FORENSIC EVIDENCE

Evidence may be microscopic, such as DNA or a tiny particle of skin, or it may be as large as a motor vehicle left behind at the scene. It could be as subtle as an unlocked window and whatever the implications of that are. Or it could be as obvious as a blood-covered knife lying next to a body.

Forensic evidence provides the largest arena in which forensic scientists, also known as criminalists, can show their expertise. Because of the wide range of evidence, criminalists and forensic scientists often specialize in a particular area or two. However, some specialists, especially those working in labs, must master more than one area.

But all, no matter what the specialty, must be able to examine, analyze, identify, and interpret a range of physical evidence. They must be able to apply the techniques of the physical and natural sciences while examining evidence, with the end goal to prove the existence of a crime or connect suspects to the crime. They also must often present their findings in a court of law. The information the forensic scientist collects is provided to investigators, attorneys, judges, or juries.

One of the most important tasks facing the criminalist is to be able to interpret the results of findings to determine the circumstances at the time a crime occurred, or perhaps to support a statement made by a witness.

Reconstructing the events of a crime is often very difficult. Forensic scientists use scientific methods, physical evidence, and deductive and inductive reasoning to gain knowledge of the events that surround the commission of a crime.

To reconstruct a crime or crime scene requires an understanding of human behavior and the physical laws and processes involved.

Any findings must be conveyed to the other elements of the criminal justice system. This is usually done by written reports or expert testimony. The criminalist must express conclusions so that technical details are understood by the court and the jury.

SPECIALIZATIONS

A variety of criminalists and forensic scientists study the scene of the crime to gather information and evidence.

- A chip of paint from a car is found on the clothes of the victim of a hit-and-run. The paint is analyzed and the make of car is now known.
- Skin particles are found under the fingernails of an assault victim. Its DNA is analyzed and is matched to the DNA of a suspect.
- A bullet fired into a homicide victim is shown not to come from a gun a suspect owns.
- A blood spatter pattern appears confusing. What are those tiny marks along the floor, wall, and ceiling? A forensic entomologist proves how insects disturbed the crime scene.

These are just a few examples of how forensic scientists help prove how a crime did-or didn't-happen.

They study hair, fibers, blood and seminal stains, alcohol, drugs, paint, glass, botanicals, soil, flammable gases, and insulating material. They must be able to restore smears or smudged markings. They must be able to identify or compare firearms and bullets. They must be able to identify tool markings and shoeprints.

In this chapter we will examine more fully the areas of forensic photography and image enhancement, questioned documents/handwriting examination, toxicology and drug analysis, and trace evidence (hair, paint, fibers).
Forensic Photography and Image Enhancement

Forensic photographers are generally employed by police departments, coroners, sheriff's offices, and related law enforcement agencies. Their primary duty is to photograph evidence and document crime scenes, and operate the photo lab and darkroom.

Some law enforcement agencies have changed the job title from forensic photographer to titles such as imaging specialists or digital image enhancement specialists because they work with both traditional photography and digital technologies.

Digital technology originated in the 1970s and came into serious forensics use in the 1990s. It is now being used by police agencies, as well as district attorneys and defense attorneys.

Digital imaging can be used to enhance a fingerprint or videotape, an X-ray, or an audio tape. Digital imaging firms, such as Imaging Forensics (see the owner's firsthand account later in this chapter) also use digital imaging technology to create dynamic courtroom presentations.

They, similar firms, and some forensic science programs offer training in digital imaging. Many police agencies that employ forensic photographers provide on-the-job training.

Questioned Documents

Document examiners answer questions regarding authorship, authenticity, alterations, additions, and erasures to documents such as wills, contracts, anonymous notes, deeds, medical records, income tax records, time sheets, contracts, loan agreements, election petitions, checks, and other documents.

They also deal with handwriting, typewriting, the authenticity of signatures, photocopying processes, writing instruments, sequence of writing, and other elements of a document in relation to its authenticity or spuriousness.

A document examiner also may be called on to determine the significance of inks, paper, writing instruments, business machines, and other features of documents.

