



On the web: www.tcnj.edu/~csiewing

Email: csiewing@tcnj.edu

March 2006

Issue #4

From the Desk of Dr. John Allison- Professor and Director of Forensic Chemistry, TCNJ



I get many calls from people in the community who decide that they'd like to work in the field of Forensic Science, and don't know what to do next. My personal opinion follows. The best you can do is complete a B.S. in one of the "hard" (basic) sciences. With this, you can pursue jobs in Forensics and dozens of other fields. Care needs to be taken when considering B.S. or B.A. programs in Forensic Science that require a few courses in many areas since, while they provide breadth, they provide insufficient depth.

In a recent survey of crime lab directors on hiring practices, 41% indicated that they require a B.S. in Chemistry, followed by 24% in Biology (and 2% in Physics!). It's clear that a strong background in Chemistry is a good first step.

What If you already have a B.S. degree (in something) but feel you need more? Usually, returning to school for a second Bachelor's degree is not the best plan. There are a growing number of M.S. degrees in Forensic Science. These programs admit students

from diverse educational backgrounds. There also appears to be a growing trend of on-line M.S. programs, particularly in Forensic Science. Personally, I've had no experience with those, but they do appear to be popular, and I encourage you to look into them if you're looking for post-B.S. training.

In terms of finding a job in Forensic Science, an important first step is to start to appreciate the true breadth of the field. The American Academy of Forensic Sciences, the largest forensic science organization in the world, is organized into ten sections that include Criminalistics, Engineering Sciences, General, Jurisprudence, Odontology, Pathology, Physical Anthropology, Psychiatry and Behavioral Science, Questioned Documents, and Toxicology. New areas are emerging all the time, such as Wildlife Forensics! With an understanding of the kinds of work forensic scientists do, your approaches to job searching will expand. For example, each group listed above has their own separate organizations (web sites and journals) and can provide information on job openings.

As you research the field of Forensic Science, keep in mind that *career goals* and *educational goals* can be two different things. For example, I was recently in contact with someone whose son wanted to pursue a career in Forensic Ballistics. This is a specialized area, not one that you would major in at a university. However, there are short courses available on the topic for people with backgrounds in Chemistry and Physics.

We hope you enjoy Issue #4 of our newsletter.

Best wishes-

John Allison

Forensic Activities in TCNJ's School of Science

Computer Science Department

Think writing cover letters and sending resumes for internships is tough? Try being fingerprinted and taking a polygraph. After months of interviewing and background checks, Lauren Leonardis, a computer science and psychology double-major at the College was selected as the first student intern in the nation to work at an FBI Regional Computer Forensic Laboratory (RCFL). Lauren, a third year student from Union, NJ was recently informed that she successfully completed the application process, including earning a governmental top secret clearance, which is required for working with the RCFL. She will be interning at the New Jersey RCFL in Hamilton, one of the 12 labs nationwide. The full-service forensics laboratory and training center is devoted entirely to the examination of digital evidence in support of criminal investigations such as Internet crimes and fraud, terrorism, theft or destruction of intellectual property, and child pornography. Lab examiners are extensively trained in using a variety of scientific instruments to recover digital evidence from crime scenes, including computer hard drives, software programs and operating systems, PDAs, cell phones and video cameras.



Mathematics & Statistics Department

It was, or purported to be, a diary kept during the "secession winter" of 1860-61. It appeared to offer verbatim accounts of behind-the-scenes discussions at the very highest levels during the greatest crisis the US had ever faced. The diarist had access to a wide spectrum of key officials, from the South as well as the North, gave a number of striking anecdotes about Abraham Lincoln, and provided an important account of events in Washington during the critical days just before the Civil War. Who was the true author? Dr. David Holmes of the TCNJ Mathematics and Statistics Department showed who the true diarist was by using multivariate statistical analysis. The end result? The diarist was not Samuel Ward as has been suggested. It was, instead, William Hurlbert.

Choosing a Forensic Science Program

Whether you are a high school junior or senior making future plans for college, or are interested in changing your area of study, this section is for you. There are a plethora of books, magazines and websites dedicated to Forensic Science programs at different colleges and universities. One such website is <http://www.crime-scene-investigator.net>. Clicking on the Training, Colleges and Employment link will take you to a page that has a listing of certificate, 2 year degree, 4 year degree and graduate programs. The entries are provided by state. For those of you who may already have a career in forensics, this section of the site lists seminars and training courses, by state, that may be of interest. If time and distance make commuting to a school difficult for you, at the end of the page are listings for online courses and home training options.

