body, and Quincy also matched Buchanek's scent to the victim. Though Buchanek had denied having anything to do with Blackwell's murder, he officially became a suspect, and officers obtained a warrant to search his home and car. He was barred from his home, and his car was seized.

Six days later Pikett and Eyre conducted another lineup, this time with a scent taken directly from Buchanek's arm, in a grassy area of the Fort Bend County Sheriff's Office. The three dogs did fourteen lineups using various scents from the crime scene. In every one, according to Pikett, the dogs picked Buchanek's scent. Once again, Pikett's dogs had nailed their man.

They did it again a year later, when in the summer of 2007 Pikett helped Houston police nab Ronald Curtis for a string of cell phone store burglaries. It wasn't long before Houston investigators called again, asking for help in solving a brutal triple slaying; Pikett and his hounds matched two men to the crime, Cedric Johnson and Curvis Bickham, both of whom were charged with capital murder. In March 2009 an officer with the Yoakum Police Department took a scent pad to Pikett after two women, on two separate Sunday mornings, had been attacked—one was raped and the other robbed. The pad had come from the hand of Calvin Miller, a mechanic who, an informant told police, had been buying a lot of cocaine lately. Pikett ran a series of scent lineups using all three dogs. Each one picked Miller.

Buchanek, Curtis, Johnson, Bickham, Miller: five men from three cities incriminated by one forensic technique. But they had one other thing in common: All five were innocent. In August 2006 the son of Blackwell's boyfriend confessed to her murder. The Houston burglaries continued while Curtis was in jail, and eventually the actual perpetrator was caught. In April 2009 another man confessed to the Houston murders. That same month Miller was exonerated by a DNA test. Between them, Curtis, Johnson, Bickham, and Miller spent nearly three years in jail, their lives shattered. Buchanek was more fortunate. He was never charged, but he had to deal with five months of stares and whispers. "My friends turned their backs on me," he says. "People from my church didn't want anything to do with me. I was locked in my house, crying and praying, trying to figure out why my world fell apart. I spent my adult life defending the Constitution. As far as I'm concerned, Pikett and the others walked all over it."

The unscientific method

What could be more terrifying than to be accused of a crime you didn't commit? How about to be accused by a forensic expert? This doesn't happen on popular television dramas like *CSI*, *CSI: New York*, and *CSI: Miami*. On those shows investigators and lab technicians confidently use often-fantastical techniques to solve violent crimes, like the time an examiner poured a special paste into a knife wound and extracted a replica of the murder weapon.

If Keith Pikett, Quincy, Clue, and James Bond were to appear on *CSI*, he would be quirky, they would be lovable, and the suspects would be 100 percent guilty. But can dogs—which are reliably used to track criminals and sniff out drugs and bombs—actually match scents in paint cans in a parking lot? We don't know. Various states have used scent lineups, but there's little science to back them up. Quincy, Clue, and James Bond had never had any standard training, and they had never been certified. Pikett (who declined to be interviewed for this story) had no specialized forensic training either, and his protocols and methodologies, which he developed himself, were primitive at best. "A gypsy reading tea leaves and chicken bones is probably as reliable as a dog doing a scent lineup," Steve Tyler, the current district attorney of Victoria County, told me. Yet Pikett worked on more than two thousand cases, helped indict more than one thousand suspects, and testified in forty cases as an expert witness before retiring this past February.

The truth is, police and prosecutors have been using questionable forensic techniques for years, things involving bite marks, blood-spatter patterns, and even ear and lip prints. They use them because they help solve crimes. But over the past decade we've begun to understand just how unscientific forensic science can be. In the lab and at the crime scene, unsound techniques have incriminated the wrong person time and again. The most visible evidence of this is the 252 DNA exonerations nationwide since 1989—many of which, according to the Innocence Project, involved some form of improper or faulty forensic science. And these exonerees were the ones whose stories had happy endings, saved by DNA taken from old crime-scene samples that had not been discarded; no one knows how many unlucky people convicted on faulty science still languish in prison.

