In previous chapters we have encountered some of the many disciplines within forensic science—pathology, toxicology, anthropology, archaeology, and entomology, to name a few. However, the profession of forensic science encompasses an even wider range of activities, with work taking place in the field, the laboratory, and the courtroom. In this chapter, we will explore some of the various careers within forensic science and discuss the kind of training necessary to pursue each.

**Disciplines in Forensic Science**

The wide variety of activities comprising forensic science is reflected in the structure of the American Academy of Forensic Sciences (AAFS), the largest forensic science organization in the world. Each of the five-thousand scientists who are members of the AAFS belongs to one of the academy’s ten divisions: Criminalistics, Engineering Sciences, General, Jurisprudence, Odontology, Pathology/Biology, Physical Anthropology, Psychiatry & Behavioral Science, Questioned Documents, and Toxicology.

**Criminalistics**

As we have seen throughout this text, the criminalist works primarily with physical evidence—analyzing, comparing, identifying, and interpreting items that may help solve a crime. The criminalist applies techniques from the physical and natural sciences to the examination of physical evidence. However, examining, testing, and interpreting results are only part of the responsibilities of the criminalist. He or she must also effectively communicate technical details and scientific findings to nonspecialist members of the law enforcement community.

The extent and depth of versatility expected of the forensic scientist are usually determined by the size of the crime laboratory’s staff. Scientists in smaller laboratories are often expected to be generalists, performing a wide variety of tasks in order to fulfill the varied objectives of the laboratory. Their counterparts in larger facilities enjoy the luxury of working in specialized areas, relying on a teamwork approach to provide the spectrum of scientific skills needed for the comparison or identification of physical evidence. Currently there is a huge demand for forensic DNA analysts. Generally these positions require a graduate degree in biochemistry or forensic science.

In addition to his or her technical responsibilities, the newly trained criminalist must discover and master the role of the expert witness. A good courtroom demeanor and the ability to communicate thoughts and ideas in clear, concise terms are absolutely essential if the scientist’s examination and conclusions are to be properly and effectively presented at a hearing or in court.

**Education and Training**

The minimum educational requirement is a bachelor’s degree in a science such as chemistry, biology, physics, or molecular biology. Coursework must include mathematics, chemistry, and/or biology. Many government criminalist positions have either local or national civil service educational and work experience requirements. Interested job applicants should inquire with appropriate civil service authorities to determine these requirements for a particular jurisdiction. The criminalist also participates in continuing education courses throughout his or her career to remain current with the ever-changing technology and procedures in the
field. The American Board of Criminalistics (www.criminalistics.com/ABC) offers certification for trained criminalists who pass a rigorous examination.

**Career Opportunities** Criminalists work in a wide array of settings, including forensic laboratories in local, regional, and state police and sheriff’s departments and district attorneys’ offices. They may also serve federal agencies such as the U.S. military; Drug Enforcement Administration (DEA); Alcohol, Tobacco, Firearms and Explosives (ATF&E); Federal Bureau of Investigation (FBI); Department of Justice (DOJ); U.S. Postal Service (USPS); Secret Service (SS); Central Intelligence Agency (CIA); and U.S. Fish and Wildlife Services. Trained criminalists also may teach at community colleges and universities.

**Forensic Engineering**

Forensic engineers apply principles of engineering to resolve legal issues, primarily in civil, rather than criminal cases. However, a forensic engineer may also assist in criminal matters or cases involving violation of government regulations. These areas of activity cover investigations into structural failure; reconstruction of automobile accidents; exploring the causes of fires or explosions; and evaluation of construction, manufacturing, or maintenance procedures. The forensic engineer’s work applies in personal-injury suits, construction claims, contract or warranty disputes, patent or copyright infringements, and criminal and regulatory matters. Certification in the forensic engineering sciences is available from the International Institute of Forensic Engineering Sciences. (www.iifes.org).

**Education and Training** The minimum educational requirement for a forensic engineer is a bachelor’s degree in engineering or an allied science. However, an advanced degree is desirable, as is registration in a professional engineering society. Because of the wide range of engineering disciplines, a forensic engineer should have professional experience in the particular field(s) of engineering that are the subject of his or her investigation.

**Career Opportunities** Although some forensic engineers work for sizable corporations or government agencies, most are either self-employed or employed by small firms. Some forensic engineers hold a full-time job in another field (such as engineering consulting or teaching) and perform forensic services on a part-time or contract basis.

**Forensic Odontology**

As we saw in previous chapters, forensic odontology applies the principles of dental science to law. This includes such activities as identifying human remains through dental analysis as well as comparing bite marks, using both physical and biological dental evidence. Forensic odontologists frequently are called upon after catastrophic events involving large numbers of casualties for which identification from other physical remains is difficult or impossible. Another important area of forensic dentistry is bite mark analysis in cases of assault, rape, and/or homicide. Bite mark analysis may involve collecting saliva for DNA profiling and matching.

**Education and Training** The forensic odontologist must of course possess a Doctor of Dental Science (D.D.S.) degree, but this basic education by
itself is not sufficient to function in this field. Courses in forensic science and medico-legal death investigation are strongly recommended. Additional courses and advanced training in approved forensic techniques and procedures are required to prepare a forensic odontologist to conduct proper crime-scene investigations. Several professional organizations, including the American Board of Forensic Odontology, the American Society of Forensic Odontology, the New York Society of Forensic Dentistry, and the New York County Dental Society, offer advanced training in this field. The American Board of Forensic Odontology (www.abfo.org) serves as a highly regarded credentialing body for forensic dentists.

