



What Do Forensic Scientists Do?

The forensic sciences form a vital part of the entire justice and regulatory system. Some of the different divisions, or disciplines, of forensic science have become identified primarily with law enforcement an image enhanced by television and movies. This is misleading because forensic scientists are involved in all aspects of criminal cases, and the results of their work may serve either the defense or the prosecution. The forensic scientist's goal is the evenhanded use of all available information to determine the facts and, subsequently, the truth.

The forensic scientist's role in the civil justice arena is expanding. Issues range from questions of the validity of a signature on a will, to a claim of product liability, to questions of whether a corporation is complying with environmental laws, and the protection of constitutionally guaranteed individual rights. Forensic science is a rewarding career where the love of science can be applied to the good of society, public health, and public safety.

Work

The work of the forensic scientist may reduce the number of cases entering our overloaded court system by assisting the decision-makers before a case reaches the court. The facts developed by forensic scientists, based on scientific investigation, not circumstantial evidence or the sometimes unreliable testimony of witnesses, may convince prosecuting or defense attorneys, a grand jury, or a judge that an issue does not merit a court hearing. The work of the forensic scientist at times proves the existence of a crime or makes connections to a crime. The forensic scientist provides information and expert opinion to investigators, attorneys, judges, and juries which is helpful in determining the innocence or guilt of the accused.

The rule of law is based on the belief that the legal process results in justice. This has come under some question in recent years. Of course, the forensic scientist cannot change skepticism and mistrust single-handedly. He can, however, contribute to restoring faith in judicial processes by using science and technology in the search for truth in civil, criminal, and regulatory matters.

The forensic scientist is entirely responsible for the work he performs; no one else can write his report nor testify to his opinion. However, it takes teamwork to solve a crime. Scientists work closely with police officers, sheriff's deputies, prosecuting and defense attorneys, DEA, CIA, and FBI agents, immigration workers, and crime scene investigators, to name a few.

There is a strong requirement for accurate record keeping, chain-of-custody documentation, stringent quality control, and data management. Chain-of-custody guarantees that the integrity of evidence is maintained at all times. The time, date, location, and signature are required when transporting a piece of evidence within the laboratory or to an outside facility.

Ethics

The forensic scientist, no matter where or by whom he is employed, works only for truth. He must make sure that the examination is complete, the tests performed are done correctly, the interpretation of the data is thorough, the written report is correct and easily understood by a non-scientist, and the testimony is complete and truthful. Anything less is not acceptable.

Testimony

Testimony is the verbal statement of a witness, under oath, to the judge and/or jury. The forensic scientist can testify on the basis of personal knowledge, and in the form of opinion based on his informed evaluation of the evidence presented and scientific tests performed and interpreted within the bounds of his skills, experience, and ability. There are four criteria that are generally required to qualify a person as an expert witness. They are: educational degrees received, number of years of occupational experience in the field, membership in professional organizations, and professional articles or books that the person has published.

What's A Forensic Scientist?

A forensic scientist is first a scientist. When he applies his scientific knowledge to assist juries, attorneys, and judges in understanding science, he is a forensic scientist.

Forensic scientists are thinkers, good with details, good with putting pieces of a puzzle together, and curious. Some scientists work in laboratories and some also go out to places where crimes are committed (crime scenes). Others teach in colleges and universities.

How Do I Become a Forensic Scientist?

You will need:

- Bachelor's of Science degree: some forensic sciences require advanced degrees; take chemistry, biology, math, English composition
- Speaking Skills: take public speaking, join the drama club, toastmasters, the debate team
- Note-Taking Skills: you can't subscribe to a service or depend on Cliffs Notes in real life!
- Ability to write an understandable scientific report
- Intellectual curiosity
- Personal integrity

How Much Money Will I Make?