Texas has had forty DNA exonerations, more than any other state, including several high-profile cases that involved forensic science. In 1986 David Pope, of Dallas, was convicted of aggravated sexual assault and sentenced to 45 years in prison based in part on the “voice-print identification” technology of a sound spectrograph that two analysts had used to compare his voice with one left on the victim’s answering machine. Pope was exonerated by DNA in 2001. In 1994 hair-comparison analysis was used to wrongly send Michael Blair to death row for the murder of Ashley Estell, a seven-year-old Plano girl; he was also exonerated by a series of DNA tests. Some terrible forensic science mistakes have been discovered without the magic of DNA. Arson science was used in Fort Stockton in 1987 to convict Ernest Willis of murder and send him to death row. It took seventeen years to convince authorities that there was no actual science to the arson evidence, and in 2004 he was released. It turns out that even fingerprint analysis—the gold standard for most of the past century—can lead to mistakes. In 2004 three FBI fingerprint examiners and one independent one investigating the Madrid train bombing that killed 191 people made four unbelievable errors, matching a print found on a bag of detonators near the scene to the finger of Brandon Mayfield, a Muslim attorney from Oregon. He was sent to jail for two weeks, where he spent seven days in solitary confinement. It was a very public humiliation for the greatest crime-solving lab of all time—made worse when Mayfield sued the government and was awarded \$2 million.

Today, law enforcement organizations and the legal system are facing a crucial moment in the history of forensic science. The Mayfield fiasco, coming on the heels of mistakes at state crime labs all over the country (most notoriously in Texas, where the Houston Police Department crime lab was closed in 2002 because of a series of problems), helped spur the federal government into action. In 2007 Congress authorized the National Academy of Sciences to investigate forensic science, and seventeen scientists, medical examiners, professors, and judges spent two years interviewing crime-lab personnel, police officers, lawyers, and scholars. Their report, released in February 2009, was a detailed summary of the “serious problems” of the forensic science system. Most disciplines had no standardized protocols, oversight was inconsistent or nonexistent, and education and training requirements varied across jurisdictions. There was too much room for human error. The report slammed techniques like bite-mark and hair comparisons, but it also went after fingerprint analysis, which the NAS said was essentially subjective. In fact, except for biological disciplines, like DNA (which has a standardized methodology in which scientists examine a person’s genetic profile by comparing thirteen specific locations on the chromosome), the report found that “forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions.” And the courts—the gatekeepers of the whole process—“have been utterly ineffective in addressing this problem.”

Invalid science, ineffective courts, and the ultimate punishment: A few months after the NAS report was released, the country got an idea of just how disastrous a forensic science mistake could be when the *New Yorker* published a long story about the Cameron Todd Willingham case. Willingham had been convicted of murdering his three children by setting fire to his family’s Corsicana home in 1991, and he had been executed in 2004. The guilty verdict came primarily because of the testimony of two longtime arson investigators—an assistant fire chief and a deputy fire marshal—neither of whom had much education in the actual science of fire. The two men sleuthed their way through the burned-out structure, and though they found no indisputable physical evidence of arson in the house—no gas can, no kerosene, no matches—they did find, on the floor of the children’s bedroom, strange marks that they identified as “pour patterns,” which indicated that an accelerant had been used. They also found “crazed glass,” pieces of broken window suffused with spiderweb cracks, which suggested that an accelerant had been used, causing the fire to burn superfast and superhot. And they found charring under a threshold plate; common sense indicated that an accelerant had been poured there too. By the time their tour was complete, they believed the fire had been intentionally set.

Willingham protested his innocence until his execution. Afterward, others began protesting too, including seven contemporary arson scientists and investigators, some of whom had done actual science experiments and analytical chemistry on fires and all of whom were stunned at the lack of hard science used to determine that the fire was arson. Each of the seven reached the conclusion that every indicator of arson the two original investigators had found was invalid. “The investigators had poor understandings of fire science and failed to acknowledge or apply the contemporaneous understanding of the limitations of fire indicators,” wrote Craig Beyler, a nationally recognized fire scientist, in an August 2009 report to the state’s new Forensic Science Commission, a panel founded by the Legislature to investigate faulty or negligent forensic science. “Their methodologies did not comport with the scientific method or the process of elimination. A finding of arson could not be sustained.”

The Willingham case got national attention this October when, two days before Beyler was to testify publicly before the commission, Governor Rick Perry replaced three members, including attorney Sam Bassett, its chairman. The new chairman, Williamson County DA John Bradley, promptly canceled the meeting. Everyone from Texas Monthly to CNN called the move an attempt to cover up the truth: Since there was no evidence of arson, there was no crime, and hence Texas could have executed an innocent man. When Bradley finally scheduled his first meeting as the new chair, in January, he moved it to Harlingen (the previous twelve meetings had been held in Dallas, Houston, Austin, and San Antonio). But instead of discussing the Willingham case, he spent the whole meeting talking about policies and procedures.

