FORENSIC SCIENCE FIELDS

Police and attorneys order the study of crime scenes and appoint experts to collect and examine evidence—fingerprints, hairs, fabric fibers, footprints and so on. The end result often can bring participants to a court of law, where guilt or innocence can be decided. And it's the court of law where the term "forensic" is most often applied.

The word “forensic” is derived from the Latin word forensic, which means "of the forum." The forum is where the law courts of ancient Rome were held. With that in mind, it makes sense that today's definition of "forensic" refers to the application of scientific principles and practices to the legal process, during which expert testimony often plays a role. In other words, "forensic" (an adjective) means pertaining to, connected with, or used in courts of law.

Forensic science is the acquisition and analysis of scientific data for application to the study and resolution of crime, investigation, civil and regulatory issues, and criminal identification.

THE ROLE FORENSIC SCIENTISTS PLAY

The forensic sciences play an important part in our justice system. Although most of its disciplines have become identified primarily with law enforcement because of television and movies, this is misleading. Forensic scientists may be involved in all aspects of a criminal case, and the results of their work may help either the prosecution or the defense. The point of forensic science is to use all the scientific information available to determine facts.

Although mostly associated with criminal proceedings, forensic science comes into play in an increasingly active role in the civil justice system as well. Questions of law and fact may require forensic science expertise for a number of reasons. A forensic scientist can attest to the validity of a signature on a document—a contract or a will, or can judge if a corporation is complying with terms of a liability settlement.

Because of forensic science, the number of cases entering the overloaded court system can be reduced. Reports produced by forensic scientists can show if a case has merit and should actually go to court.

Forensic science also has been helping to restore the faith people once had in our legal system. The belief that the legal process results in justice has been shaken over the last few years. Now, with DNA technology and advances in other related areas, the forensic scientist can help present the facts in a criminal or civil case, without depending on circumstantial evidence or unreliable witness testimony.

Although the gathering and examination of forensic evidence plays probably the largest role, there is much more to forensics than just DNA matching.

FORENSIC SCIENCE FIELDS

For further clarification, let's look at the different types of evidence as well as the definitions for other specific fields. The chapter where further discussion can be found is noted after each topic.

Forensic evidence

Scientists and experts (also known as criminalists) work in the following areas:

Computer and digital image enhancement Crime scene reconstruction

DNA
Documents
Drugs
Entomology
Fingerprints
Firearms-ballistics
Footwear and shoeprints
Hair fibers
Handwriting
Linguistics/audio
Locks
Paint
Photography
Poisons and other toxins
Polygraphs
Sculpting
Voice and speech analysis
Tire tracks and skid marks
Tool marks (Chapter 2)

Forensic accident investigation: Experts reconstruct accidents for testimony in law cases (Chapter 3).

Forensic pathology: Pathology is the study of disease. Forensic pathology requires additional training and is the application of the principles of pathology, and of medicine in general, to legal issues. Forensic pathologists perform autopsies and conduct other investigations (Chapter 4).

Forensic coroners or forensic death (medical or legal) investigators: Those who gather evidence and/or conduct autopsies or other investigations for information to be used in the court system (Chapter 4).

Forensic medicine: the application of medical knowledge to questions of civil and criminal law, especially in court proceedings (Chapter 4).

Forensic deontology: Forensic deontology is a branch of dentistry that deals with the collection, evaluation, and proper handling of dental
Forensic deontology: Forensic deontology is a branch of dentistry that deals with the collection, evaluation, and proper handling of dental evidence to assist in civil and criminal proceedings (Chapter 4).

Forensic nursing: Forensic nurses work in both crime scene investigations and in areas such as rape crisis centers. They often work with forensic social workers (Chapter 4).

Forensic anthropologists, artists, and sculptors: Those who use their expertise to create reconstructions that can help identify remains or assailants (Chapter 5).

