CAREERS

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Forensic scientists must handle evidence, appear in court and understand the legal process.

FORENSICS

The call of the crime lab

Forensic scientists can work in academia, government and the private sector, but the field is competitive.

BY VIRGINIA GEWIN

Cedric Neumann has witnessed first-hand his field's scientific coming of age. "When I started my undergraduate degree, nobody wanted to work in forensic science; there was only a handful of programmes in the world," he says. Instead, "police officers were trained to work in a lab". But in the late 1990s, around the time that Neumann began his graduate studies at the University of Lausanne in Switzerland, which has the oldest forensic-science programme in the world, dozens of undergraduate and post-graduate programmes worldwide began to churn out forensic scientists.

Two things have made forensics a more visible — and fashionable — career choice, says Neumann. An increased focus on using DNA technologies to solve crimes has sparked a demand for properly trained biologists. And several television drama series that glorify forensic science have generated so much interest in the field in the past ten years that students have been flocking to study it.

Forensic science encompasses a range of disciplines — including DNA analysis, examination of fingerprints or footwear impressions, and firearm analysis — used to solve criminal cases. In recent years the field has come under scrutiny amid calls for peer review to establish the reliability and accuracy of many forensic methods — and to develop them further.

The discipline has been subject to market pressures. While Neumann was doing his PhD in his spare time, he also worked at Britain's Forensic Science Service (FSS), a government-owned company that provided the bulk of forensics services and research in the country. But by last year the service was losing £2 million (US$3.3 million) a month, and was deemed no longer cost-competitive against private-sector rivals who typically analyse only a few types of forensic evidence. The FSS is slated to close next March, making England and Wales the only parts of the world with a totally privatized forensic-science market.

Neumann, now developing statistical tools to identify fingerprints at Pennsylvania State University in University Park, is among the many forensic scientists who are concerned that privatization could compromise the quality of the science that has been achieved by services such as the FSS. For example, Neumann says, if the focus turns to only highly commercial products, such as DNA profiles, there may be less emphasis on analysing sources of evidence that require more specialized training, such as handwriting examination or tool marks, thus reducing the availability of the broad knowledge often needed to solve crimes.

Still, crime isn't going anywhere, and neither is the need for forensic scientists — if anything, demand for their skills has increased over time. Today, forensic scientists can find jobs in government labs, private industry and, increasingly, academia. Yet a surplus of trainees, an economic downturn and ever-shifting political agendas make career prospects in this field difficult to predict. The mixture of scientific acumen and forensic training needed to carve out a successful sleuthing career will depend on an applicant's personal goals.

UNSTEADY DEMAND

Although the field is growing worldwide, that growth is uneven. "The demand for forensic scientists is good, but spotty," admits Jay Siegel, director of the forensic and investigative sciences programme at Indiana University–Purdue University Indianapolis.

For example, the UK forensics scene is in the middle of a mighty shake-up as it prepares for the FSS's closure — a move that will result in 1,600 lay-offs. The turnover promises to open opportunities for new graduates as private companies recruit to fill the gap. "We anticipate that many people working at the FSS may choose not to relocate to other providers," says Steve Allen, managing director of LGC Forensics, a private forensic-services company headquartered in Teddington, UK. So far, says Gillian Tully, head of research ▶

and development at the FSS, some 90% of the 300 staff already laid off at the three shuttered FSS sites in Birmingham, Chepstow and Chorley have left the profession completely; some retired and others didn't want to move or were disgruntled by the privatization, she says. Allen hopes that LGC Forensics, Britain's largest private forensics firm with 550 employees, will increase its staff by 50–100% as the FSS workload is divvied up. "We're out there right now actively recruiting at all levels," he says.

This short-term recruitment push, however, might mask other long-term trends. Public-sector budgetary constraints continue to stymie recruitment worldwide. "We had a big growth phase a few years back. Now we are in a tight fiscal climate and I expect limited recruitment in the next two to three years," says Gary Pugh, director of forensic services at New Scotland Yard in London, the headquarters of the Metropolitan Police, who will rely solely on his in-house forensics team and private providers after the demise of the FSS. In the United States, economic conditions have grown so dire that cuts are being made at many of the 400 publicly funded crime labs that support local, state and federal branches of law enforcement. Alabama has been the most severely affected state, closing three crime labs to save money in the state budget.