“every contact leaves its trace”

It would not have surprised Willingham, Buchanek, Curtis, or any of the other victims of bad forensic science that the father of crime-scene investigation was a fictional character. Sherlock Holmes, the subject of four novels and 56 short stories by Arthur Conan Doyle between 1887 and 1927, was one of the most popular characters in fiction in a new era of science, a man who used his superior sleuthing skills to solve baffling crimes. He was the first to analyze handwriting, typewriter-key impressions, and footprints, connecting evidence at the scene with the person who left it. He had superb observational and deductive-reasoning skills that allowed him to make superhuman leaps of logic, as when he once deduced that Watson had a “careless servant girl” because of the six parallel marks on the inside of his shoe, which the detective saw in the flickering light of a fireplace. He was always right, as are his modern-day TV counterparts. Holmes was also a cocaine addict who wasn’t above breaking the law (theft and extortion, for example) to solve a crime. It’s a wonder he didn’t send any innocents to prison. Of course, he wasn’t real.

But what followed him was. A Frenchman named Edmond Locard established the first police lab in Lyons in 1910, where he could analyze evidence left at a crime scene. Locard had studied medicine and law, but more important, he had studied Holmes, and he frequently noted his admiration for Doyle and directed investigators to read him. Before Holmes had come along, few had thought to connect the criminal to the scene, and crimes were typically solved the old-fashioned way: by asking around or just compelling a suspect to confess. Locard revolutionized the inefficient business of crime-scene investigation with what came to be known as the Locard Exchange Principle: “Every contact leaves its trace.”

Over the next three generations, this principle would become the cornerstone of forensic science. Out in the field, investigators used deductive logic and common sense to compare and match things left behind at crime scenes—a fingerprint, a strand of hair, a speck of blood—with the person suspected of leaving them. In the labs, forensic scientists developed new ways of helping them. “Crime labs arose from law enforcement,” says Jay Siegel, a member of the NAS committee and the head of the

forensics program at Indiana University—Purdue University. “And law enforcement’s job is to get the bad guys off the street.” The results were often convincing, as when police investigator Calvin Goddard solved the 1929 St. Valentine’s Day Massacre by comparing marks on bullets left at the scene with marks on bullets made from two submachine guns taken from Al Capone’s men. Or when scientists took a huge step forward in 1937 with the discovery that Luminol could be used to test for the presence of blood.

Yet these advances were accompanied by theories and practices that seemed reasonable but were ultimately flawed. For example, the idea that if a hair found at a murder scene was the same color, thickness, and texture as one from the suspect, then the two could be reliably linked. Or that if a bite mark found on a body looked the same as an impression of the teeth of a suspect, he had left the bite mark. Or that two recorded voices could be matched. Imperfections were rarely analyzed, and basic assumptions were problematic—or outright wrong, because they had not been subjected to the scientific method. “There is not the scientific culture in a law enforcement agency that there is in a scientific agency,” says Siegel. “They often don’t pay attention to the scientific rigors needed to properly analyze and interpret forensic evidence.”

One of the results of not paying attention to science was that no one ever looked closely at an inherent problem at the heart of these comparisons: the uniqueness fallacy. Folklore, intuition, and hundreds of crime movies and detective shows have led us to believe that every fingerprint, bite mark, voice pattern, or even strand of DNA is unique to a person, but in fact we don’t know if this is true. “What law enforcement folks do is called ‘individualizing,’” says Michael Saks, a leading authority on forensic science at Arizona State University. “They’ll say, ‘We know no two fingerprints are alike,’ or ‘Every single person has unique bite marks.’ They say it, and everyone believes it, but no one knows if that’s true. It can’t be tested unless you test everyone on the planet.”

The Ashley Estell case is a good example of what happens when comparisons are taken too far. Estell disappeared from a crowded Plano soccer field in September 1993. Her body was discovered six miles away by the side of a dirt road, and crime-scene analysts found black hairs on and near her body. When a criminologist spotted Michael Blair, who had dark hair, driving by, he insisted the police follow him. They pulled him over, and it turned out that Blair was a convicted child molester. He also had a stuffed toy rabbit and a leaflet about the search in his car.

Blair was interrogated for nine hours, and a few days later, he was arrested. Police had no fingerprints, blood, or eyewitnesses to tie Blair to Estell or the scene, but they had found hairs in Blair’s car that, according to a crime-lab analyst, “appeared similar” to Estell’s hair. Hairs in a clump were also found at a park two miles from the soccer field and appeared to have come from both Blair and Estell.

At trial, the most important witness was the analyst, who made three major connections between Blair and Estell: Those hairs from the car had the same “microscopic characteristics” as hers; two small black hairs found on and near her body had Mongolian characteristics, which could apply to Blair, who was half Thai; and a fiber found on her body was similar to fibers from the rabbit. The jury found Blair guilty in 27 minutes. One juror later said, “He wore his fingerprints in his hair.”