After forensic document examiners perform their analysis, they prepare a report of their findings. The examiner also must often go to court and testify as an expert witness.

Questioned document courses are offered as part of criminal justice, police science, or forensic science college-level programs.

Some forensic document examiners are trained on the job or have a job that sponsors their training. Trainees need a bachelor's degree. The training covers a two-year apprenticeship under the supervision of a court-qualified examiner. A trainee studies the leading texts pertaining to questioned documents, performs supervised casework, prepares court exhibits, and conducts independent research.

Document examiners are employed by large police departments as well as most state and federal law enforcement agencies.

Some of the well-known agencies include: the Federal Bureau of Investigation; the Royal Canadian Mounted Police; the United States Secret Service; the United States Immigration and Naturalization Service; the United States Postal Inspection Service; the Internal Revenue Service; Revenue Canada-Customs, Excise, and Taxation; and the United States Army Crime Laboratory.

Some examiners work privately and can be found in most major cities.

Many qualified examiners are members of the American Academy of Forensic Sciences, the American Society of Questioned Document Examiners, and are certified by the American Board of Forensic Document Examiners. The American Board of Forensic Document

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continued on back
Examiners, and are certified by the American Board of Forensic Document Examiners. The American Board of Forensic Document Examiners is the only certifying body, although there are other organizations with similar sounding names.

The board aims to safeguard the public interest by ensuring that anyone who claims to be a specialist in forensic document examination does, in fact, possess the necessary skills and qualifications.

At the time of application for certification, applicants must be engaged in the full-time practice of forensic document examination. (Exceptions are evaluated on an individual basis.)

Applicants also must take comprehensive written, practical, and oral examinations that are based on a wide range of problems frequently encountered in document examination.

For more details about qualifying for certification contact the American Board of Forensic Document Examiners (ABFDE). Their address and website are provided in Appendix A.

Toxicology and Drug Analysis

Toxicology is the study of the harmful effects of chemicals, drugs, or poisons on living systems. Toxicologists pay particular attention to the conditions under which the harmful effects occur.

Forensic toxicology refers to the interpretation of findings as they apply to the law. Findings often are used in a court of law to assist the judge or jury in making a decision.

There are three additional definitions for forensic toxicology: human-performance forensic toxicology, postmortem forensic toxicology, and forensic urine drug testing.

Human-performance forensic toxicology determines the presence or absence of ethanol and other drugs and chemicals in blood, breath, or other appropriate specimen(s) and evaluates their role in modifying human performance or behavior. This would be used, for example, to determine if someone was driving while intoxicated.

Postmortem forensic toxicology determines the presence or absence of drugs and their metabolites, chemicals such as ethanol and other volatile substances, carbon monoxide and other gases, metals, and other toxic chemicals in human fluids and tissues, and evaluates their role as a determinant or contributory factor in the cause and manner of death.

Forensic urine drug testing determines the presence or absence of drugs and their metabolites in urine to demonstrate prior use or abuse. With the sophistication of medicine and the recreational uses of drugs and alcohol, the role of toxicologists is very important. They are often asked to work with emergency room staff to determine the cause of a coma, for example. They assist law enforcement officers to determine the cause of unsafe driving. Or they assist a medical examiner to determine the cause of death. To complete their tasks, toxicologists often must work with only a small sample of blood, urine, or stomach contents. Interpretation of the results often requires the joint effort of doctors, coroners, and forensic scientists.

As with other specialties, training comes from extensive study in B.A. forensic science or criminalists programs, B.A. chemistry programs and to some extent on-the-job training.

Trace and DNA Evidence

Trace evidence refers to hair, fiber, paint/polymer, and glass, and could include gunshot residue. Trace and DNA evidence experts must have a bachelor's degree in chemistry, forensic science, biology, or biochemistry. Trace evidence experts also must be familiar with the use of specialized equipment, including a variety of microscopes. They must know the proper collection (from the bodies of victims of violent crimes, from crime scenes, and from accidents), examination, and documentation procedures of trace evidence samples.
To become a Fellow of the American Board of Criminalists (ABC) in the trace evidence specialty, it is necessary to successfully complete the Trace Evidence Specialty Examination and proficiency tests.