But if the economy is pushing recruitment down in some regions, politics and crime patterns can easily prompt hiring elsewhere. For example, New Jersey — where the governor, Chris Christie (Republican), is the former US attorney for the state, the chief federal law-enforcement officer — created 29 positions in the state Office of Forensic Sciences amid budget cuts. And, despite budget woes, administrators in Los Angeles, California, are recruiting for the last of 26 DNA technician positions intended to reduce the city's backlog of 6,000 sexual-assault DNA-collection kits that need analysis, says Greg Matheson, director of the Los Angeles Police Department Crime Lab.

Despite federal budget cuts, Vermont Senator Patrick Leahy (Democrat) introduced a federal bill in January to boost forensic research needed to strengthen the quality of evidence routinely used in the criminal justice system. But Siegel doubts that the bill will pass in this climate.

P. BOUDRY

Jan De Kinder runs a Belgian institute that develops new forensic techniques.

GETTING PROPER TRAINING

The 'CSI effect' — the tremendous interest in the field aroused by the US television programme *CSI: Crime Scene Investigation* and similar dramas — has spurred a flood of applications for forensic-science jobs. "If we have an opening for a forensic chemist, we can easily get 200–300 applications for that position," says Michael Medler, laboratory director of the forensic-services agency in Indianapolis, Indiana. The agency, an independent government entity, hires crime-scene specialists, forensic analysts and technicians.

As a result of the interest, employers have their pick of the talent, and increasingly choose applicants with postgraduate degrees. "In the past year, most forensic labs have become bigger, and the scientific requirements for applicants continue to become more rigorous," says Jan De Kinder, director of the Belgian National Institute of Criminalistics and Criminology in Brussels, a research body within the justice department that conducts original research and develops new forensic techniques. He says that half of the 100 people working in his lab have MSc or PhD degrees — a worldwide trend, he adds. And whereas a PhD is not a requirement for many of the jobs in a forensic lab, a lack of one can affect aspirations (see 'The case for a forensics PhD').

The scientific skills most in demand include DNA profiling and mass spectrometry for analysing the chemistry of trace specimens, as well as statistical analysis to identify patterns found in other types of evidence, such as fingerprints. Siegel says that the biggest trend in academic forensics research at the moment is the attempt to validate the techniques used in such pattern-evidence analysis; a 2009 report by the US National Academy of Sciences highlights this need.

Universities have seized on the growing interest in forensics as a money-making opportunity. Hundreds of undergraduate and MSc forensic-science programmes now exist, but their quality varies widely. The American Academy of Forensic Sciences in Colorado Springs, Colorado — the field's professional organization — established the Forensic Education Programs Accreditation Commission (FEPAC) in 2004 to accredit undergraduate and graduate degree programmes that meet minimum standards of excellence.

Since then, 35 have been accredited, and that could grow to 50 within the next five to ten years, says Siegel. "The standards are quite rigorous — the faculty and instruments needed to teach forensic science are pretty expensive," he adds.

Some employers tend to hire traditional chemistry or biology graduates rather than graduates of forensic-science programmes. "It's really important to have a good scientific mindset and experience in biology or chemistry; we can train them in the forensic part," says Allen. Positions at private companies, often further removed from the field's judicial responsibilities, may not demand the forensics know-how required at public agencies.

Chris Hassell, director of the US Federal Bureau of Investigation laboratory in Quantico, Virginia, echoes the importance of a scientific background. "We don't generally target people coming out of forensics disciplines; we're looking for good scientists," says Hassell. He says that a candidate's scientific publication record can set her or him apart from the crowd — for example, if it includes a paper addressing

WHAT APPLICANTS NEED TO KNOW

The case for a forensics PhD

Advantages

- A PhD is a must if you know you want to do forensics research at an academic institution.
- A doctorate can make you a more credible witness in court.
- Some laboratories, especially US federal labs, tend to promote people with PhDs more quickly and more willingly than those without, says Jay Siegel, director of the forensic and investigative sciences programme at Indiana University–Purdue University Indianapolis.

Disadvantages

- There aren't many university programmes that offer a PhD in forensic science — and those that exist are all in Europe. A more typical route to employment, especially in the United States, is to get a postgraduate degree in chemistry or biology, with a specialism in forensics.
- A PhD isn't required for a typical forensics job in a crime lab — and it can be a deterrent to getting hired, because employers might be concerned that the candidate will get bored or leave for a job in academia, says Siegel. V.G.

the validity of a specific forensic technique.

Commitment is key. "Unlike other areas of science, in forensics a person's credibility is called into question daily in a court of law," says Medler. In addition to mastering a range of scientific techniques, he says, forensic scientists must be able to identify the most probative pieces of evidence at the crime scene, must know how to document who has physical possession of evidence and why, have knowledge of the legal process and have the ability to communicate on a court stand. Much of that training must be acquired on the job.