Forensic psychology and psychiatry: The application of the related professions of psychology and psychiatry to questions and issues pertaining to law and the legal system. Scientists in this area can help determine if a suspect is competent to stand trial or if he or she knew the difference between right and wrong when committing a crime (Chapter 6).

Forensic social workers, psychiatric technicians, mental health workers, and counselors: Those who work with offenders involved within the criminal justice system (Chapter 6).

OTHER FORENSIC DISCIPLINES

In addition to the established specialties mentioned above, there are many new areas of forensic study that are just emerging:

Forensic Computer Examination: Forensic computer experts prove fraud or other crimes in which computers are involved. Some experts specialize in forensic accounting, investigating and interpreting bankruptcies, and other complex financial transactions. Using accounting techniques they attempt to determine the patterns of people who might have committed frauds.

Forensic Accounting: Forensic accountants study white-collar crime such as fraud, embezzlement, or tax evasion.

Forensic Economics: Forensic economists estimate the value of the victim's present and future lost income resulting from wrongful injury or death.

Wildlife Forensics: Wildlife forensic scientists work in two main areas: identifying evidence, and linking the suspects, victims, and the crime scene by means of physical evidence. They determine poaching violations and work with state and federal officials to develop hunting regulations. They also are concerned with the Endangered Species Act. Wildlife forensics differs from criminal science only in that the victim (and occasionally the perpetrator) is an animal.

Forensic Engineering: Forensic engineers put their expertise to work in legal-related matters, such as the quality evaluation of construction or manufacturing, failure analysis, and maintenance procedures. The role of the forensic engineer also can overlap with accident and arson investigators. Structures forensic engineers examine can range from apartment buildings or bridges to surgical implants or bones. Their expertise is applied in personal injury cases; construction, contract, or warranty disputes; patent or copyright infringements; and criminal and regulatory matters.

Forensic engineering is a specialized practice of the engineering sciences, not a separate discipline. Few universities offer courses in forensic engineering; therefore, forensic engineers must develop their own credentials. Most perform their services part-time in addition to other work, such as college teaching.

Forensic Architecture: Forensic architects investigate construction defects and code violations for evidence to be used in a court of law. Their role can sometimes overlap the role of the forensic engineer. There are also other forensic specializations, such as forensic administration, research, rehabilitation, laboratory investigation, field investigation, communications, and forensic education.

THE ROLE OF LAWYERS
Law is at the core of forensic sciences, and lawyers work hand in hand with forensic scientists, advancing the search for truth.

To be fully effective, a forensic specialist not only must be an expert in his or her discipline, but also must be expert in communicating findings in legal proceedings. No matter how accurate the findings are, if a forensic specialist can't communicate results in a clear fashion to the law firm that hired him or her or to a jury in a court of law, his or her abilities are useless.

A forensics specialist also must be familiar with and conform to the laws governing collection, preservation, and admissibility of evidence. If an investigation is tainted, a case can be lost-or won.

Lawyers who use expert testimony in their work should have a better than basic knowledge of all the forensic sciences and must be articulate in presenting the findings of the expert witness. No matter how qualified the expert witness may be, and however accurate the analysis of the evidence, the value of these tests and analyses will be diminished if the lawyer is untrained in the field and is unprepared to present the evidence effectively.

SAMPLE JOB TITLES

Forensic scientist positions come with a variety of job titles. Some employers might designate entry-level jobs with Roman numerals, for example, Forensic Scientist I or Forensic Pathologist II. Other titles include (but are not limited to):

Administrator of public services
Assistant medical examiner
Chemist
Criminalist
Deputy medical examiner
Director of laboratories
Document examiner
Drug chemist
Firearms examiner
Forensic chemist
Forensic consultant
Forensic DNA analyst
Forensic drug analyst associate
Forensic pathologist
Forensic scientist
Forensic scientist (DNA/trace evidence)
Forensic technologist
Histologist
Latent fingerprint examiner
Medical examiner
Deontologist
Professor (assistant, associate, or full)
Tool mark examiner
Toxicologist
Trace analyst
Trace evidence technologist

JOB SETTINGS

Forensic scientists are employed by federal, state, and local governments and agencies. Some work for private laboratories; others work for universities. Still others work in hospitals and clinics or in private practice.