Income in the forensic sciences varies greatly depending upon your degree, your actual job, where you work, and how many hours you work. You may never "get rich" but you will have a good income. You will be satisfied with your job, knowing you are contributing to justice keeping the good guys on the street and helping put the bad guys in jail. Forensic scientists work different hours, depending upon what they do. Some work in forensic laboratories and work 40 hours a week, Monday through Friday. Others work out in the field on digs and may work different hours. Still others are "on call" and work after their regular shift and receive overtime or compensatory (comp) time. Essentially every branch of forensic science offers opportunities for personal growth, career advancement, and increasing financial compensation.

Where Will I Work?

Forensic scientists work in laboratories, at crime scenes, in offices, and in morgues. They may work for federal, state and local government, forensic laboratories, medical examiners offices, hospitals, universities, toxicology laboratories, police departments, medical examiner/coroner offices, or as independent forensic science consultants.

Disaster Mortuary Operations Response Team (DMORT) is a branch of the Federal Emergency Management Association (FEMA). Teams are sent on an "as needed" basis to mass disasters or large criminal cases. Members are sent for two weeks to any destination in the world and may extend their time as needed. DMORT is used to assist already existing forensic teams.

Disciplines Within the American Academy of Forensic Sciences

The American Academy of Forensic Science, the largest forensic science organization in the world, is composed of over 5,000 scientists organized into ten sections representing the different areas of interest, activity, education, and expertise of individual members. Each of the following sections will be reviewed in alphabetical order:

- Criminalistics
- Engineering Sciences
- General
- Jurisprudence
- Odontology
- Pathology/Biology
- Physical Anthropology
- Psychiatry & Behavioral Science
- Questioned Documents
- Toxicology.



Criminalistics

Scope of Work

Criminalists analyze, compare, identify, and interpret physical evidence. Forensic labs have two primary functions: identifying evidence, and linking suspect, victim, and crime scene through physical evidence. The main role of the criminalist is to objectively apply the techniques of the physical and natural sciences to examine physical evidence. Physical evidence may be anything: evidence so small that a microscope is needed to see it, or as large as a truck. It may be as subtle as a whiff of a flammable gas at an arson scene or as obvious as a pool of blood at a homicide scene. The enormous range of material challenges the ingenuity of the criminalist who examines and identifies hair, fibers, blood, seminal and body fluid stains, alcohol, drugs, paint, glass, botanicals, soil, flammables, and safe insulating material; restores smeared or smudged markings; and identifies firearms and compares bullets, tool markings, and foot prints. Perhaps the most important task of the criminalist lies in interpreting the results of the tests to determine the truth. This may be the circumstances at the time a crime occurred, or may support a witness' statement. Reconstructing the events of a crime is often very difficult. It requires an understanding of human behavior, of the physical laws and processes involved, and the recognition of how they interact. Finally, any findings must be conveyed to the other parts of the criminal justice system, such as officers and attorneys. This is done by written reports and expert testimony. The criminalist must express conclusions so that technical details are understood by the non-scientist jury, attorneys, and judges.

Education and Training

The minimum requirement is a bachelor's degree in chemistry, biology, physics, molecular biology, or a related science. In the future, a master's degree may be required. Many colleges and universities offer degrees and courses in forensic science. In deciding whether to get a degree in chemistry or biology, or one in forensic science, study the courses offered. At least 24 semester hours of either chemistry or biology is required and math is a must. The title of the degree is not as important as the courses taken.

To keep up with the many advances in science, the criminalist must take continuing education courses all during his career. By passing a very tough examination, the criminalist may become certified by the American Board of Criminalistics (www.criminalistics.com/ABC). Entire forensic laboratories may prove their competence by becoming accredited by organizations such as the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (www.ascl.org/lab).