The Trace Evidence Specialty Examination consists of three modules: a core module all applicants must pass, and a module covering fiber/hair and paint/polymer, one of which must be successfully completed at the same time as the core module.

Information for each of the trace evidence modules is available at the ABC website, provided in Appendix A.

CREDENTIALS FOR CRIMINALISTS

The American Board of Criminalists (www.criminalistics.com/ABC/abchome.htm) has a certification program that includes a general knowledge exam and several other specialty exams. Currently these specialty exams are offered in the fields of forensic biology, drug analysis, fire debris analysis, and trace evidence examination.

The process leading to the designation of Diploma calls for successful completion of the general knowledge examination and continuing education. A prerequisite for this award is work experience and a bachelor's degree (in a natural or other appropriate science).

SAMPLE JOBS

The following sample job advertisements will give you an idea of the qualifications needed, the responsibilities, and the salary levels different job titles offer.

Because these listings are provided as a sample only, the employers advertising for workers are not designated. An Internet search will reveal current listings. Use keywords such as "forensics," "jobs," "careers," and "criminalists."

Latent Fingerprint Examiner

The Police Department is seeking applicants for the position of Latent Fingerprint Examiner. Qualifications include a bachelor's degree and one year of experience in fingerprint identification. Additional work experience in fingerprint identification may substitute for the required education on a year-for-year basis. An additional 5 percent pay supplement is available for IAI Latent Certification.

Responsibilities include comparing and evaluating latent finger-prints, processing physical evidence for latent fingerprints, testifying in court regarding physical and latent comparisons, and utilizing the Automated Fingerprint Identification System (AFIS). Salary: $42,272-$70,887.

The City Police Department is seeking applicants for the position of Latent Print Examiner. Qualifications include a bachelor's degree in criminalistics, chemistry, biology, physics, or a related science from an accredited college or university; two years of experience examining and identifying latent fingerprints; and certification as a Latent Print Examiner by the Latent Print Certification Board of the International Association for Identification—or an equivalent combination of relevant education and experience in examining and identifying latent fingerprints. Salary: $38,093-$46,597.

Chemist

County is seeking applicants for the position of GC/MS Chemist. Qualifications include education and experience equivalent to a bachelor's degree in a job-related field of study and three years of additional experience.

Responsibilities include applying scientific principles and using special instrumentation, particularly gas chromatography-mass spectrometry, to quantitatively and qualitatively analyze materials for the presence of controlled substances, other drugs, metabolites,
spectrometry, to quantitatively and qualitatively analyze materials for the presence of controlled substances, other drugs, metabolites, poisons, environmental pollutants, and other substances, testifying in legal proceedings, performing method development and analysis of non-routine or complex samples, leading the installation and training for new equipment, guiding implementation of new/revised methodology, performing more complex instrument troubleshooting and repair; and performing oversight of environmental, health, and safety issues. The chemist must meet the duties and responsibilities of a Drug Chemist II and/or Toxicology Chemist II. Successful applicant must pass a criminal background check. Salary: $35,652-$42,780.

Firearms Examiner

County is seeking applicants for the position of Firearms Examiner. Qualifications include education and experience equivalent to a bachelor's degree in a job-related field of study and one year of related experience. Responsibilities include conducting a variety of independent physical and microscopic analyses, classifications, and identifications on all types of tool marks, firearms, ammunition, and other types of physical evidence; interpreting analytical results and preparing written opinion reports regarding findings; and testifying in legal proceedings regarding testing methods, results, and validity of testing protocols, Salary commensurate with experience.

Forensic Scientist

The Forensic Services Division, a division of the Department of State Police, is seeking applicants to fill vacant Forensic Scientist positions in various laboratory locations throughout the state. Qualifications include a bachelor's degree in a natural/physical science and two years of experience independently performing analytical forensic laboratory procedures in a criminal justice agency without case-by-case supervision. Responsibilities include performing complex laboratory analyses on physical evidence, devising analytical approaches to casework that may include problematic research and/or generation or modification of methods, interpreting analytical results, preparing written reports, and testifying as an expert witness in courts of law. Salary: $39,000-$57,492.

