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## The Chemistry of Crime

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## The Chemistry of Crime

by **Beth Luce**

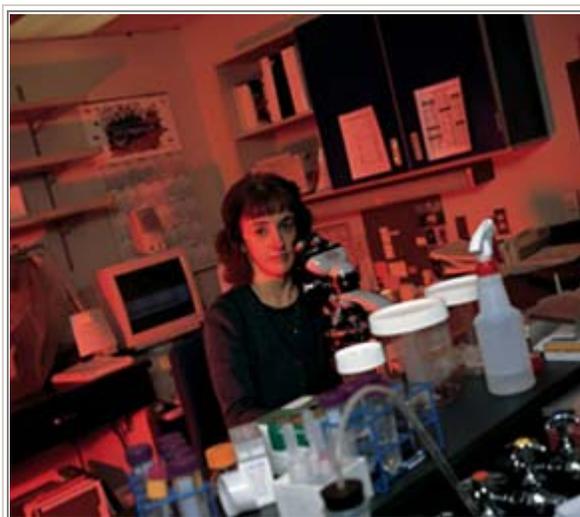
A small piece of car upholstery. A soiled shirt found in a dumpster. Dirt scraped from beneath a fingernail. An ominous, brown stain from a windowsill. A vaginal swab. These are not the props from this week's episode of *Law and Order*. For Jean Cooper Johnston '77, these are daily work materials.

She examines the upholstery under a microscope, hoping to find a speck of blood. The shirt might yield a sweat stain, a hair, or skin cells on the collar or cuffs. The fingernail scrapings might contain blood or skin cells. The vaginal swab might reveal semen. Any of these would contain DNA that—if Johnston can extract and analyze it — might send a culprit to jail or exonerate an innocent person.

Johnston is a forensic scientist in the Washington State Patrol Crime Lab in Seattle. She works in the biochemistry–DNA section, which is primarily responsible for investigating body-fluid evidence in major crimes, such as homicide, assault, and rape. She is one of only seven scientists in the Seattle office (there are eight others across the state) trained to use a relatively new and decidedly advanced system of DNA typing called short tandem repeat (STR).

A small team of forensic scientists, including Johnston, are now at work on what has arguably been called the longest ongoing, unsolved, serial-murder case in the country. In the 1980s, the murders of 49 women, many of them prostitutes and runaways, were attributed to the Green River Killer, named for the wooded river near Seattle where most of the bodies were found. Gary Leon Ridgway, a truck painter, became a top suspect in 1987, largely due to eyewitness accounts. But there wasn't enough evidence to try Ridgway until last year, when Johnston and others in the state crime lab used STR typing to link Ridgway to three of the bodies. They matched the DNA in a sample of Ridgway's saliva taken during questioning 14 years ago to semen found on the victims' bodies. One of these DNA sperm samples reportedly matched Ridgway's so closely that it could not belong to anyone else in the world's population of six billion.

Last November, Ridgway was arrested for four of the murders. Police and prosecutors have been careful not to identify Ridgway as the Green River Killer, pointing out that there may be other suspects in the ongoing investigation. Johnston can't comment directly on the Ridgway case or any ongoing investigation, but she confirmed that evidence continues to come in on the Green River slayings. Local news sources have reported that vehicles formerly belonging to Ridgway or used by him have been recovered from different areas of the country and are being examined



*Photo by Anil Kapahi*

**Jean Cooper Johnston '77 uses her forensic skills to help bring a suspected serial killer to justice.**

for evidence.

### **Profile of a forensic scientist**

Easy-going and well spoken, Johnston, 46, patiently explains the complicated science she uses to decipher evidence. A small, trim woman with a likable demeanor and a ready smile, Johnston laughed easily when talking about her son Kyle, 16; daughter Haley, 14; and her husband of 22 years, George, who is also a forensic scientist.

But she's all business when it comes to her work. Johnston's boss, bio-DNA supervisor George Chan, calls her efficient, meticulous, conscientious, organized, systematic, and "a treasure to the unit." Though Johnston works a 30-hour week, Chan said she produces more results than a full-time person. "She's one of the best forensic scientists we have," he says, adding that Johnston is also very skilled at testifying in court. "She's good at explaining things and remaining neutral," even in the face of less-than-friendly fire from defense attorneys, he says.

On occasion, Johnston speaks to public groups such as schools and Rotary clubs, describing the work of the crime lab. She also conducts seminars at hospital emergency rooms and medical clinics on how to gather evidence. All the forensic scientists are encouraged to do this, but she seems to be particularly good at it, according to Chan.

Naturally organized, Johnston says she is very focused on the job. She has to be. There's no time to waste. The state crime lab is woefully overburdened and understaffed, with a backlog of around 600 cases. In her office alone, which serves 2.5 million people in Seattle and surrounding King County, about 225 cases, by Chan's reckoning, wait for attention.