Career Opportunities

Criminalists work in forensic laboratories in police departments, sheriff's offices, district attorney's offices, regional and state agencies, medical examiners' offices, private companies, colleges and universities, and for federal agencies such as the Drug Enforcement Administration (DEA), Bureau of Alcohol, Tobacco and Firearms (ATF), Federal Bureau of Identification (FBI), United States Postal Service (USPS), Secret Service (SS), Central Intelligence Agency (CIA), the military forces, and the United States Fish and Wildlife Services. Criminalists assist the United States Department of Justice in helping other countries create or update forensic services. The criminalist may start as a bench scientist after graduating from college and, through education and dedication, work his way up to forensic laboratory director. There are many opportunities to teach at community colleges and universities. As science advances, more criminalists will be needed to perform new tests in an ever-expanding field of evidence. One of the newest areas of criminalists is wildlife forensics. The major difference between criminal forensic science and wildlife forensic science is that the victim (and occasionally the suspect) is an animal.

Suggested Additional Reading:

Saferstein R., *Criminalistics: An Introduction to Forensic Science*, 7th Edition (Upper Saddle River, NJ: Prentice Hall) 2001.

Inman, K. and Rudin, N., *Principles and Practices of Criminalistics* (New York, NY: CRC Press) 2001.



Engineering Forensic Sciences

Innovation and problem-solving are key traits of an engineer. An engineer applies the principles of mathematics and science for many purposes. The forensic engineer applies the art and science of engineering to the purpose of the law. Most requests for services involve civil suits. However, the forensic engineer may also assist in the prosecution or defense of criminal or regulatory matters.

Scope of Work

Questions posed to forensic engineers are in subjects as varied as the specialties of the engineers themselves. Typical subjects include: failure analysis, accident reconstruction, causes and origins of fires or explosions, design review, quality evaluation of construction or manufacturing, maintenance procedures, and environment definition. The scopes may range from entire communication networks or transportation systems to the molecular composition or grain structure of a specific component. Structures examined may range from skyscrapers, aircraft, or bridges to surgical implants or bones. Conclusions are applied in personal injury litigation, construction claims, contract or warranty disputes, patent or copyright infringements, criminal, and regulatory matters.

Some questions the engineer may be asked to answer are:

Why did the vehicle roll over?

How could the accident have happened?

Why did the airplane crash?

Why did the building collapse?

Did defects exist?

In most legal disputes involving engineering issues, each party will hire its own engineer(s) for consultation and to testify on its behalf. In other words, the forensic engineer's work is subject to the scrutiny of other highly qualified professionals.

Education and Training

Forensic engineering is a specialized practice of the engineering sciences. Few universities offer courses in forensic engineering; therefore, the forensic engineer must develop his own credentials. The minimum education required is a bachelor's degree in engineering or an allied science. However, it is recommended that the forensic engineer have an advanced degree, when appropriate, and be a registered professional engineer. The forensic engineer must be highly competent, ethical, credible, and should have extensive professional experience in the subject matter under consideration. Other essential capabilities include writing and speaking skills, as well as evidence handling techniques. Knowledge and understanding of legal procedures and standards of proof are definite advantages. Active participation in professional organizations and continuing education are highly recommended.

Career Opportunities

Forensic engineers may be employees of large corporations or government agencies. However, most forensic engineers are employed by small firms or are self-employed. Some perform their forensic services on a part-time basis or in addition to their other work (e.g., a college professor providing forensic engineering consultations). The competent, ethical, credible, and professional forensic engineer is in high demand now and will be in the foreseeable future.



General Forensics

Scope of Work

Members of the General Section include scientists with forensic specialties in the scientific areas of laboratory investigation, field investigation, clinical work, communication, computer investigation, education, research,

and other emerging forensic science disciplines. These scientists are employed or practicing in the following areas of forensic activity: administrator, accountant, archaeologist, artist/ sculptor (including facial reconstruction), aviation accident investigator, ballistics analyst (ammunition performance and wound interpretation), computer-related crime investigator, computer specialist, forensic consultant, coroner (non-pathologist), crime scene investigator, medico-legal investigator, educator (potentially all forensic areas), image enhancement specialist, marine biologist, nurse examiner, photographer, polygraph examiner, radiologist, researcher, rehabilitation specialist, social worker - forensic applications, and speech scientist (voice identification, enhancement of recordings, validation and authentication of transcripts and/or recordings). New areas of forensic study result from a combination of unique problems faced by investigators and advances in natural and social sciences. Many of the well-established disciplines in the forensic sciences were nurtured in and emerged from the General Section of the American Academy of Forensic Sciences.