Forensic Technologist, Trace Evidence Section

The Police Crime Laboratory Unit is seeking applicants for the position of Forensic Technologist, Trace Evidence Section. Qualifications include a bachelor's degree in chemistry, forensic science, biology, or biochemistry and one year of laboratory experience or relevant experience as an intern in a forensic laboratory. A master's degree in forensic science may be substituted for experience.

Responsibilities include the maintenance and calibration of equipment in the trace evidence section, including a variety of microscopes, SEM, FTIR; the proper preparation of standards, reference libraries, and samples; and the proper collection, examination and documentation of trace evidence samples. Salary: $32,700.

The County Coroner's Office is seeking applicants for the position of Forensic Scientist in the DNA/Trace Evidence Department. Qualifications include a bachelor's degree, or higher, in chemistry, biology, or forensic science. Experience working in a crime laboratory is preferred. The ideal candidate for this position will possess experience with DQ Alpha/Polymarker STR, SEM/EDX, FT-IR, AA, ICP, polarized light microscopy, proper evidence collection techniques, and knowledge of crime scene evidence collection.

Responsibilities include the collection and analysis of DNA evidence and trace evidence such as hairs, fibers, paint, glass, and GSR; the collection of evidence from the bodies of victims of violent crimes; the examination of vehicles; and crime scene evidence collection.

Trace Analyst

The County Police Department, Forensic Services Section, is seeking applicants for the position of Trace Analyst. Qualifications include graduation from an accredited college or university with a bachelor's degree in chemistry, biology, or a related field that includes at least twenty-four semester hours in either chemistry or biology, plus two years' experience in the scientific evaluation of physical evidence, including testifying in criminal court as an expert witness.

Responsibilities include examining and analyzing physical evidence such as fibers, paint, glass, arson, and gunshot residue. Salary:
Responsibilities include examining and analyzing physical evidence such as fibers, paint, glass, arson, and gunshot residue. Salary: $38,872-$48,418.

Criminalist

The Police Crime Laboratory Unit is seeking applicants for the position of Criminalist. Qualifications include a bachelor's degree in chemistry, forensic science, biology, or biochemistry and two years of experience in general criminalistics. A master's degree in criminalistics may be substituted for one year only of experience. Court experience is desirable. Responsibilities include routine analytical and experimental work in the crime laboratory; preparing reports and findings; participating in the search and collection of physical evidence, including crime scene processing; and testifying in court as required. Salary: $39,100.

Criminalist

The County Department of the Coroner is seeking applicants for the position of Criminalist. Qualifications include a bachelor's degree from an accredited college with specialization in criminalistics, chemistry, biochemistry, or a closely related scientific field that includes completion of one full year of college-level general chemistry and completion of a college-level course in quantitative analysis. A master's degree or higher in chemistry, biochemistry, or a closely related scientific field from an accredited college is highly desirable.

Under close supervision, guidance, and direction by either a senior or supervising criminalist and while participating in on-the-job training, responsibilities will include performing physical and chemical analysis of evidentiary materials such as blood, narcotics, drugs, hairs, fibers, metals, tool marks, and bodily fluids, utilizing microscopic techniques and/or comparison macro photography, chromatography, spectrography, and/or physical, analytical, and comparison techniques; participating in the preparation of written findings and displays for court presentation; testifying in court concerning findings as established by the laboratory analysis; and examining crime scenes to collect, interpret, and preserve physical evidence for analysis and evaluation. Incumbents receive work of a progressively responsible nature and of broadening scope as capabilities develop and complete comprehension with all phases of laboratory analysis is gained. Salary: $43,713-$54,248.

Criminalist I/II

The County Sheriff's Office Forensic Laboratory is seeking applicants for the position of Criminalist I/II. Qualifications include advanced knowledge of general criminalistics to contribute in the laboratory's multidisciplinary environment. The ideal candidate also will have experience in the collection, analysis, and evaluation of physiological fluids and other physical evidence gathered from crime scenes and will be able to participate in the laboratory's on-call, crime scene rotation schedule. Salary: Criminalist I: $46,572-$58,224. Criminalist II: $58,032-$72,540.