Self-employed forensic specialists might work in accident reconstruction or offer digital image-enhancing technology. The range of settings is as wide as the range of specialties.

SAMPLE JOBS

The following administrative listings are provided as a sample only, and as such, the hiring firms are not mentioned. You may look for current listings by doing an Internet search using keywords such as "jobs" and "forensics."

Additional sample jobs are provided throughout the book.

The City of , Department of Police Operations-Crime Lab

is seeking applicants for the position of Administrator-Public Services 2. Qualifications include a bachelor's degree in chemistry, biology, physics, forensics, or criminalistics that included course work in general chemistry, organic chemistry, instrumental analysis, quantitative analysis, and physics; and six years of responsible experience in a forensic laboratory of which two years must have been in a supervisory capacity. Must be court qualified in at least two fields of forensics.

Responsibilities include planning, coordinating, and supervising the work and staff of the crime laboratory, and preparing reports for and testifying as an expert witness in hearings and in court as required. Salary: $55,671-$65,491.

Director of Laboratories
The County Health Department is seeking applicants for the position of Director of Laboratories to oversee a full-service crime laboratory (criminalistics, forensic biology/DNA, and toxicology). Qualifications include a Ph.D. in toxicology, biology, chemistry, and/or forensic science or a directly related field; thorough knowledge of modern laboratory techniques in toxicology and/or the forensic sciences; and a minimum of five years of laboratory bench work experience in one of the forensic disciplines as well as three years of laboratory administrative experience. ABC or DBFT board certification is desirable. Salary: $93,777-$ 100,670.

Forensic Administrator

The County Regional Forensic Science Center is seeking applicants for the position of Forensic Administrator. Qualifications include a bachelor's degree in business, administration, or management with a background in forensic science. Responsibilities include managing the daily operations of the facility and supervising the administrative support staff, managing departmental budget and overseeing AP/AR, acting as public relations representative for the department, managing services and professional contracts, and acting as liaison to local law enforcement agencies and county officials. Salary: $44,400.

Forensic Toxicology Laboratory Manager

The State Patrol is seeking applicants for the position of Forensic Toxicology Laboratory Manager. Qualifications include a bachelor's degree in the biological or physical sciences, a minimum of three years' experience in the supervision or management of a forensic toxicology laboratory engaged in postmortem and human performance forensic toxicology, court-qualification to testify as an expert on the effects of alcohol and/or drugs, and a familiarity with current analytical standards, instrumentation, and technology. Familiarity with Drug Recognition Expert (DRE) and breath alcohol testing issues as well as experience in business operations, laboratory accreditation, and quality program development will be considered a plus.

Responsibilities include administering a program of analytical and interpretive forensic toxicology; planning, organizing, and evaluating various functions of the toxicology laboratory such as servicing law enforcement agencies, coroners, and medical examiners throughout the state; supervising and managing operations of the laboratory; testifying in judicial forums on toxicological issues; supervising staff; writing standard operating procedures; overseeing quality control programs; and preparing and maintaining laboratory accreditation. Salary: $57,708-$70,332.

Assistant, Associate, or Full Professor

University is seeking applicants for the position of Assistant, Associate, or Full Professor. Qualifications include a master's or doctoral degree in forensic science or a related field and a minimum of two years teaching experience.

Responsibilities include teaching courses in the Master of Forensic Sciences degree program, advising students, performing administrative tasks, and engaging in scholarly activities.

Most university teaching jobs require a graduate degree. In some settings a master's is sufficient; generally, though, most professors must have a Ph.D. In addition to teaching experience, many positions also require field experience, especially for the more practical, hands-on type of courses.