The advent of digital photography with its potential to aid in the documentation of crime scenes and injuries, as well as to speed up all aspects of photography from mug shots to autopsy, creates an important area of research and development. Ecological awareness brings the investigation of crime relating to the various aspects of hazardous waste, illegal dumping, and other such crimes against the environment to those with expertise in areas such as the forensic marine sciences, and many other sciences applied to environmental issues. To help unearth the details of financial schemes, money laundering, and digital fraud on the Internet, an important area of investigation involving **forensic accounting** has been developed.

Computer forensics has become important because recent intrusions to gain or corrupt information in other computer systems by criminals using computer technology to support their activities has become a major crime activity.

Education and Experience

All members of the General Section must have at least a bachelor's degree. Many of the disciplines represented require a master's or doctorate degree. Work experience requirements vary with educational levels.

Career Opportunities

Many of the forensic scientists within the General Section work for colleges, universities, government agencies, police agencies (State, City, and local agencies), federal agencies (such as DEA, ATF, and FBI), and criminal investigation arms of the U.S. Army, U.S. Air Force, and their support laboratories. Others work for coroners, medical examiners, hospitals, and District Attorney's offices. Private companies and independent forensic specialists are consultants to both the prosecution or defense. Income is dependent on specialty and geographical area and generally is increasing for the well-trained forensic scientist. Career advancements are available in many agencies and are dependent on the discipline. Almost all agencies that support forensic science personnel provide opportunity for continuing in-service training, and many offer additional advanced training.



Jurisprudence

Forensic is defined by Black's Law Dictionary as "belonging to courts of justice." Forensic science is the application of science to assist courts in resolving questions of fact in criminal and civil trials. At the dawn of the new millennium, however, the jurisprudence of forensics applies a definition more broad than that of "forensic science.". Definitions of "science" are themselves under scrutiny by attorneys in courts of justice, and many areas of forensic science defined by the law of evidence as "technical or other specialized knowledge" are being evaluated by the courts under different standards of reliability. In this historical context, "forensic

science" may generally be defined as *the application of "scientific, technical, or other specialized knowledge" to assist courts in resolving questions of fact in civil and criminal trials.*

Scope of Work

Attorneys for the prosecution and the defense, as well as the judge, are lawyers. They are the main players in the drama of the courtroom. The lawyer who uses expert testimony in criminal and civil cases must be knowledgeable of the law that governs the admissibility of forensic evidence, and qualified to apply this law to present and challenge forensic evidence in depositions and court proceedings. The judge must understand all the issues and make sure of the legality of the entire process. Although each deposition and court appearance is a unique experience, forensic witnesses may reasonably expect that direct and cross-examination will cover at least a few key areas. The lawyer may make a threshold inquiry into the field of specialization in which the witness claims to be an expert, reliability of that field of knowledge for judicial purposes, and the witness' qualifications in that field. This inquiry may address any and all formal education the witness has or has not completed. Education in the area of specialized knowledge in which the witness claims to be proficient will be most relevant. Any publications or other educational materials authored or edited by the witness and others in the field may be reviewed and addressed to either support or challenge the witness' opinions and conclusions. Professional or technical training in the area of specialization, the witness' performance in that training, and certifications or other credentials related to the areas of specialization, may also be addressed. The witness' experience in the field of specialized knowledge may also be covered, together with any issues related to the witness' competent performance in the field. The witness' performance at work including written and oral performance evaluations, disciplinary proceedings, and any other evidence relevant to the witness' experience may be scrutinized. Testimony of the witness in other court proceedings may also be addressed if it used to undermine the reliability or validity of the witness' opinion in the case at hand.

Education and Training

Members of the Jurisprudence Section must possess **a law degree** and have passed a bar examination to practice law in one or more states. Continuing education is mandatory for the attorney to keep current in new issues.