Criminalist II

The County of is seeking applicants for the position of Criminalist II. Qualifications include a bachelor's degree from a U.S. accredited college or university, or certified equivalency for foreign studies in chemistry, biology, or a closely related field, with completed course work consisting of at least eight semester/twelve quarter units of general chemistry and three semester/four quarter units of quantitative analysis; three years of comparable, full-time experience conducting a variety of forensic examinations including the explanation and presentation of laboratory tests in a court of law as an expert witness; and proficiency in two of the following areas: analysis of solid dose narcotics and dangerous drugs; analysis of alcohol content of blood and urine in forensic samples; analysis of blood or body fluids for genetic characterization; analysis of trace evidence; analysis of blood, urine, or other materials for drugs and poisons; processing of crime scenes for physical evidence; and firearms and tool marks examination, or three years of experience as a Criminalist I.

Employees are expected to provide their own transportation (reimbursed) for travel and pass a thorough background investigation, which includes a truth verification interview. Work schedule will include irregular hours, weekends, holidays, or evenings. There will be exposure to disease and hazardous materials in the handling and analysis of evidence.

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Responsibilities include performing work involved in the collection, preservation, analysis, and interpretation of physical evidence relevant to law enforcement investigations; and providing expert witness testimony regarding the results of chemical and biological tests concerning case sample analysis. Salary: $60,070-$73,008.

Forensic DNA Analyst

A private laboratory is seeking applicants for the position of Forensic DNA Analyst. Qualifications include a bachelor's degree in biology, genetics, biochemistry, molecular biology, or forensic science. Classes in bio-statistics and or population genetic is an added advantage. Prior experience using the Applied Bio-systems 310 or 377 for analysis of the CODIS 13 core loci or for DNA sequencing is highly desirable.

Responsibilities include performing DNA testing on forensic casework samples.

Forensic DNA Analyst (Casework Manager)

The Health & Social Services, Office of the Chief Medical Examiner DNA Unit, is seeking applicants for the position of Forensic DNA Analyst (Casework Manager). Qualifications include at a minimum a B.A./B.S. degree or its equivalent degree in biology, chemistry, or forensic science; successful completion of college course work covering the subject areas of biochemistry, genetics, and molecular biology; and completion of course work or training covering statistics and population genetics as it applies to forensic DNA analysis. An advanced degree and testimony experience are preferred but not required.

Responsibilities include coordinating the forensic DNA caseload for the state and processing these cases using the Promega PowerPlex 16 STR system on the ABI 310 Genetic Analyzer. Primary duties include case inventory, photo documentation, serological preliminary analysis, DNA extraction, DNA amplification, STR analysis, report writing, and courtroom testimony.

Forensic DNA Examiner/Analyst

Private laboratory is seeking applicants for the position of Forensic DNA Examiner/Analyst. Qualifications include a B.S. degree plus five years experience, or an M.S. degree plus three years experience, or a Ph.D. degree plus two years experience. Degree should be in biology, chemistry, or a forensic science-related area, and applicant must have successfully completed college course work covering the subject areas of biochemistry, genetics, and molecular biology or other subjects that provide a basic understanding of the foundation of forensic DNA analysis, as well as course work and/or training in statistics and population genetics as it applies to forensic DNA analysis. Applicants also must have a minimum of six months of forensic serology and DNA laboratory experience, including the successful analysis of a range of samples typically encountered in forensic casework prior to independent casework analysis using DNA technology.

Responsibilities include the performance of forensic serological testing, trace evidence analysis, and the isolation, amplification, and typing of DNA in forensic casework biological samples. This person is responsible for specimen processing, test performance, and reporting of test results.

Forensic Drug Analyst Associate

The Department of Public Safety is seeking applicants for the position of Forensic Drug Analyst Associate. Qualifications include a bachelor's degree in a natural science, criminalistics, or a closely related field.

Responsibilities include the analysis of controlled substances and testifying in court as an expert witness. Salary: $27,044.