University instructors in the forensic sciences work under the same conditions as instructors in other fields.

Some university professors work in the field full-time or as part-time consultants, while also teaching part-time.

**SALARIES FOR FORENSIC SCIENTISTS**

What forensic scientists earn across the board is almost impossible to say. Salaries depend on job title, level of expertise-bachelor's through doctorate level, as well as number of years' experience- employer, and the region of the country.
As a general rule, federal agencies pay the most and local law enforcement agencies the least. Starting salaries could range from $25,000 per year to $35,000 per year, depending on the graduate’s area of specialization and skills. Forensic experts with impressive credentials and many years of experience can command substantially more money.

The chapters ahead feature several firsthand accounts of forensic specialists working in the actual fields. Many provide salary information for their specific field. In addition, many of the sample jobs listed in this chapter and others also provide salary ranges.

TRAINING

Forensic science is a general term that encompasses a range of disciplines and levels of expertise. A forensic scientist could be trained at the bachelor’s level in toxicology, DNA, or ballistics, for example. A forensic scientist could also be a Ph.D. psychologist who studies criminal behavior, profiles criminal suspects, and presents testimony in court; or a Ph.D. forensic anthropologist who specializes in reconstructing skulls to identify remains.

The type of training forensic scientists pursue depends on their area of interest and the number of years they are willing to invest. Forensic scientists who function mainly as criminals specialized in one or more areas of forensic evidence (DNA, handwriting analysis, and so on), may pursue a bachelor's degree or go on for a graduate degree. Forensic medicine specialties, for example, would, in most cases, require a medical degree.

Those who pursue undergraduate degrees in forensic science often use that degree as a stepping-stone to graduate work-in law, allied health and medicine, and engineering, to name a few.

It is important to note that some—even many—forensic scientists don’t necessarily start their careers working in forensics. A psychologist might earn a Ph.D. in clinical psychology, not sure during his or her schooling what the ultimate job setting will be. Opportunities for consulting and other forensic work might come along gradually over time, before developing into a full-time career. The same can hold true for the accident investigator, the fire safety officer, the physical anthropologist, who more and more gets involved with forensic work and eventually replaces the original full-time career focus.

The specific training required for the different forensic specialties are covered in the chapters ahead, included here as examples are two sample undergraduate and graduate programs for forensic science. (In Appendix D you’ll find a list of colleges and universities that offer forensic science programs.)

Sample Programs

The two schools whose programs are profiled here are provided as examples; their inclusion is not meant as an endorsement, nor is the exclusion of other programs meant to indicate disapproval.


John Jay's Bachelor of Science in forensic science is designed "to provide training for students seeking to work in forensic science laboratories, or who are planning to pursue careers as scientists or scientist-administrators. The major draws from the biological science from physics and chemistry (organic, physical, and analytical), and from the law. Students may specialize in one of two tracks: Criminalistics or Toxicology."
Criminalistics Track

Freshmen Modern Biology General Chemistry

Sophomores Organic Chemistry Quantitative Analysis

Forensic Science Survey of Criminalistics or Environmental Science Introduction to Environmental Science General Physics

Juniors

Physical Chemistry II

Biochemistry

Forensic Science Laboratory (2)

Law and Evidence

Seniors

Forensic Science Laboratory Internship

Instrumental Analysis (2)

Toxicology Track

Freshmen Modern Biology General Chemistry

Sophomores Organic Chemistry Quantitative Analysis Law and Evidence General Physics

Juniors

Physical Chemistry II

Biochemistry

Instrumental Analysis (2)

Toxicology: Forensic Pharmacology

Seniors

Forensic Science Laboratory Internship Toxicology of Environmental and Industrial Agents Analytical Toxicology

Master's Programs

Master's programs at John Jay College of Criminal Justice include the following programs and fields:

Master of Arts in Criminal Justice Master of Public Administration Inspector General Program Master of Arts in Forensic Psychology Master
Master of Arts in Criminal Justice  
Master of Public Administration  
Inspector General Program  
Master of Arts in Forensic Psychology  
Master of Science in Forensic Science  
Master of Science in Protection Management  

These master's programs complement baccalaureate degree study and may lead to doctoral study. The programs also provide for an opportunity to pursue new areas of specialization and are designed to meet the needs of pre-career, in-career, and in some cases, second-career students.