Career Opportunities

Attorneys may be employed in a variety of areas by a variety of organizations. Some are in private practice; others work in District Attorney's offices, State's Attorney's offices, Public Defender's offices or for the Federal Government. Some are employed by large private companies; still others teach in colleges and universities. Hours of work and income are dependent on geographical area and place of employment, experience, status and reputation, and type of practice.



Odontology

Forensic dentistry (odontology) is a vital branch of forensic science that involves the application of dental science to the identification of unknown human remains and bite marks, using both physical and biological dental evidence.

Scope of Work

Forensic dentists deal with a range of medicolegal problems. Identification of the human remains of natural disasters, terrorist activities, and missing and unknown persons is a central activity (www.caag.state.ca.us/bcia2/mups). This may involve participation in autopsy examinations at the request of law enforcement, coroners, or medical examiners at the local or state level. The postmortem dental examination

of human remains usually involves charting dental and cranial features, radiographic (x-ray) documentation of these features, and forensic report writing regarding these findings. A second step is the application of these findings to investigations by law enforcement to identify the missing or unknown person.

Dental identification plays a particularly important role in the identification of victims of catastrophic events where there are massive numbers of casualties such as airplane crashes. This is demanding work with rigorous standards requiring special training and experience. Inexperienced odontologists usually consult senior odontologists to serve as mentors when embarking on actual casework.

During bite mark analysis, the odontologist also may collect trace salivary evidence for later DNA profiling and matching.

Digital imaging methods may be used in comparing dental evidence from a homicide suspect (www.forensic.to/webhome/bitemarks).

Another activity is injury analysis that determines the presence and extent of dental injuries or physical neglect in an adult, children, and elderly abuse cases.

Odontologists also give expert testimony in civil litigation involving dental issues such as personal injury law, workers compensation, professional malpractice, and disputes regarding aspects of the dentist/patient relationship.

Education and Training

It is vital that a person interested in forensic odontology be properly educated and trained. A **Doctor of Dental Science, DDS** degree is a basic; however, a traditional dental education does not provide the curriculum and experience that is required to function in this field. There are also opportunities for other dental professionals in the field as well.

The American Academy of Forensic Science (AAFS) is the forum for forensic dental lectures, demonstrations, and practical courses that are valuable educational experiences.

The AAFS affiliated American Board of Forensic Odontology (www.abfo.org) serves as the highly regarded credentialing body for dentists who have satisfied experience and training requirements to sit for the challenging ABFO examination.

Career Opportunities

There are many opportunities for forensic odontologists to have formal appointments or consulting relationships with coroners, medical examiners offices, state and local government agencies, and branches of the military. Reimbursement is on a fee-for-service or contractual basis. Private consultations are possible with insurance companies and legal firms.

It is common for court qualified forensic odontologists to testify in criminal and civil courtrooms. Expert testimony in civil and criminal litigation involves dental issues such as personal injury law, workers compensation, professional malpractice, disputes re
dentist-patient relationship, and
identification of bite marks in criminal cases.



Forensic Pathology/Biology

Although forensic pathologists cannot perform all of the miracles seen on television shows, it is an interesting and exciting field and is becoming a more popular and competitive career choice. **Pathology is a medical specialty** the study of disease. Pathologists study disease by performing a type of surgery called an autopsy and examining the tissues removed, and by observing surgically removed specimens under the microscope. Analysis of fluids taken from the body, such as blood or urine, also provides information about disease to the pathologist. Forensic pathology is the application of the principles of pathology, and of medicine in general, to the legal needs of society. Forensic pathologists perform autopsies to determine what caused a person's death. They are also involved in the investigation of the circumstances surrounding the death. Knowing about these

circumstances allows them to determine the manner of death natural, accident, suicide, homicide, or undetermined.