Forensic Chemist I (Drug Chemist)

The County Police Department is seeking applicants for the position of Forensic Chemist I (Drug Chemist). Qualifications include
The County Police Department is seeking applicants for the position of Forensic Chemist I (Drug Chemist). Qualifications include graduation from an accredited four-year college or university with major course work in chemistry and one year or more technical experience in analytical chemistry.

Responsibilities include analyzing and identifying controlled dangerous substances, utilizing modern analytical techniques and instrumentation as necessary, preparing analytical reports, and testifying in court as an expert witness. Preference will be given to applicants who have experience in the analysis and identification of controlled dangerous substances, who have forensic chemist certification from the State Department of Health and Mental Hygiene (or comparable certification from another state or the American Board of Criminalistics), and who have successfully presented and defended expert witness testimony in court. Salary: $34,395-$51,900.

Forensic Consultant-Firearms Analysis Section

The City Police Department is soliciting proposals for the services of a Forensic Consultant for the Firearms Analysis Section of the Police Laboratory. The primary duties and responsibilities of the consultant will be (1) to provide comprehensive training in both firearms operability examination and in forensic microscopy; (2) to create and administer competency and proficiency tests for each discipline; (3) to create and administer a program to train examiners in moot court sessions; and (4) to process cases and conduct operability and microscopy examinations when needed.

Firearms/Tool Mark Examiner

The State Police Crime Laboratory is seeking applicants for the position of Firearms/Tool mark Examiner. There is a full-time position available as well as a contractual position, which may be full-or part-time. Qualifications include experience in firearms/tool mark examination work, two of which must have been as a court-recognized expert. A college degree is not required, but preferred.

Responsibilities include analyzing and comparing firearms and tool mark evidence, preparing written reports, and testifying in court as a forensic expert. Salary: $36,765-$54,963.

Forensic Document Examiner

A government laboratory is looking for an experienced Questioned Document Analyst. The GS-1397-13 level position is for a senior examiner with considerable experience as a forensic document examiner. Board Certification by the ABFDE will be necessary for consideration at the GS-13 level. Salary: $60,818-$79,063.

The GS-1397-11/12 level position will be available if fully qualified candidates cannot be found at the senior examiner (GS-13) level. Although certification is not required at this level, significant laboratory experience as a working document examiner is necessary. This is not an entry-level position. Salary for a GS-11 is $42,673 to $55,474 per year. Salary for a GS-12 is $51,144 to $66,488 per year.

FIRSTHAND ACCOUNTS Sandra Ramsey Lines, Forensic Document Examiner

A former government examiner, Sandra Ramsey Lines is now in private practice based in Arizona. Her clients come from all over the country.

She earned an A.A. in criminal justice from Scottsdale Community College and her B.A. in management from the University of Phoenix.

She began her career with a two-year internship with the Arizona Department of Public Safety in 1991 and has been working in the field since then.

GETTING STARTED

*In the late 70s, while I was employed as a police officer/detective with the Cleveland Police Department in Ohio, I was in charge of a
complicated investigation involving fraudulent checks. The city was in 'default' at the time and did not have the money to pay the
document examiner who was on contract with the city. I learned of a relatively new examiner with another county laboratory. I was so
impressed with him and his work that I wanted to enter the field. Al though I did not have a degree at the time, he offered to train two
Cleveland police officers in a two-year program. I put through a proposal with the department, but it was not acted upon at that time.
Although I loved my work as a law enforcement officer, I never lost my interest in questioned document work, so when the opportunity
came along years later in Arizona, I ran with it.

"While employed as a special agent with the attorney general's office of Arizona, I was privileged to work with an assistant attorney
general who (along with me) recognized the need for more qualified document examiners. Together we were able to obtain a federal
grant to pay my salary while I was in training. In addition we were fortunate enough to find a wonderful mentor with the state laboratory
who agreed to conduct the training. It took a few years, though, for the approval process to come together and the training to begin.