Actually, he didn’t. A series of DNA tests, taken between 1998 and 2007, found that none of the hairs connected Blair to Estell and that the rabbit fiber could have come from half a million different stuffed animals. Blair was taken off death row, and Estell’s killer was never found.

The lesson from the Blair saga is that using a microscope to compare a hair found at a crime scene with one from a suspect is too unreliable, too human. It depends too much on interpretation and not enough on hard science. And this, says Saks, is the difference between DNA and other methods. “The

DNA scientists know they can't prove two people don't share the same DNA profile," he says, "so they develop a methodology of stating it. That's why they speak in terms of probabilities." DNA analysts say, for example, that two people could have all thirteen locations of their profiles match, but the odds of that happening are one in 200 billion. This is a "statistical model for estimating random match probabilities." Because other forensic science techniques don't have these statistical models, analysts can't give probabilities. What they can give, and what they have offered since Locard's time, are opinions and judgments, which can be as unreliable and unsteady as the people who make them. Forensic science is done not in a vacuum but in the lab and at the crime scene, where analysts are often influenced by the people around them. This is called bias, and it isn't necessarily a bad thing. It's a human thing.

But it's a dangerous thing when it comes to law enforcement. "When you work in a crime lab," says Vincent DiMaio, a former medical examiner in Bexar County, "you get a mind-set, a view of the world, based on the people you hang around with. Since crime labs are often run by police agencies, analysts spend a lot of time with cops and other analysts." Besides the law enforcement mind-set, there's a too-much-information problem, says Saks. "Our perceptions and judgments play tricks on us. If I'm an analyst and I know other stuff that says, 'This is the guy,' I'll see similarities that aren't really there." Carol Huser, the coroner in La Plata County, in Colorado, told me, "In a crime lab, you typically work closely with the police and prosecutors and are given information that can introduce unintended bias and cause subtle shifts in point of view. It's awfully easy to come to see yourself as being on the side of the angels, a member of a team whose goal is to get the bad guys."

Especially when the suspect is someone like Blair, a five-foot-tall child molester whom a prosecutor referred to as a "subterranean little troll." The difficulty, says Sam Bassett, "is staying true to scientific principles in the midst of an emotionally challenging case where there may be influence from your employer or from friends in law enforcement." People under pressure discern patterns that aren't there; they join the conclusions of other members of their team, even if they don't really believe them. This was the cause of the notorious mistake in the 2004 Madrid bombing case. How could FBI fingerprint examiners—the best in the business—make such an error? The Department of Justice investigated and found it was simple: They were law enforcement agents and they were human. They had found ten genuine points of comparison between the bag print and Mayfield's, but then their biases got in the way, and they found others that didn't exist. They overlooked or rationalized "subtle but important differences" between the two. The second examiner knew that the first had claimed to have found a match, and he followed suit. The Department of Justice found that the examiners had no idea that Mayfield was a Muslim, so the bias wasn't because of his religion. It was the human bias of wanting to nail the bad guy.

The legend of Keith Pikett

The rise and fall of deputy Keith Pikett shows just how vulnerable the system is to the vagaries of bad forensic science. Pikett was born in New York on January 27, 1947. He went to high school outside Buffalo and college at the University of South Alabama, where he earned a degree in chemistry and met his future wife, Karen. He also earned a "master of sport science—sport coaching" degree from the U.S. Sports Academy, in Mobile. In 1979 the couple moved to Houston and settled into teaching—elementary school for her, high school chemistry and physics for him. Ten years later the two dog lovers got a four-month-old bloodhound named Samantha. They were intrigued by the breed and its legendary powers of sniffing, and the couple found that she could follow rudimentary scent trails. They began training her, a process Pikett later described as "You're just playing hide-and-seek. Chase." They would hold a smelly handkerchief up to her nose, say, "Seek," and get her to follow a trail.

In 1991 they took her to a trailing camp in Illinois, and she successfully sniffed where other dogs had failed. An impressed observer told the Piketts, “That dog needs a job.” So upon their return to Texas, they began taking Samantha on search-and-rescue missions, helping the police find missing children and elderly people. Soon they got a second dog, Columbo. The Piketts started going to seminars, where Pikett, he later testified, learned from “old-timers.” Around 1993, Pikett recalled, someone in law enforcement said to him, “‘Well, that’s nice, but can you find criminals?’ It just got bigger and bigger.”

In 1994 Pikett began taking his trailing bloodhounds to the next logical step: using them to match scents and identify people in a lineup. It made sense—if dogs could sniff out a scent on a trail, why couldn’t they match a person’s scent in a lineup? Many scientists believe that we each have a unique scent. Ken Furton, a chemistry professor at Florida International University, says that we each have an “odorprint,” which is made up of 63 compounds, such as acids and ketones. And in fact, scent lineups have been used for years in Florida, New York, California, and Arizona, as well as in Europe. Doug Lowry, of the National Police Bloodhound Association, says that his group used humans in their lineups, which Pikett sometimes did too. “This method was passed down through the ages,” Lowry told me.