Working on cases, Johnston examines evidence such as knives used in homicides and, in one case, a hammer used in a sexual assault. When asked how working with such gruesome materials makes her feel, she answers that it doesn't bother her much. "I guess I'm looking at it as an object, and thinking about what I can find from this," she says. "Are there hairs adhering here? Is the knife tip bent? That might show force that the detectives want to document. And I'm looking for bloodstains. It doesn't bother me to the extent that I can't work on it."

What does get to her sometimes, she admits, is when she has to examine children's clothing or diapers. "I'm a mom," she says. "I can't help thinking that these kids never had a chance in life."

At any given time, Johnston typically works on from six to 15 cases in various stages. Usually she has three or four cases that she's actively working on. The rest are sidelined for various reasons, perhaps awaiting samples of a suspect's DNA or waiting for legal steps to be accomplished by the attorneys.

The first thing she sees of each assignment is paperwork from the investigators working the case. After looking over lists of evidence gathered and a description of the crime, she'll talk with the prosecutors and detectives to get a better sense of the situation, what kind of timeline they're working under, and what evidence they think is most important. From that point she prioritizes

the evidence, deciding what analyses should be done. For instance, sometimes detectives will take 50 samples of blood dripped around a crime scene.

"We don't have the manpower, nor does it make sense, to look at 50 pieces of evidence for one case, when four pieces will provide the needed information," she explains.

When the evidence arrives at her lab, she painstakingly examines it, looking not only at any obvious stains, but also for the almost invisible trace of evidence that frequently proves to be the smoking gun. "I've gotten nice DNA profiles off a little fleck of blood the size of a period," Johnston says.

She removes the body-fluid sample from the evidence, be it a sweater, a blanket, or a piece of a car, and prepares it for testing. "Our lab policy is that we try not to consume more than half of the evidence so the defense has an opportunity to test it themselves," she says. If there's only a minute quantity of evidence, such as a single hair root that cannot be divided, the defense has the option of sending a hired expert to observe the procedures.

After removing the sample, she uses STR to type the DNA. In this procedure, small quantities of DNA are copied until there's a large enough piece to be typed. Results can then be compared to samples of a suspect's DNA to see if they match. All of this, from the time she first talks to investigators until she writes her report and has a peer review it, takes about two weeks.

### **Cold hits and hard time**

If no suspect has been identified in a case, Johnston can try for a "cold hit," something that wasn't possible a short time ago. "It used to be that we really couldn't do much with a DNA profile if there was no one to compare it to," she explains. But now there's a database of DNA samples taken from convicted felons in the state of Washington.

"We take evidence from an unsolved case, which could be new or could be a decade old, and put it into the computer and search for a match. If it finds one, then we have a cold hit," Johnston says.

All convicted felons, even of non-violent crimes, are required to submit a DNA sample for the state database, which currently contains about 34,000 samples. Many more samples are ready to be analyzed and fed into the computer.

If the state database search proves fruitless, Johnston can try a national database run by the FBI, the Combined DNA Index System (CODIS). Begun in 1990, CODIS now has more than 800,000 searchable DNA profiles in the system, according to the official FBI Web site. The site states that Illinois, for example, has more than 22,000 offender profiles on record and that 491 investigations have so far been aided by the system.

An interest in high school chemistry started Johnston on the road to her profession. "I always liked the lab portion of it," she says. When she went to college, she started out at Western Illinois University, but only attended for one quarter. "I remember going to one of my first classes. It

was in a huge auditorium, very impersonal, and the professor was up there talking about a kegger for the class! I wasn't into that at all. I didn't feel comfortable in the environment of the larger school. So I transferred to Illinois Wesleyan and just really felt like I found my niche. Not that there weren't parties. As a matter of fact I joined a sorority, Kappa Kappa Gamma, and had a great time."

She fondly remembers Frank Starkey, who taught chemistry at IWU in the 1970s. "He was supportive of the work I did and the goals I tried to reach for myself," Johnston says. "He was just a nice, genial guy."

During her time at Illinois Wesleyan, Johnston worked as the catering supervisor for the campus food service. "I was fortunate that my folks were able to pay for my education. So I didn't have to work, but I chose to," she says. "I like to stay busy." Her voice conveys a sense of pride as she recalls her duties. "I got to decide how many people I needed to staff an event, and made all the arrangements to hire them, and picked out what kind of tablecloths and napkins would be used, and I had to be there to oversee things and make sure it all fell into place."

The parallels between this early job and her current work as a forensic scientist are obvious. "I like doing things that provide a level of organization and follow-through, and seeing that the product is done well," she says. "That aspect satisfies me."

