



## Taking the Initiative: Practitioners Who Perform Frontline Research

by Lois A. Tully, Ph.D.

### About the Author

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**I**n the past, the line between practitioners who work in a crime laboratory and researchers who work in a university lab or technology firm was always fairly bright. That line has begun to blur, however, as more and more practitioners take the initiative to perform inhouse research that leads to new forensic tools and technologies.

Although many practitioners who work on the front lines of criminal justice have compelling research ideas, these often must take a back seat to the reality in our Nation's crime labs, where shelves of evidence await testing and there is daily pressure from agencies and the communities they serve. Crime laboratory professionals may realize that research is the key to long-term solutions, but with limited resources and overwhelming caseloads, what can they do to move a great research idea from their heads to the laboratory bench?

In recent years, an increasing number of crime lab practitioners have received funding from such agencies as the National Institute of Justice (NIJ) to help them perform inhouse research. Here are a few of their stories.

Eric Buel, Ph.D., has seen forensic science progress from the days when identifying blood types was state-of-the-art to today, when DNA can be used to identify a person with virtual certainty. In 2000, Buel, who now serves as director of the crime lab at the Vermont Department of Public Safety, wanted to explore promising new technologies to improve the efficiency and efficacy of the human DNA quantification test, which determines if evidence collected from a crime scene is from a human and whether there is enough of it to develop a DNA profile. Buel's search for help led him to NIJ, which funded his development of a new human DNA quantification method.<sup>1</sup> Now his Vermont laboratory and other crime labs routinely use this method.

## UNIQUE INSIGHT FROM CRIME LAB PROFESSIONALS

When people think of scientific research, they often think of work being performed in university laboratories or technology firms. Although these may be ideal settings for performing basic research to lay the foundations for future forensic technologies, crime lab practitioners have unique insight into the types of applied research that will provide long-term benefits to their everyday challenges. For example, crime lab professionals understand what it takes to create tools capable of withstanding scrutiny in the courtroom. The types of samples they receive also can prompt important research and development. Unlike samples that generally come into clinical or diagnostic labs, crime lab samples are often poor in quality or limited in amount. It is not unusual to receive a single hair that was found in a cap worn by a suspect or a piece of biological evidence that has been exposed to heat, humidity, or other damaging elements. Because of the limited quantity or poor condition of such a sample, a crime lab typically has only one attempt to perform the test and get a result that may provide a crucial lead in a criminal investigation.

Tom Parsons, Ph.D., faced a similar dilemma. After several years of working with ancient DNA at the Smithsonian Institution, Parsons took a job at the Armed Forces DNA Identification Laboratory (AFDIL), where he and his team were using mitochondrial DNA (mtDNA)<sup>2</sup> to identify the skeletal remains of soldiers killed in the Vietnam, Korean, and other wars. Some of the remains, having been exposed to environmental elements for many years, had severely damaged DNA. As a result, even the most sophisticated mtDNA technologies could not always yield sufficient information to make an identification. Nevertheless, Parsons believed it was possible to boost the power of mtDNA and provide more complete profiles of the soldiers. He also knew that doing such research would take money, people, and many months of experiments. Parsons turned to NIJ, and with a grant, he and his fellow scientists at AFDIL explored a novel way to capture more information from mtDNA. This work helped identify the remains of several soldiers, including one killed in World War II.<sup>3</sup>

Heather Miller Coyle, Ph.D., had spent much of her academic career studying plant sciences, so she never thought that she would end up working in a crime lab. After completing her Ph.D. in plant molecular biology, she spent a few years in the pharmaceutical industry until—seeking a way to use her science background to better serve

the public—she took a job as a criminalist in the DNA unit of the Connecticut Department of Public Safety. There, her supervisor encouraged her to look for ways to expand the lab's capabilities. This opened the door for Miller Coyle to team up with scientists from the University of New Haven and, with support from NIJ, explore technologies for plant DNA profiling that can assist in criminal investigations. Miller Coyle has since conducted a workshop to teach other crime lab personnel when and how to use the tools she developed under her NIJ grant.<sup>4</sup>

## Helping Practitioners Take Action

In recent years, the entire criminal justice community has benefited from research done inhouse by crime lab professionals like Buel, Parsons, and Miller Coyle through NIJ support. In the years since writing their NIJ grant proposals, these practitioners have published their research in peer-reviewed scientific journals, and more importantly, their contributions have been invaluable to the broader forensic DNA community.