When trailing or tracking, dogs sniff out the dead skin cells (sweetened with bacteria) that are constantly flaking off when we touch things or just move through the world, over grass, soil, or even sidewalks. But simple trailing and tracking is much easier than matching scents and picking someone out of a lineup. Dogs are creatures of habit with short attention spans. They are easily distracted and catch colds and suffer allergies. No one knows exactly what they are doing—or smelling. They can’t tell us their methodology. Studies do show that dogs can discern one scent from another, though they make mistakes at least 15 percent of the time, according to an extensive 1994 study published in the journal *Animal Behaviour*.

Then there’s the handler. In the early 1900’s, an amazing German horse named Clever Hans put on public demonstrations where he answered math problems by tapping one of his hooves, say, eight times after being asked what was four plus four. But eventually someone figured out that Hans could do this only if he could see his handler, who unconsciously raised his head slightly when Hans reached the correct answer. Hans was clever in the way many animals are—they can read us, just as we can read them. Dogs in particular are adept at interpreting their master’s body language and even emotional state, and as anyone who owns dogs will tell you, they want to please their masters more than anything.

In Holland during the nineties, scientists and the police figured out a way to keep the handler from influencing scent lineups. First the dogs are trained to run scent lineups exclusively for an entire year. When they are ready, an actual lineup is done in a clean room, using sterilized stainless-steel tubes that are held for five minutes by the suspect and six other people (five foils and one control person). The dog—on his own—walks through four lineups. The first two are control lineups to make sure the dog is willing and able to perform; he must twice pick out the scent of the control person. If he does this properly, he is given the scent of the suspect. If he gets it right the first time, he does it again. When a Dutch dog alerts, he does something affirmative, such as bite at the tube, bark, or lie down. Even with all these safeguards, the Dutch have had high error rates—alerting on the wrong man 6 percent of the time and failing to alert at all 32 percent of the time.

Pikett devised his lineups on his own, using gauze pads, paint cans (which he occasionally cleaned in the dishwasher), and Ziploc bags; his methodology was simple, he would later say: “It’s only a couple of steps.” He would walk the dog along the cans and look for him or her to alert. His dogs’ alerts were less distinct than those of drug- and bomb-sniffing dogs, which bark, jump, whine, scratch, or just sit

down. Pikett would later say he watched his dogs' body language, looking at their head, ears, tail, and legs. "That's called reading your dog," he once testified. He didn't use blind or double-blind procedures ("I don't feel it's necessary") and never used gloves in his lineups. Neither he nor his dogs were ever supervised by others in the department or certified (there's no industry group).

In 1997 Pikett got a new dog, Quincy, and used a lineup to nab Marcus Cotton for murdering a Fort Bend County deputy. Pikett also testified in court, and on the stand he padded his résumé by claiming he had a master's degree in chemistry—not the only time he would say this. That same year Pikett began working with the FBI, which, he later said, "started flying me around the country to work on some cases." He was getting so popular that in 1998 he retired from teaching; attended the Gus George Law Enforcement Academy, in Richmond; and became a full-time Fort Bend County deputy sheriff and the head of the K-9 Patrol Unit.

Over the next twelve years, Pikett and his dogs became legends. In 1999 he used a scent lineup to help the Texas Rangers figure out that one man had killed five people in Houston and a couple small towns, which turned out to be true when they caught Rafael Resendiz Ramirez, a.k.a. the Railroad Killer. In 2002 Pikett was named Officer of the Year by the 100 Club, a southeast Texas police support group, and Quincy was inducted into the Texas Animal Hall of Fame. Pikett printed up baseball-like trading cards for his dogs, each of whom wore a badge. He taught seminars and lectured at conferences for district attorneys. Mostly, though, he helped law enforcement all over the state with trailing and lineups. He used a lineup to help police nail the triggerman in Bart Whitaker's elaborate scheme to murder his Houston family in 2003. Many times authorities called Pikett to corroborate other evidence. For example, one morning in May 2007 an Elgin detective asked Pikett for help indicting a man in custody for rape; the detective took scent pads from the suspect, drove three hours to Fort Bend County, and got validation from Pikett's dogs about the suspect, who later confessed.