Although there is much emphasis on violent deaths (deaths due to homicide, accident, or suicide), forensic pathologists also investigate sudden deaths of apparently healthy individuals (those not currently being treated for a disease which could account for the sudden death), the death of someone who has never seen a doctor (unattended), deaths occurring in police custody, suspicious or unusual deaths, deaths that may be the result of surgical or diagnostic procedure which could be a therapeutic misadventure, or some deaths which occur in public institutions. **Scope of Work**

The forensic pathologist's involvement and investigation may include visiting the scene of death. Forensic pathologists and/or their investigators gather information concerning what happened at the time of death, what the person was doing at the time, and the medical history of the person.

The forensic examination of a body includes examining the clothing on the body, the body itself, and an internal examination of the organs, which is the autopsy.

Education and Training

All forensic pathologists are medical doctors (MD/DO). After four years of college and four years of medical school, a residency in pathology is required. Forensic pathology is a subspecialty of pathology, so an additional one or two-year fellowship specifically in forensic pathology must then be completed after college, medical school, internship, and pathology residency. Certification in pathology or one of its several subspecialties is acquired from The American Board of Pathology.

Other physicians with MD or DO degrees or scientists with a PhD degree in a biological-related field may also qualify for membership in the Pathology/Biology Section of the AAFS.

Career Opportunities

Forensic pathologists are usually employed by city, county or state medical examiners' offices, hospitals, and federal government agencies, such as the Center for Disease Control (CDC) and the Armed Forces Institute of Pathology (AFIP).

Physical Anthropology

Forensic anthropologists are also called to identify individuals killed in disasters such as plane crashes, explosions, fires, and other tragedies resulting in the loss of life and mutilation of bodies

Scope of Work

Physical anthropologists have a long tradition of the study of human skeletal remains from ancient societies. The techniques they have developed to determine sex, age ancestral background (race), health status, marks of trauma and occupational stress, and stature in life, also have proven extremely useful in forensic sciences. Forensic anthropologists are skilled in the identification of skeletal materials. In addition to their efforts to document age, sex, stature, race, and other characteristics of the specimens under investigation, they are familiar with various types of injuries and can work with forensic pathologists to establish cause of death. Many forensic anthropologists have training in archaeological methods and assist law enforcement agencies in the initial investigations of crime scenes.

Education and Training

Forensic anthropologists usually earn a PhD in anthropology with an emphasis on the study of human osteology and anatomy. The course of study will vary, but each person is broadly trained in physical or biological anthropology with an emphasis in skeletal biology. What sets forensic anthropologists apart from other physical anthropologists is their research emphasis on issues affecting contemporary human populations. It is necessary



to gain practical experience in forensic anthropology before court systems will accept an individual as an expert witness in the field.

The American Board of Forensic Anthropology (ABFA) was created for the purpose of certifying experts in the field of forensic anthropology as well as establishing a forum for all members of the section who perform forensic anthropology services. For Board certification, it is necessary to demonstrate practical experience as judged by case reports that are submitted for review. Also for Board certification, a PhD is required and a written and practical examination must be passed. Requirements for certification may be found at the ABFA website: www.csuchico.edu/anth/ABFA/

Career Opportunities

Forensic anthropology is practiced nearly everywhere there are skeletons to be examined. Traditionally, forensic anthropologists worked out of their laboratories at major research institutions or universities. The U.S. Government has recently hired forensic anthropologists at the U.S. Army-Central Human Identification Laboratory for repatriation issues. The Armed Forces Institute of Pathology - Office of the Armed Forces Medical Examiner employs a forensic anthropologist as a Deputy Chief Medical Examiner, and various state and local medical examiner offices use forensic anthropologists as medical investigators or administrators. Additionally, state and federal law enforcement agencies have hired physical anthropologists to act as special agents and laboratory personnel.