NIJ's support of practitioners with promising research ideas goes well beyond DNA. The Institute's forensic research portfolio extends from arson to anthropology, handwriting to handguns, methamphetamine to maggots, and toxicology to trace evidence. Here are a few more examples

of how NIJ grants are being used to foster practitioner research:

- In Washington, criminals who manufacture methamphetamine seemed to stay one step ahead of law enforcement by continuously changing their methods of manufacture. This was making it difficult for police to know what to look for and how to test for it. To meet this challenge, David Northrop, Ph.D., analyst at the Washington State Patrol Crime Laboratory Division, used an NIJ grant to develop better ways to detect and identify substances that are characteristic of methamphetamine manufacturing processes.<sup>5</sup>
- In the Georgia Bureau of Investigation crime lab, George Herrin, Ph.D., and his colleagues explored a more effective method of detecting drugs and poisons in autopsy samples. With NIJ support, they developed a new technology that screens for more than 100 drugs and poisons and is up to 50 percent faster than existing technology.<sup>6</sup>
- Scientists in the crime lab at the California Department of Justice developed an improved tool for capturing, analyzing, and comparing impression evidence left at crime scenes. This tool can enhance forensic comparisons of such items as tire treads and footwear impressions.<sup>7</sup>
- In another section of the crime lab at the California Department of Justice, scientists developed a new DNA quantification method that is now being used to develop profiles in missing persons and unidentified remains investigations.<sup>8</sup>

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### For More Information

- For general information on NIJ's forensic DNA research and development projects, see [www.dna.gov/research](http://www.dna.gov/research).

### Notes

1. Buel, E., *Simple, Rapid, and Accurate Quantitation of Human DNA*, final report submitted to the National Institute of Justice,

August 2006 (NCJ 215340), available at [www.ncjrs.gov/pdffiles1/nij/grants/215340.pdf](http://www.ncjrs.gov/pdffiles1/nij/grants/215340.pdf).

2. Human DNA can be extracted from the nucleus of a cell and from another part of the cell called the mitochondrion. Mitochondrial DNA (mtDNA) is present in hundreds to thousands of copies in each cell, making mtDNA analysis the most suitable method for testing samples that are old, degraded, or limited in quantity.
3. Parsons, T.J., *Mitochondrial DNA Genome Sequencing and SNP Assay Development for Increased Power of Discrimination*, final report submitted to the National Institute of Justice, March 2006 (NCJ 213502), available at [www.ncjrs.gov/pdffiles1/nij/grants/213502.pdf](http://www.ncjrs.gov/pdffiles1/nij/grants/213502.pdf).
4. Miller Coyle, H., G. Shutler, L. Tully, E. Pagliaro, A. Harper, T. Palmbach, and H.C. Lee, *Validation of a DNA Method for the Individualization of Plant Evidence*, final report submitted to the National Institute of Justice, November 2005 (NCJ 211999), available at [www.ncjrs.gov/pdffiles1/nij/grants/211999.pdf](http://www.ncjrs.gov/pdffiles1/nij/grants/211999.pdf).
5. Northrop, D.M., E.C. Person, and L.A. Knops, *Capillary Electrophoretic Analysis of Clandestine Methamphetamine Laboratory Evidence*, final report submitted to the National Institute of Justice, 2005 (NCJ 219501), available at [www.ncjrs.gov/App/Publications/abstract.aspx?ID=241293](http://www.ncjrs.gov/App/Publications/abstract.aspx?ID=241293).
6. Herrin, G., H.H. McCurdy, W.H. Wall, and L. Holt, *Investigation of a Unique Adjunct to Enzyme Immunoassay in Order to Rapidly Perform First-Pass Screening for Drugs and Poisons in Postmortem Toxicology Cases*, final report submitted to the National Institute of Justice, 2006 (NCJ 219502), available at [www.ncjrs.gov/App/Publications/abstract.aspx?ID=241294](http://www.ncjrs.gov/App/Publications/abstract.aspx?ID=241294).
7. Hamiel, J.S., and J.S. Yoshida, "Evaluation and Application of Polynomial Texture Mapping in the Area of Shoe and Impression Evidence," *Journal of Forensic Identification* 57 (3) (May/June 2007): 414-434.
8. Timken, M.D., K.L. Swango, C. Orrego, M.D. Chong, and M.R. Buoncristiani, *Quantitation of DNA for Forensic DNA Typing by qPCR (quantitative PCR): Singleplex and Multiple Modes for Nuclear and Mitochondrial Genomes, and the Y Chromosome*, final report submitted to the National Institute of Justice, June 2005 (NCJ 210302), available at [www.ncjrs.gov/pdffiles1/nij/grants/210302.pdf](http://www.ncjrs.gov/pdffiles1/nij/grants/210302.pdf).