In Europe, the training requirements for crime-lab analysts vary depending on which body has authority over the forensics operations. For example, in France, Italy and Spain, forensic services are provided by the police; until recently, only trained police officers could work in crime labs. However, in Belgium, forensic labs are under the purview of the justice department.

Applicants with criminal records or who fail drug tests face dim prospects. Matheson says that background checks disqualify up to two out of every ten candidates.

CLOSING THE GAP

Forensic science is considered a young field. Police labs, frequently inundated with caseloads, are often simply unable to perform much-needed research. And although there is a growing amount of forensics research in academia, interactions between practitioners and researchers can be limited.

But as the number of forensic-science programmes at universities grows, and the PhD and MSc students chip away at research needs, the field's scientific footing is expanding. "The advantage of having more university training programmes in forensics is the increase in research activities," says De Kinder. Unfortunately, researchers still struggle to find funding.

"To better our profession we need to do two things: encourage people with PhDs to get into forensics and overcome the disconnect between academia and the practising field," says Larry Quarino, chair of FEPAC and director of the forensic-science programme at Cedar Crest College in Allentown, Pennsylvania. He advocates the creation of a sabbatical that would allow practising forensic scientists to conduct academic research necessary for their positions.

"For a scientific discipline to be a living discipline, it needs to conduct research," says Pierre Margot, head of the school of criminal justice at the University of Lausanne. "As long as researchers are working on the needs of tomorrow," says Margot, "I'm not too worried about the state of the job market today."

Virginia Gewin *is a science journalist based in Portland, Oregon.*

TURNING POINT
Jill Venton

Jill Venton, an analytical chemist at the University of Virginia in Charlottesville, received the 2011 Society for Electroanalytical Chemistry Young Investigator Award in March for her efforts to develop sensors able to probe neurotransmitters in fruitflies.

As an analytical chemist, do you find neurochemistry messy?

Analytical chemists develop methods to quantify the composition and structure of matter, and I definitely think like an analytical chemist — I like precise measurements with small error bars. But life does not take place in a beaker, and I knew early in my career that I wanted to apply my skills to biology. I did my PhD in analytical chemistry with a neuroscience focus and found that I liked the field, so I followed up my degree by doing a postdoc supervised jointly by a chemist and a neuroscientist. By comparison with chemistry, neuroscience is messy. It's more exploratory, which often doesn't lend itself to nice, neat experiments, because we know so little about the brain — but it has been fun and challenging to use my talent for precision to help develop ways to measure brain functions.

How do you get your research ideas?

Some come from colleagues. For example, a neuroscience colleague wanted to measure neurotransmitters in the fruitfly brain and challenged me to help him find a way to do it. I had never thought of it before, but I was exploring techniques to measure fast changes in neurotransmitters in the mammalian brain, so I thought I could tackle it. Other ideas come from the need to keep pushing technology further and exploring the boundaries of what new methodology can tell us about neuroscience.

What's your strategy for winning early-career awards?

I have applied for a lot of young-investigator awards, and certainly have not won them all. When I started out, I applied indiscriminately for any funding or award. I was lucky to get a US National Science Foundation career award early on, which helped to give my lab a foundation. Once I got that, I became pickier in terms of which awards to seek, because I didn't have infinite amounts of time to apply to them. At the moment, I rely on national funding agencies for my bread and butter, and apply for awards that have a certain level of prestige to supplement that.

You are awaiting a decision on tenure now. Was the tenure process what you expected?

I knew that the tenure committee would look at grants and publications, and that there would be significant emphasis on letters written on my behalf from people outside this institution. Many people do what's called a 'tenure tour' in the year or so before they go up for tenure, working to raise their profiles and build a reputation in the field to ensure those positive tenure letters. I had a baby a year and a half before I went up for tenure, so my ability to travel was limited and I was more selective about where I went. For example, rather than presenting at single universities, I went to a Gordon Research Conference — an international gathering of scientists to discuss the frontiers of research. Before getting pregnant, I spent time networking by meeting people at conferences and organizing workshops or symposia.

Analytical chemistry is a male-dominated field. Does that pose challenges?

Yes. I'm one of only three women in a department of about 30 — and the only woman with a child. But it is very typical in chemistry for women to hold only 10% of the academic positions. Still, this department has accommodated my efforts to set a flexible schedule to balance work and life. The biggest challenge is that there weren't — and still aren't — many role models, successful female researchers. I had to look to biology and neuroscience for those. ■

INTERVIEW BY VIRGINIA GEWIN