If you're searching for a college program-

There are many 2-year, 4-year and "Certificate Programs" at colleges and universities across the country. For example, in the state of Pennsylvania, there are 4-year programs at Waynesburg College, Mercyhurst College, Keystone College, York College of Pennsylvania and West Chester University to name a few. Some very good specialized programs exist in the state such as Widener University's B.S. Program in Forensic Anthropology, and Cedar Crest College's accredited program (Allentown).

At the M.S level in Pennsylvania, Arcadia University in Glenside offers an M.S. degree in Forensic Science. Duquesne University in Pittsburgh offers a Master of Forensic Science and Law Degree.

If you're looking for additional training other than a B.S. or M.S program, perhaps completing work for a Forensic Criminalistics Certificate at Central Pennsylvania College in Lancaster is for you.

If you're interested in home-study and on-line training, opportunities are available through organizations such as Kaplan University, St. Petersburg College and the American Institute of Applied Science.

INFORMATION OF EDUCATIONAL OPPORTUNITIES AND ACADEMIC INSTITUTIONS CAN BE FOUND THROUGH WEBSITES SUCH AS:



- <http://www.aafs.org>
- <http://www.allcriminaljusticeschools.com>
- <http://www.gradschools.com>
- <http://www.GuideToCriminalJusticeSchools.com>
- <http://www/forensicpage.com>
- <http://www.crime-scene-investigator.net>
- http://education-portal.com/forensic_science_programs.html

What follows is some information from the American Academy of Forensic Science on employment in the field of Forensic Science

Forensic Science– An Array of Job Opportunities

Forensic scientists analyze the physical evidence they receive from police, then prepare reports describing the results of their analysis. Those documents, along with forensic scientists' expert testimony, can be important prosecutorial tools for convicting the accused.

Analyzing evidence. Whenever a crime is committed, police try to preserve the scene until an investigator collects every piece of evidence—like hair and fiber samples, pieces of clothing, or other personal belongings—that might provide clues to solving the case. The evidence is then turned over to forensic scientists for analysis. Their analyses involve a variety of sciences, mathematical principles, and problem solving methods, including use of complex instruments; chemical, physical, and microscopic examining techniques; and reference literature. Most physical evidence involves class and individual characteristics. Class characteristics are those common to a group of similar objects—for example, a particular type of car tire. Individual characteristics are those unique to a given object, such as the wear and tear on your car tires. Analysis of detailed evidence can identify both class and individual characteristics. Forensic scientists can thus use physical evidence to determine the make, model, year, and, ultimately, identity of the car involved in a crime—and through further analysis can also tell which way the car was facing, how it pulled away from the crime scene, and in which direction. Some forensic scientists are generalists; others specialize in a particular area of laboratory analyses. Persons employed in large laboratories tend to specialize. Most crime lab professionals work in one or more of the following areas.

Controlled substances and toxicology. Crime lab professionals specializing in this area examine blood and other body fluids and tissues for the presence of alcohol, drugs, and poisons.

Biology. Crime lab professionals compare body fluids and hair for typing factors, including DNA analysis. DNA analysis determines how frequently parts of a person's genetic code are found in the population; forensic scientists isolate DNA strands from an individual's body fluids to compare that person's unique DNA to the DNA of a sample of others in a database. Because of its accuracy, DNA analysis has grown popular in recent years. Analysis of a hair found at a crime scene can determine factors such as whether the hair belongs to a human or animal, the body area a hair came from, diseases the person or animal has, and, sometimes, race. And through simple side-by-side examination, hair comparisons can match a hair found at a crime scene to the person who left it there.

Chemistry. Forensic scientists analyze trace physical evidence such as blood spatters, paint, soil, and glass. For example, blood spatters help reconstruct a crime scene: The patterns of spatters and the shapes of blood droplets tell how the crime was committed.

Document examination. Document examination includes many areas of expertise, including forgery, document dating, and analysis of handwriting, typewriting, computer printing, and photocopying.