"In 1996 a different attorney general made a political decision to shut down the questioned document laboratory I had established. This
laboratory was 75 percent federally funded and served the Medicaid fraud units throughout the United States. I had a choice: Should I
remain as a special agent with the agency and give up four difficult years of training, research, and certification preparation, or go with
another agency. I retired as an Arizona law enforcement officer and became a senior forensic document examiner with the Bureau of
Alcohol, Tobacco and Firearms in Walnut Creek, California. When I married two years ago, I moved back to Arizona and started a private
practice."

WHAT THE WORK IS LIKE

"A forensic document examiner conducts the examination of questioned documents. We analyze and compare questioned handwriting,
hand-printing, typewriting, commercial printing, photocopies, papers, inks, and other documentary evidence with known materials to
establish the authenticity of the contested (or questioned) material, as well as the detection of alterations.

'The examiner helps lawyers and the court by examining and offering written opinions on a variety of disputed document problems
including: wills, deeds, medical records, income tax records, time sheets, contracts, loan agreements, election petitions, checks, and
anonymous letters to determine identity, source, authenticity, alterations, additions, deletions, or other germane issues. In addition, a
forensic document examiner (FDE) must give expert testimony and be prepared to demonstrate/support his or her findings to a court of
law or regulatory body.

'To be recognized as a candidate for certification by the American Board of Forensic Document Examiners (ABFDE), the only board
recognized by the American Academy of Forensic Sciences and the American Society of Questioned Document Examiners, one must
possess a minimum of a bachelor's degree and successfully complete a minimum two-year, full-time training program in a qualified
laboratory or with a qualified forensic document examiner (FDE) recognized by the board.

"For me the work is never boring. Each case is unique and presents its own challenges. There is no typical case. One day you can be
working on a disputed will involving the possibility of forged signatures, typewriting identification, and paper insertions. The next day it
may be an anonymous note or notes involving a computer-generated document.

"When I examine questioned documents, my findings may be responsible for sending someone to prison or helping someone to prove
their innocence. Therefore, I keep abreast of the latest research and work in my field, generally through continuing education. I conduct
independent research, publish in respected scientific journals, and remain active as a member in professional organizations.

"One downside of the FDE's work in public or private practice is dealing with the attorneys who have hired (knowingly or unknowingly)
nonqualified individuals who represent themselves as FDEs. Oftentimes these nonqualified individuals received their training as
graphologists (nonscientific reading of one's personality from their handwriting). Some 'FDEs' purport to be 'certified' by a board with a
name similar to the American Board of Forensic Document Examiners. Their 'board' does not utilize the more stringent qualifications or
testing requirements of the ABFDE. It can sometimes be difficult to explain these differences in an inoffensive manner to a lay jury.
A qualified FDE must make every effort to be impartial and avoid mistakes. A serious error can cost you your reputation and credibility in court.

"Discovering evidence that can lead to a definitive conclusion brings me a feeling of satisfaction and a job well-done. However, all cases do not have definitive conclusions, and sometimes I have to say I don’t know. I must know my limitations and be prepared to consult colleagues with more experience or expertise in certain areas.

"In private practice the FDE must invest considerable sums in obtaining the proper equipment to conduct examinations. They must establish good credentials and a reputation for honesty with their clients. My findings may not be what a client hopes for, but I must be willing to give the good with the bad."

**SALARIES**

"An FDE in government practice can earn $20,000 to $80,000 a year, depending on their agency and credentials. In private practice, FDEs charge anywhere from $75 an hour to $250 an hour, again depending on their location and what the market will bear or what their credentials are.

"In private practice the downside may be in getting paid by the clients. Most examiners require a retainer prior to conducting examinations. Days may go by without any work, or all of a sudden you could be inundated with cases, creating a backlog. The private examiner must be prepared for either eventuality."

**ADVICE FROM SANDRA RAMSEY LINES**

"It is very difficult to obtain training as an FDE from a qualified examiner or accredited laboratory. My suggestion for anyone interested in this field is to obtain a forensic science degree and then apply for any position in a government laboratory. From there you have the opportunity to meet a qualified examiner and possibly obtain training, assuming you have the aptitude and patience for this very interesting discipline."