Other times, as with Michael Buchanek, Calvin Miller, and Ronald Curtis, the police needed probable cause to get a search or arrest warrant, so they called Pikett, who was happy to oblige. Curtis had already had the charges against him dismissed by a judge when a police officer decided to take another run at him. The cop got Curtis to provide a scent pad, which was taken to Pikett, whose dogs implicated Curtis.

Dog-scent lineups had become an invaluable forensic tool for law enforcement, while Pikett was the go-to guy to catch criminals, even when the abilities of his dogs were clearly too good to be true. For example, last year both the Texas Rangers and the state attorney general's office employed Pikett to run scent lineups on items such as clothing, a Dr Pepper bottle, and vehicle floor mats that had connections to two murder investigations, from 1988 and 1992, respectively. In their affidavits for warrants to get scent pads from suspects Lightsey Saul Jr. and Anthony Graves, a sergeant with the Rangers and an investigator for the AG's office each wrote that Pikett had told them "there is a strong likelihood" the scents from the killers would still be on those things 21 and 17 years later—and that his dogs could identify them. Not only did the investigators believe Pikett, so did the judges who granted the warrants. To no one's surprise, the dogs matched both Saul and Graves to the evidence.

The experts

Pikett's dogs became superheroes to police and prosecutors all over the state. By last summer, Pikett estimated his three dogs had performed 6,756 scent and live lineups and made only five mistakes, though he had no records to back this up. When he was asked at a trial in 2007 if he thought it was important to figure out if his bloodhounds were reliable in some kind of measurable way, he replied, "No. Everybody in the country calls me, so I guess that's something."

Of course, Pikett wasn't the first "expert" to become a popular witness for the prosecution. Ever since the Supreme Court's landmark 1923 *Frye* decision, which held that a forensic technique (in this case, lie detectors) had to have "general acceptance" in the scientific community before it would be admitted in court, the law has used several standards for allowing new evidence. Ultimately, though, "reliability" is the touchstone, and the judge is the gatekeeper. The problem is that judges are trained in the law, not the sciences, so they allow all kinds of experts and testimony. "As long as a judge says you're an expert, you're an expert," says state representative Pete Gallego, a former prosecutor from Alpine who is the chair of the House Committee on Criminal Jurisprudence. "Anybody can be an expert on anything." Cathy Cochran, who serves on the Texas Court of Criminal Appeals, says there is some truth to that. "We judges have not been sufficiently skeptical of forensic science and forensic scientists. But if you don't know why something works and you don't know the principle behind it, you ought to stay away from it."

This was true enough in Pikett's case. After he first testified, he kept getting called back, to the constant annoyance of defense attorneys, who often objected to his expertise. In 2002 an appellate court expressly approved scent lineups as sufficiently reliable and found that Pikett was sufficiently qualified. The judge noted how the deputy and his dogs had never made a mistake, adding that Pikett "holds a master's degree in chemistry."

One of the reasons judges tend to let in shaky experts and expertise, says Guy Wellborn, a professor of the law of evidence at the University of Texas at Austin School of Law, is that they don't like to unilaterally turn down something they don't understand. "It puts judges in an uncomfortable position," he says. Huser, the Colorado coroner, told me about a case in which she was a witness for the prosecution: "The defense lawyer questioned whether I had sufficient expertise to testify. The judge just shrugged and said, 'She knows way more than I do, and that's the standard!'"

Even if judges occasionally let in unreliable evidence, the thinking has always been that the jury could sort it out. Unfortunately, the jury also has to learn about science from the experts, and this, says Wellborn, is not always such a good thing. "What predicts whether a jury will believe an expert is how confident he is, but unfortunately there's no reason to think there's any correlation between confidence and accuracy. Being highly confident and adamant in your conclusion is not a sign of being a good scientist. It's a sign of being a bad scientist. A good scientist is cautious, admits other hypotheses, acknowledges doubt. If you talk that way as an expert, you won't be hired back." To make matters worse, the defense often can't afford experts of its own to provide balance to the testimony. "In a criminal trial, the resources are usually all on one side," says Wellborn. "The state has a machine running 24/7 generating forensics."

Pikett and his dogs became the prosecutor's best ally. The deputy was confident and folksy; his bloodhounds were trustworthy, loyal, and error-free. Attorney Steven John Gilbert represented two clients convicted in part on Pikett's testimony: "He would get up there and say, 'My dogs can smell those thousands of skin cells even when they've been on the ground for four months,' and juries were eating it up."

It's in the nature of experts to exaggerate, says Saks. But even when experts are cautious on the witness stand, their testimony can be misinterpreted or misused. In the Blair case, the expert witness said that hairs found in Blair's car had the same "microscopic characteristics" as Estell's. That didn't mean they definitively came from the same person. However, the prosecutor eliminated any ambiguity in his closing remarks, telling the jury, "You can call it a link, you can call it association, you can call it a match." The jury was sold.