Array of Opportunities (cont'd)

Firearms and toolmark identification. Firearms examination involves matching identifying characteristics between a firearm and projectile and between a projectile and target. Typically, this includes matching bullets to the gun that fired them. Toolmark identification involves matching some identifying characteristics of a tool, such as a pry bar, to the object on which it was used, such as a door frame. It also includes explosives and imprint evidence.

Psychophysical detection of deception exam. The psychophysical detection of deception exam (formerly known as the polygraph) is based on the scientific theory that when telling a lie, a person's body responds in a certain way despite any attempts to avoid detection. Forensic scientists use special equipment to measure changes to internal body functions— including breathing, blood pressure, and pulse rate— in response to their questions and then analyze the results.

Fingerprinting. Fingerprints provide a highly accurate means of identification because each person's fingerprints are unique. And because they are formed underneath the skin, fingerprints never change—even after scarring or burning. Forensic scientists match developed fingerprints from an individual against the fingerprints on file to make a positive identification. Digital technology allows crime lab professionals to compare prints at a rate of 400,000 per second.

Describing results. Crime lab professionals provide the judicial system with expert opinions and analyses of evidence. They prepare reports that explain the results of their analyses and describe the methods and techniques used to support their conclusions. Everything they do must be accurately documented, since the written report must be able to stand on its own in a court of law. Forensic scientists examine evidence within the context of an entire case, and prosecuting attorneys rely on that expertise in preparing the case for court.

What is it Like Working in Forensics?



Employment and working conditions. Most forensic scientists work in crime laboratories run by city, county, or State governments. The next largest group works for Federal agencies including the Departments of Justice (Federal Bureau of Investigation [FBI] and Secret Service), Treasury (Drug Enforcement Administration and the Bureau of Alcohol, Tobacco, and Firearms), Postal Inspection Service, and Health and Human Services. Other Federal agencies send them work on a case-by-case basis. A smaller number work in private labs and colleges and universities. Employment of most crime lab professionals is contingent upon satisfactory completion of a background investigation and random drug testing.

Forensic scientists usually work a regular 40-hour week. Sometimes they have to travel and work long, irregular hours. They spend much time in laboratories analyzing evidence but Forensic scientists testify in court as expert witnesses. They also work in offices to record and draft reports on the results of their analyses.

What is it Like Working in Forensics? (cont'd)

Those who work in large labs may use technologically advanced equipment such as chromatographs, to analyze drugs, alcohol, arson evidence, and fibers; spectrographs, to identify chemicals; and computerized laboratory equipment.

Crime lab professionals may be exposed to health or safety hazards when working in the lab or handling certain chemicals, but there is little risk if procedures are followed. When testifying in court, they should be well prepared, poised, and confident in their testimony and have a neat personal appearance.

Earnings

According to the Bureau of Labor Statistics, starting salaries for forensic scientists ranged from \$28,000 to \$71,000 in 2004. Experienced crime lab professionals earned about \$40,000 to \$85,000, and some lab directors earned as much as \$100,000.

Outlook

Job opportunities for forensic scientists are expected to increase as a result of the judicial system's continuing need for corroborating evidence in prosecutions. However, forensic scientists can expect competition for jobs at the Departments of Justice, Treasury, and other Federal law enforcement agencies. Job opportunities will be best for crime lab professionals who have an advanced degree or certification in a forensic specialty—especially one that is growing rapidly, such as DNA analysis.

Training & Qualifications

Students planning careers as a forensic scientist must have perseverance, curiosity, and the ability to concentrate on detail and work independently. They should enjoy science and mathematics, which forensic scientists rely on heavily in their work. Beginning forensic scientists usually have at least a bachelor's degree in forensic science, chemistry, biology, physics, or physical anthropology. Murder investigation, for example, detectives and forensic scientists use chemistry, physics, and biology in combination to conduct special tests such as determining blood alcohol levels, making barely visible bloodstains more visible, and typing blood to identify possible suspects.

Geometry and trigonometry help investigators evaluate critical evidence like the angles of lethal blows and the trajectory of bullets. Because forensic scientists prepare reports and may be called as expert witnesses, they must have good oral and written communication skills. Lab experience, either in an academic laboratory or through an internship or co-op program, also is useful.



Beginning forensic scientists usually must have at least a bachelor's degree in forensic science, chemistry, biology, physics, or physical anthropology. Thirty-one colleges and universities offer a bachelor's degree in forensic science; most also offer advanced degrees in specialized areas of forensic science.