George Reis, Forensic Digital Imaging Consultant

George Reis is the owner of Imaging Forensics, a digital imaging firm, in Fountain Valley, California. He started out as a forensic photographer and has been working in the field since 1989.

**GETTING STARTED**

"I have always been a photographer, with experience as a photojournalist and in advertising photography. I chose the field of forensic photography purely by accident. I owned a commercial photography business that was struggling, and I decided to find a job in photography rather than continue the struggle. I looked for jobs in the newspapers' classifieds, saw a listing for a photographer with the Newport Beach Police Department, and decided to apply. I never had an interest in this type of photography or in police work in general. I thought that if I did get the job it would only be temporary. Instead, it proved to be an incredible opportunity and resulted in my consulting/training business that has been very successful. I started my consulting business because there was a strong need for someone to help other police agencies take advantage of digital imaging technology.

"After working as a forensic photographer for a couple of years, I realized that many aspects of the job could be done better with digital imaging technology. I introduced these concepts to the agency where I was working and began sharing this with other agencies. Seeing these agencies often getting bad advice from vendors, I realized there was a need for a consulting business, which I started in 1995.

"Since starting in the field of forensic photography and identification in 1989, I have taken numerous courses offered through law
"Since starting in the field of forensic photography and identification in 1989, I have taken numerous courses offered through law enforcement and forensics-based organizations. These include classes in fingerprint identification methods, crime scene investigation, and attendance at educational conferences through the International Association for Identification (IAI), Evidence Photographers International Council (EPIC), American Academy of Forensic Science (AAFS), and others.

"I would say that six or eight of us were the early users of digital technology, and I and others developed many of the techniques used for digital image processing, including enhancement and analysis."

WHAT THE WORK IS LIKE

"Forensic digital imaging is the legal use of photographs and images for documentation or analysis of crime scenes, evidence, or accident scenes. My job is unique in that I am a business owner working directly with police agencies, investigative firms, and attorneys on casework. As a digital imaging consultant, my business works in three areas. The first is consulting: helping police and investigative agencies incorporate the use of digital imaging equipment. This includes recommending equipment, writing protocols, and configuring and installing equipment.

"Next is training: teaching forensic personnel how to use the hardware and software for digital imaging, as well as the legal requirements and digital technology theory.

"The third is enhancement and analysis services: providing these services to agencies and businesses that may not have the expertise or equipment to do it themselves. This provides me with a lot of variations in my day-to-day job.

"Sometimes I'll travel across the country to teach a workshop in digital imaging or to consult with an agency on how they can implement digital imaging. Other times I am enhancing videotapes or negatives to try to get the most information from these images.

"As an example, I was given a videotape of a burglary in which the two suspects pulled up to a closed convenience store in a commercial truck, broke the glass in the front door, entered through the broken glass, stole merchandise, and then exited with the goods. By enhancing the frames of the video that showed their truck through the store window, we were able to positively identify the unique numbering on the cab of the truck. This led to an arrest, which then led to an identification and conviction of the two suspects.

"My work varies from day to day and is almost always fun. However, as a business owner, I also have to keep track of all business paperwork and tax information and spend time on promoting the business."

THE UPSIDES AND DOWNSIDES

"The most exciting aspect of my work is seeing the excitement that others get from this. For instance, when I provide training, an officer may skip lunch to continue working on a project or want to discuss digital imaging over dinner. Another fulfilling aspect is when a DA or attorney tells me that my work made a significant difference in the case.

"The most difficult part is traveling when I don't want to."

SALARIES

"A forensic photographer earns from about 25 percent less than a police officer to about 10 percent more. This depends on the agency and whether there is a senior or supervisory position available. My income, as a business owner, is based on the amount of work I do. If I am busy (which I usually am) I make more than a forensic photographer."

ADVICE FROM GEORGE REIS

"Get experience anywhere and everywhere you can. Volunteer at your local police department. Study photography, learn software..."
Get experience anywhere and everywhere you can. Volunteer at your local police department. Study photography, learn software applications, and learn about signal processing (if digital imaging analysis is your interest). Join organizations such as the LAI and EPIC. Attend conferences and meetings of these organizations. Ask questions, meet people, and work hard."