Doctoral Program in Criminal Justice  

The City University of New York Ph.D. Program in Criminal Justice is located at John Jay College and is administered by the Graduate School and the University Center of The City University of New York. The program prepares students for teaching, research, and policy development careers.

Courses are taught by John Jay faculty and faculty from other senior colleges of The City University of New York. Doctoral students in criminal justice are encouraged to take some of their electives in related disciplines such as sociology, political science, philosophy, economics, and psychology.

Virginia Commonwealth University 816 West Franklin Avenue Richmond, VA 23284 www.vcu.edu  

Virginia Commonwealth University offers a Bachelor of Interdisciplinary Studies with a specialization in forensic science. "Students learn the theory and practice of forensic science, including: the nature and scope of the discipline; the application of forensic science to crime, police investigation, and the adjudication process; clinical and statistical predictions of criminal behavior, classifications of offenses and offenders, and the legal and ethical issues these engender; and the fundamental natural science and laboratory skills required for forensic work.

"The specialization in forensic science will provide students with a solid education preparing them for effective professional careers in crime laboratories, police agencies, and/or to pursue graduate studies. Students will also be prepared to pursue advanced degrees in, to name a few.... They will be exposed to principles of drug analysis, DNA analysis, trace evidence, criminalistics, and legal issues. They will be able to scientifically analyze evidence and explain its meaning in a criminal justice setting. The forensic science specialization consists of 120 credits. Students also will qualify for a minor in chemistry by completing the specialization."

FORENSIC SCIENCE CORE COURSES

Introduction to Biological Sciences I, Introduction to Biological Sciences II, Introduction to Biological Sciences Lab I, Introduction to Biological Sciences Lab II

General Chemistry I, General Chemistry Lab I  
General Chemistry II, General Chemistry Lab II

Introduction to Forensic Science  
Justice System Survey  
General Physics

Forensic Science Specialization Requirements

Cell Biology  
Experimental Methods  
Genetics  
Organic Chemistry  
Organic Chemistry Lab I  
Organic Chemistry II, Organic Chemistry Lab II  
Quantitative Analysis, Quantitative Analysis Lab  
Criminalistics and Crime  
Analysis Lab  
Forensic Criminology  
Forensic Evidence and Criminal Procedure  
Forensic Science Internship  
General Education

Students also will select courses from the approved lists found in the VCU Undergraduate and Professional Programs Bulletin in the following general education and electives areas:

PAGE 9  
www.lawenforcementcrossing.com  
continued on back
Written Communications
Mathematical and Statistical Reasoning
Pre-calculus Mathematics
Basic Practices of Statistics
Ethical Principles
Natural Sciences
Visual and Performing Arts
Literature
Civilization
Foreign Language
Human Behavior
Urban Environment
Justice System Survey
Medicinal Chemistry
Biochemistry
Instrumental Analysis
Clinical Immunology
Clinical Instrumentation
Criminal Law
Foundations of Criminal Justice
General Physics
Internships

Most university departments of forensic science strongly encourage students who have no previous forensic science or criminal justice experience to participate in one or more internships in a criminal justice agency or forensic science laboratory. While most of these internships are almost always unpaid, internships can provide valuable experience and a foot in the door when it comes time to land full-time employment. A list of labs and agencies where interns can be placed are provided in Appendix C.
time employment. A list of labs and agencies where interns can be placed are provided in Appendix C.