Education and Training

Students wishing to know more about this field should include in their training programs courses in **statistics, archaeological recovery methods, human anatomy, and skeletal biology.**



Psychiatry & Behavioral Forensic Science

A broad range of legal issues is addressed by forensic psychologists and psychiatrists as they work with criminal and civil cases and other areas such as family and domestic relations law. In criminal law, such issues as competence (e.g., competency to stand trial and to testify, to waive legal representation, or to be executed), and the assessment of mental illness as it relates to diminished responsibility or innocence by reason of mental illness or defect are the focus. Civil law requires assessment of such issues as involuntary psychiatric hospitalization, right to refuse treatment, competency to participate in do-not resuscitate decisions, and disability compensation among others. Issues in family and domestic relations may include juvenile delinquency, child custody, parental fitness, domestic abuse, adoption, and foster care.

Scope of Work

Given the scope of the practice, forensic psychiatrists and psychologists often spend a significant amount of time interfacing with lawyers and judges, and are trained in giving expert testimony.

of the confession that he made to police officers, his competence to cooperate with his attorney in his own

Education and Training

Psychiatrists are **medical doctors (MD)** who have completed twelve years of education between college, medical school, and residency training in psychiatry. Forensic psychiatrists also will have additional education and experience in areas relevant for law.

Some forensic psychiatrists take an additional one or two years of post-residency training in psychiatry-and-the-law. Others pursue a career of independent study and on-the-job training. The American Board of Psychiatry and Neurology certifies competence in forensic psychiatry of those specialists who have passed its special

examinations in forensic psychiatry. There is also the Accreditation Council on Fellowships in Forensic Psychiatry that certifies the quality of post-residency sub-specialty fellowship training programs.

Forensic psychologists major in **behavioral science** during their four years of college, complete an additional one to two years of training for a master's degree, and spend an additional four to six years in graduate school to obtain a PhD in psychology. Some psychologists take post-doctoral fellowship training in forensic psychology. Some psychologists have independently studied and obtained on-the-job-training in forensic psychology. These specialists then apply to the American Board of Professional Practice in Psychology for certification through examination in the specialty of forensic psychology.

Career Opportunities

Forensic psychiatrists and forensic psychologists may be employed in private practice, by city, county, and state government, by hospitals, and by the federal government. They work in a prison or state hospital setting for example, or have their own private practice serving as consultants to a broad range of organizations that may present with problems which interface with psychiatry, the behavioral sciences, and the law.



Questioned Documents

The document examiner discovers and proves the facts concerning documents and related material, such as ink, paper, toner from a copier or fax, and ribbons, such as from a typewriter. The bulk of the examiner's caseload rests upon answering questions such as:

Who wrote this?

Is this a true signature?

Has this document been altered?

Are there additions and/or erasures on this check?

Was this pen used to write this?

Tell me about this paper.

Scope of Work

A document examiner may also be requested to examine items on a document to establish the manufacturing source, similarities or differences, first production date, or date used (a most difficult task). This is done by using chemical and/or physical analysis. Items to be examined may include inks (writing, printing, stamp pad, ink jet and typewriter), toners, pencil marks, erasure residues, correction material, and paper. Most of these tasks require the use of a good collection of known standards to which to compare. Often a criminalist is called to assist.

Education and Training

Candidates for an apprenticeship program in questioned documents should possess a minimum of a bachelor's degree, preferably in one of the sciences. There are presently no degree programs with emphasis in forensic document examination available in the United States. Colleges and universities offer questioned document or related courses as part of criminal justice, forensic science, or criminalistics degree programs. An apprenticeship program lasting approximately two years under the direct supervision of a Full Member or Fellow of the Questioned Documents Section of the AAFS, or a member of the American Society of Questioned Document Examiners, or one who is a Diplomate of the American Board of Questioned Document Examiners, is required.

Career Opportunities

Forensic document examiners are employed in both the public and private sectors. Private practice consultants can be found in most major cities. Many large police organizations, as well as most state and federal law

enforcement agencies generally employ forensic document experts. Many qualified practitioners are members of the American Society of Questioned Examiners (www.asqde.org), Southeastern Association of Forensic Document Examiners (www.asqde.org/safde), and are certified by the American Board of Forensic Document Examiners (www.asqde.org/abfde.htm).