According to Vincent DiMaio, another phrase that confuses jurors is "consistent with." "Jurors hear 'A is consistent with B' and think that means they're the same. It doesn't necessarily mean that."

Philip Wischkaemper, one of Blair's appellate attorneys, agrees: "Rain is 'consistent with' clouds in the sky, but it's cloudy here in Lubbock right now, and it's not raining."

Ultimately experts are doomed by the very nature of science to not know what they are talking about. For example, back in the eighties arson investigators genuinely believed that certain marks on the floor of a burned-out house were evidence that an accelerant had been used. Now they know better.

Science came too late for Cameron Todd Willingham, but it arrived just in time for another death row inmate, Cathy Lynn Henderson. Henderson was babysitting three-month-old Brandon Baugh in her Pflugerville home in January 1994 when the baby fell and died from multiple skull fractures. Henderson said she had accidentally dropped Brandon while reaching to answer the phone, but Travis County medical examiner Robert Bayardo disagreed. At the time, most scientists believed that a simple skull fracture indicated an accidental fall, whereas multiple fractures suggested some kind of violence, and he ruled that the baby's fractures indicated homicide. At trial the assistant DA asked Bayardo if a fall from Henderson's arms could have caused the fractures. "No," he replied. "That's incredible." For injuries as bad as those, Bayardo testified, "He would have to have fallen from a height higher than a two-story building."

Henderson was found guilty in May 1995, sent to death row, and eventually given a June 2007 execution date. But between 1994 and 2007 a lot of things changed in the field of infant head trauma; biomechanical research had led some pathologists and doctors to conclude that babies could get severe head injuries with far less force than anyone had previously thought. In other words, a short fall could cause catastrophic skull injury—and Henderson could have been telling the truth. Her lawyers showed this research to Bayardo, who filed a stunning affidavit in May 2007. "Based on the physical evidence in the case," he wrote, "I cannot determine with a reasonable degree of medical certainty whether Brandon Baugh's injuries resulted from an intentional act or an accidental fall. In fact, had the new scientific information been available to me in 1995, I would not have been able to testify the way I did . . ." Two days before Henderson was scheduled to die, the Court of Criminal Appeals granted a stay of execution and sent the case back to the trial court.

"Reckless Disregard"

Last June the cracks finally started appearing in Pikett's world: Not only did the state lose a case in which he'd testified, but for the first time a judge refused to allow him to take the stand. "Deputy Pikett's methods fail the reliability test," wrote Brady Elliott, of the Fort Bend County district court, "and therefore I will not qualify him as an expert." In October the attorney general's office—which had been pursuing both the Saul and Graves cases—declared that it had "imposed a moratorium prohibiting the use of scent evidence." (The investigations of both men are ongoing.) Then came the media scrutiny, including a long story in the *New York Times*. It was all too much for Pikett, who retired in February. "When all those things hit," Sheriff Wright told me, "none of the agencies wanted to call him for work because they were afraid of being sued."

Indeed, fifteen years of relying on an unreliable expert finally caught up with the State of Texas. In 2009 Buchanek, Curtis, Johnson, Bickham, and Miller all filed federal civil rights suits against the cities of Victoria and Houston and the counties of Victoria and Fort Bend, as well as various law enforcement officers, including, of course, Pikett. The suits accuse them of negligence, poor methodology, and outright fraud, of acting "unreasonably and in reckless disregard for the truth." The scent lineups, one suit declares, were "rigged to be result oriented."

Three noted dog experts analyzed a video of the fourteen lineups used against Buchanek; all three agreed that the dogs didn't go anywhere near some of the cans Pikett said they'd alerted on. "This is

the most primitive evidential police procedure I have ever witnessed,” Robert Coote, an English police-dog expert, wrote in an affidavit for Buchanek. “If it was not for the fact that it is a serious matter, I could have been watching a comedy.” Doug Lowry, of the National Police Bloodhound Association, also provided an affidavit in which he argued that Pikett had been telling his dogs what to do; Coote agreed, adding, “It appears that it was Mr. Pikett who actually stopped walking when reaching the cans containing the suspect scent.” Steven Nicely, the owner of K9 Consultants of America, described Pikett in an affidavit as “an unprofessional charlatan.” All three saw nothing to indicate that the dogs had alerted on anything. Kevin Kocher, of the National Bloodhound Training Institute, who also saw the video, told me, “Those dogs showed none of the behaviors that dogs that are ‘working’ show. If a dog is working, you’ll see the behavior, either a passive alert or an aggressive one. I mean, a dog is a dog.”