In her senior year Johnston looked for an internship required for her degree. It was a chance for her to try out a career. She already knew she didn't want to work in a hospital as a medical technologist, drawing blood from people's arms—"That's what makes me queasy," she jokes—and she didn't want to work for a drug manufacturer, "making sure dosages are correct or whatever. I just thought that might be boring, day in, day out," she says. "I tried to think what else I could do with a chemistry degree that wouldn't be routine."

Her mother's hairdresser's son worked for the state police breath-testing unit, and when her mother told her about it, Johnston thought it sounded interesting. She arranged for an internship with the Illinois State Police Forensic Science Lab in Springfield, shadowing forensic scientists as they worked. "I learned a lot about the real aspects of the job, and I really enjoyed it," she says.

She decided to pursue a master's degree in forensic chemistry and found a program at the University of Pittsburgh, where she graduated in 1978. Her first job was in the Houston Police Crime Lab, where she met George Johnston. He was from Mississippi and had been in Houston about eight months when she arrived. They married the following year.

After two years at Houston, "we were looking for other job opportunities," Jean says. "Washington was expanding its state crime lab system and looking for experienced forensic scientists. It was a good fit, and we were both hired."

Jean worked in the Tacoma office (about 40 miles south of Seattle) in the chemistry and biochemistry units, while George was assigned to the Seattle office in the microanalysis unit, which examines everything from paint chips to tire tracks.

It was there that the Johnstons first learned of the Green River Killer. George was one of the original forensic scientists to work on the case, which he did for several years.

"We examined all the evidence that came in for trace evidence, such as hair and fibers. We were looking for links between a victim and a suspect or between a victim and another victim," he says. "That was way before DNA analysis."

Today George heads the quality-assurance efforts for the entire state crime lab, consisting of six offices across Washington.

Around 1987, with a baby and a toddler, Jean decided to work half time and began job sharing with another woman in Seattle. "It was not real common at the time," she notes. "It was quite a struggle to get upper management to buy off on it."

Now that her kids are teenagers, her work schedule has increased to 30 hours a week. From their home on Bainbridge Island, across Elliott Bay from Seattle, it's about an hour's commute by ferry each way. So her workday looks more like a full-time job, but she still manages to make time for the family, according to George. "She likes what she does. She's very dedicated. And with all that, she still takes good care of the kids. She's a busy person."

### **Guess what I did at work today, dear?**

With two forensic scientists in the house, one might think there'd be a lot of gory shoptalk. But both Jean and George say that's not the case. "When the kids were little we made a very conscious effort to steer clear of some of the things that we do and see every day," George says. Now that the kids are older, they have a good idea what their parents do, but still don't hear a lot about it at home.

"There's a lot of stuff going on in our division, so we chat about that, but usually after dinner, when the kids are doing homework," George says. The nice thing about being married to someone in the same line of work is that, "She knows what I'm going through, and I know what she's going through."

"We have a totally suburban life," Jean says. "Soccer, homework, stuff like that. We're normal people with kids and lives."

Jean hasn't changed much since they first met, George believes. Although he says she has a lighter side and "a weird sense of humor," she continues to be very serious about most things. "But on a professional level, she's changed tremendously," he adds, "because she's so good at what she does."

Being good at what you do is especially important when the stakes are so high. DNA evidence can help convict the guilty, but it is also an influential tool in establishing the opposite. "It's only one piece of the process of building a case, but it's a powerful piece," Johnston says.

In recent years, DNA testing has offered hope to people who might have gotten a sentence they didn't deserve. The Innocence Project, a national non-profit legal clinic based at the Benjamin N. Cardozo School of Law in New York City, seeks to free people who claim to have been wrongly convicted. The group takes cases in which postconviction DNA testing could yield conclusive proof of innocence. To date the project has helped to exonerate 105 people.

"I think that's really exciting," Johnston says. "There are certainly many cases coming out that it is the wrong person, and from what I've read, a lot of those cases were based on eyewitness testimony, which is not completely reliable." She says it's well worth the cost of resources to conduct the DNA tests. "Even if it's only for one person," she says. "I can't imagine having to give up your whole life, all your freedom, and you're wrongly convicted."

On the other hand, she notes, many times the DNA tests confirm that the convicted prisoner is in the right place after all. "Sometimes it turns out that it's just a bunch of hooley," she says.

Although she doesn't see herself as a romantic heroine, solving crime like a character in a Patricia Cornwell novel, Johnston knows the importance of the role she plays in serving justice. Her ability to focus on the evidence and provide facts are vital to the cases she works on.

When she's through for the day with bloody knives, microscopes, computerized DNA results, prosecutors, detectives, and court documents, she heads home to her typical American family. But on her bedside table is usually a true-crime book. Lately she's reading Ann Rule's *Every Breath You Take*, about the bizarre murder of a woman relentlessly pursued by her sexually obsessed ex-husband.

For Jean Johnston, matters of crime and justice, it seems, are in her blood.