Forensic Toxicology

Toxicology is the study of harmful effects of chemicals or drugs on living systems. Forensic toxicology is that branch of toxicology that deals with the medico-legal aspects of toxicology. Forensic toxicologists answer the question, "Did prescription or illegal drugs and/or alcohol lead or contribute to the person's death or intoxication?" Answering this question often requires law enforcement officers, forensic pathologists, forensic toxicologists, other forensic scientists, and crime scene investigators to work together.

Scope of Work

There are several areas of specialization within the field, which offer a variety of career paths. One, postmortem toxicology, involves the determination of the contribution of drugs or other chemicals to the circumstances of the death. The forensic toxicology laboratory contributes a critical perspective to a death investigation, working with a forensic pathologist, and scene investigators, to determine which drug analyses or poisons are involved qualitative and quantitative methods of analysis. Other forensic toxicologists work with law enforcement agencies in the investigation of crimes in which an individual's drug or alcohol use is an element of the crime or may be a defense. Forensic toxicology testing also contributes in other areas, as varied as wildlife crimes involving the poisoning of animals, the use of drugs to facilitate sexual assault, and drug use and doping in human and animal sports. In all of the aspects of forensic toxicology, the interpretation of the results is a consistent challenge. The results obtained are determined by tests that are complex and difficult for most juries and lawyers to fully understand and appreciate. Therefore, the toxicologist must have or develop the ability to describe the process involved, the findings determined, and the relevant interpretation derived in a straightforward and easily understood manner.

Education and Training

A bachelor's degree in a **physical science** including a solid background in **chemistry** and coursework in pharmacology is an ideal mix of educational qualifications for a toxicologist. There are some graduate programs offering coursework in forensic toxicology to the master's or PhD level (www.aafs.org/Education/schools1.htm).

Many enter toxicology after working in or pursuing education in other areas such as medicinal chemistry, pharmacology, pharmacokinetics, or clinical chemistry. Membership in the section requires at least one year of additional experience and work which meets other requirements of scholarly production or advanced study. The American Board of Forensic Toxicology and the Forensic Toxicology Certification Board offer professional certification to scientists with work experience in forensic toxicology.

Career Opportunities

This is an exciting field in which to interact with other professionals and to work with different types of cases. Forensic toxicologists work in police or law enforcement laboratories, medical examiner laboratories, and workplace drug testing laboratories. Other career opportunities exist in hospitals, universities and industry laboratories, and with agencies which monitor drug use in sports.

The Society of Forensic Toxicology (www.soft-tox.org) is a leading professional society for toxicologists in the United States. They maintain internet links to most major professional societies and toxicologist Certification

Boards. The International Association of Forensic Toxicologists (www.tiaft.org) is another excellent source of international reference materials. These websites provide many additional details concerning career opportunities in the field of toxicology.

Resource List

AOAC International: www.aoac.org

American Academy of Forensic Psychology: www.abfp.com

American Academy of Forensic Sciences: www.aafs.org

American Board of Forensic Anthropology: www.csuchico.edu./anth/ABFA

American Board of Criminalistics: www.criminalistics.com/ABC

American Board of Forensic Document Examiners, Inc.: www.asqde.org/abfde.htm

American Board of Forensic Odontology: www.abfo.org

American Board of Forensic Psychology: www.abfp.com

American Board of Forensic Toxicology: www.abft.org

American Society of Crime Lab Directors: www.asclld.org

American Society of Crime Lab Directors/Laboratory Accreditation Board: www.asclld.org/lab

American Society of Forensic Odontology: www.asfo.org

American Society of Psychiatry and the Law: www.cc.emory.edu/AAPL.org.htm

American Society of Questioned Document Examiners: www.asqde.org

California Association of Criminalistics: www.Cal-tox.org

Forensic DNA: www.forensicdna.com

National Association of Medical Examiners: www.thename.org

Society of Forensic Toxicologists: www.soft-tox.org

Young Forensic Scientists Forum: www.aafs.org/yfsf/index.html

For more forensic links, go to www.aafs.org/links1.htm