Since Pikett’s dogs consistently put innocent people at the scenes of violent crimes, it’s impossible to escape the conclusion that Pikett was, in Lowry’s words, “cueing his dogs.” In a reply to Buchanek’s suit, Pikett filed a motion for summary judgment, in which he denied “intentionally implicat[ing]” Buchanek in the lineups, saying he hadn’t known which cans held his scent. As to why his dogs consistently matched Buchanek’s scent to the crime scene, he stated, “There certainly could be non-incriminating reasons why Buchanek’s scent/his skin cells could be detected/present on the victim’s body.” Pikett also defended his dogs’ alerts. There is, he wrote, a “unique and intimate relationship between the dogs and their handler, wherein the means of communication becomes clear and obvious between them, although it might appear subtle, incomprehensible, or undetectable to others.”

In his complaint, Buchanek claims the dogs didn’t follow any scents to his or Blackwell’s homes. They were “reportedly directed there” by Pikett and other officers. Sheriff O’Connor, who was part of the caravan following Pikett, denies this. “I watched it all very closely,” he told me. “I saw those dogs pulling him. Sure it was unusual, but I’ve trained hunting dogs. I’ve seen a Brittany dog track a bird for a mile.” Pikett insisted that he “was not leading or directing his bloodhounds, but rather he was following the dogs, during their trailing activities.” He also contended, “‘Vehicle trails’ are not impossible,” adding that his dogs had done them before three dozen times, at least in practice sessions.

“Dogs just can’t do that,” says Ed Frawley, a famed breeder and trainer. Echoing the other experts, Frawley noted the 24 hours that had elapsed between the time Blackwell’s body had been dumped and the dogs started on the trail, the 5.5-mile distance, the heavy March wind (up to 28 miles per hour), and the estimated 13,000 vehicles traveling along Loop 463 that day. “Dogs cannot follow the scent of a person in a car.”

How did Keith Pikett, a well-intentioned chemistry teacher who just wanted to help the police, become Deputy Pikett, “unprofessional charlatan”? And how much did law enforcement enable him? Attorney Jeff Blackburn, who represented numerous defendants in the notorious Tulia drug cases against a lying undercover detective, says, “There will always be careerist cops bold enough to seize an opportunity to make names for themselves by testifying against someone. They get too big for their britches, become the star of the show in their mind. Before you know it, they’re inventing stuff.” Shirley Baccus-Lobel, an appellate lawyer for Richard Winfrey Sr.—who was convicted of a bloody 2004 murder on the testimony of a jailhouse snitch and several Pikett lineups, one of which took place three years after the murder along the third-base line of a Little League baseball diamond—says law enforcement can be part of the problem: “The police are doing it because it’s easy. It’s easier than the grunt work involved in walking the streets, developing leads. ‘Just call the dog guy. He can do it in an hour!’” Even Sheriff Wright agreed with this notion: “My opinion of what happened in some of these cases is that some of the investigators relied too much on dogs and not enough on shoe leather to beat out the evidence.”

I asked Wright if any of the controversy had made him doubt Pikett's work: "Not necessarily. We've known in the past he's missed some." Of course, the big question now is, How many?

Hard science

Even the most vocal critic of the criminal justice system wouldn't argue that we should give up on using forensic science to solve crimes because of practices such as scent lineups or officers like Pikett. Crime is messy, crime scenes are imperfect, and we shouldn't be slaves to the needs of perfect science—or "quantified random match probability data." Fingerprints, for all their problems, are essential to the crime-solving process. Even things like dog-scent lineups, if done as the Dutch do them, can help investigate crimes, exclude suspects, and nail the bad guy. As Siegel says, "Just because some of the methods used in the analysis of scientific evidence haven't been scientifically validated yet doesn't mean they are invalid."

But if the system is going to be fixed, putting some actual hard science into forensic science would be a good place to start. The NAS report made several recommendations for reform in the labs, such as creating a new federal agency to oversee various disciplines, establishing rules that standardize the terminology experts can use in court, and removing labs from the control of law enforcement agencies. State representative Gallego held a hearing in January to discuss changing the rules of evidence to keep things like dog-scent lineups out of the Texas courts. He thinks the way to fix the system is to put more responsibility on judges: "We need to find a way to make judges more cautious, to make sure the gatekeeper keeps the gate—lets in the good evidence, keeps out the bad, like these scent lineups."

A little more caution, or even skepticism, on the part of law enforcement in the quest to solve crimes wouldn't hurt either. If the history of forensic science has shown us anything, it's this: Whether we're talking about voice prints, hair, or the smells that waft from our bodies, if it sounds too good to be true, it probably is.

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