Training and Qualifications (Cont'd)

Whatever the major, required college courses include sciences such as biology, physics, chemistry, and pharmacology; also frequently required is a course in quantitative analysis and statistics. Laboratory experience involving analytical instruments or blood sample analysis is helpful. Computer courses are also recommended, as employers prefer job applicants with computer skills for modeling and simulation tasks and to operate computerized laboratory equipment.

Students do not need to specialize at the undergraduate level. In fact, broad training allows bachelor's degree holders more flexibility for job hunting or changing jobs. Students who pursue study beyond a bachelor's degree often specialize in a subfield of forensic science, such as firearms examination, depending on their interests. A Ph.D. is usually preferred for advancement to many administrative positions such as lab director. Those with a Ph.D. also may teach forensic science at the college or university level.



Forensic scientists must be acquainted with the methods that are usually accepted in their specialty. For example, controlled substances examiners and toxicologists should be able to select appropriate procedures and equipment for reliable analyses of controlled substances; develop a valid procedure, if necessary; and evaluate the significance of test results. Most employers provide additional education or training for new employees with bachelor's degrees. Many crime lab professionals attend postgraduate training on subjects such as biochemistry, population genetics, and molecular biology. In addition, they may attend conferences or workshops on topics such as specific analytical techniques, exhibit handling, and court testimony. Forensic scientists often receive training prior to their appearance as an expert witness. This training may include moot court practice, actual court observation, and appropriate reading material.

For Those Already in the Field

The FBI Forensic Science Research and Training Center offers forensic science courses for FBI special agents and laboratory examiners and technicians. The forensic science training program also is open to forensic scientists of other Federal agencies and State and local agencies. The program includes hands-on training and introduces new or advanced techniques for examining physical evidence. Voluntary certification, available through nongovernmental organizations such as professional societies or certifying agencies, demonstrates professional competence in one or more specialties. Certifying organizations include the American Board of Criminalists, the American College of Forensic Examiners, and the International Association for Identification.

Training Opportunities

March 25, 2006

Cedar Crest College (PA) is holding its 4th Annual Forensic Science Symposium on March 25, 2006. Presenters from universities, state district attorney's offices, police departments and criminalistics labs will lecture on various aspects of forensic science. The topics to be discussed are:

- ◇ Mass Disaster: WTC Experience
- ◇ CSI Effect and Crime Lab Culture
- ◇ Latent Fingerprint Comparison
- ◇ Introduction of Low Copy Number DNA and Potential Application to Forensics
- ◇ An Overview of Forensic Entomology
- ◇ Forensic Ballistics and Tool Mark Analysis
- ◇ An Introduction to Forensic Odontology
- ◇ Examination of WTC Deaths by Polarized Light Microscopy

Registration in advance is suggested. For more information and a registration form, go to <http://www.tcnj.edu/~csiewing>

April 28, 2006

The New Jersey Association of Forensic Scientists will be conducting a Spring 2006 Seminar titled "Exploring New Frontiers in Forensic Science." Topics to be discussed are Computer Related Crimes, Advances in Crime Scene Processing, Mitochondrial DNA, Toxicological Analysis of Oral Fluids and Advances in Forensic DNA Analysis. The seminar is to be held at Trump Marina Casino in Atlantic City, NJ. For registration information, fees, and directions, please visit <http://www.njafs.org>

May 3-5, 2006

The Mid-Atlantic Association of Forensic Scientists (MAAFS) will be holding their annual meeting at the Omni Richard in Richmond, Virginia.

The MAAFS has also published a "call for papers." Interested in making a presentation? Visit their website at <http://www.maafs.org/annualmtg2006.htm>

July 18-19, 2006

The American College of Forensic Examiners Institute of Forensic Science (ACFEI) will be holding certification courses in the following areas: Forensic Consulting, Forensic Nursing, Forensic Accounting, and Medical Investigation. The courses will be run July 18-19, 2006 in Las Vegas. For more information, check out: <http://www.acfei.com/conferences.php>

If you missed the debut of HBO's all-new documentary special "**AUTOPSY: SEX, LIES AND MURDER**" (or even if you didn't) there is much to learn at their website:

<http://www.hbo.com/autopsy>