**Career Opportunities**  Most forensic odontologists are engaged in private dental practice. They typically have either formal appointments or consulting relationships with coroners, medical examiners’ offices, state and local government agencies, and branches of the military. They also often offer private consultations for insurance companies and law firms. Qualified forensic odontologists frequently provide expert testimony in criminal and civil cases involving personal injuries, worker’s compensation, malpractice suits, potential violations of the dentist–patient relationship, and identification of bite marks in criminal cases. Once a commitment is made to enter this field, the dental investigator needs to be current in the most accurate methods available, be aware of ethical values and conflicts, and possess the dedication to render assistance in a timely and professional manner.

**Forensic Pathology**

Forensic pathology is the application of the principles of pathology—and medicine in general—to the legal process. Forensic pathologists perform autopsies to determine the causes of an individual’s death and the circumstances surrounding the death. Understanding the circumstances of a person’s death allows the pathologist to determine whether the death was the result of natural causes, an accident, suicide, or homicide. Forensic pathologists also identify remains using medical information, dental records, and other peculiarities of an individual. Forensic pathologists help public health officials recognize and control epidemic diseases. Clinical forensic pathologists study patterns of injury in living people to help law investigations into crimes such as child and elder abuse. The principal professional organization for forensic pathologists is the National Association of Medical Examiners (www.thename.org).

**Education and Training**  Forensic pathologists undergo the same training and education as any medical doctor: four years of college, followed by four years of medical school, then a residency in pathology. After college, medical school, internship, and residency, an additional one- or two-year fellowship in forensic pathology must be completed. This is then followed by certification in pathology or one of its subspecialties from the American Board of Pathology.

**Career Opportunities**  Forensic pathologists are usually employed by city, county, or state medical examiners’ offices and hospitals. Some federal government agencies, such as the Centers for Disease Control (CDC) and the Armed Forces Institute of Pathology (AFIP), also employ forensic pathologists.
Forensic Anthropology

Forensic anthropologists are trained in the study of human skeletal biology, and they typically use this training to identify deceased individuals when skeletal remains are the only useful evidence. They also determine whether recovered bones are human or nonhuman and determine sex based on skeletal structure. Forensic pathologists may estimate the cause and time of death when remains are unsuitable for examination by a pathologist.

Education and Training  Forensic anthropologists usually earn a Ph.D. in anthropology with an emphasis on human osteology (the study of bones) and anatomy. Practical experience in forensic anthropology typically is required before a court accepts an individual as an expert witness in the field. The American Board of Forensic Anthropology (ABFA) (www.csuchico.edu/anth/ABFA/) provides professional certification for experts in the field of forensic anthropology. To earn certification, an individual must submit case reports for review that demonstrate practical experience in the field. The applicant must also pass both a written and a practical examination.

Career Opportunities  Most forensic anthropologists work out of laboratories at major research institutions or universities. In addition, various state and local medical examiner offices use forensic anthropologists as medical investigators or administrators. The federal government employs forensic anthropologists at the U.S. Army Central Identification Laboratory and the Armed Forces Institute of Pathology. State and federal law enforcement agencies also hire physical anthropologists to act as special agents and laboratory personnel. The largest group of forensic anthropologists works for the military in the U.S. Army’s Central Identification Laboratory in Hawaii (www.jpac.pacom.mil/CIL/CIL_Home.htm). A major professional organization in this field is the American Association of Physical Anthropologists (www.physanth.org).

Forensic Psychology and Psychiatry

The forensic psychologist or psychiatrist deals with issues of human behavior and mental illness as they relate to matters of civil and criminal law. This involves such activities as determining an individual’s competence to stand trial, testify, or waive legal representation, and determining whether mental illness mitigates a suspect’s responsibility for his or her actions. For example, the forensic psychiatrist often gives an opinion about whether a defendant might be innocent by reason of mental illness or defect. Other areas in which such expertise is applied includes cases of involuntary psychiatric hospitalization, a patient’s right to refuse treatment, and competency to participate in do-not-resuscitate decisions. Forensic psychology includes psychological evaluation and expert testimony regarding such criminal forensic issues as trial competency and forensic behavioral analysis.

Education and Training  Forensic psychiatrists are medical doctors who complete a course of study similar to that of forensic pathologists. This includes four years of college followed by medical school and residency training in psychiatry. Some forensic psychiatrists take an additional year or two of post-residency training in psychiatry and the law, and many continue independent study and on-the-job training after completing their formal education. The American Board of Psychiatry and Neurology offers
certification in forensic psychiatry for those who pass special examinations. Forensic psychologists usually obtain a Ph.D. degree and are licensed by a state board, and may be board certified by the American Board of Professional Psychology (www.abpp.org).

**Career Opportunities** As with other professionals in the psychiatric profession, forensic psychiatrists and forensic psychologists may be employed in private practice, by hospitals, or by city, county, state, or federal government agencies. They often work in a prison or state hospital setting. The major professional organization for forensic psychiatrists is the American Academy of Psychiatry and the Law (www.aapl.org).

**Document Examiners**

As we saw in Chapter 16, the document examiner analyzes questioned documents and related material, such as ink, paper, toner from a copier or fax, and computer printers. Detecting forged documents and counterfeit currency is a large part of the document examiner’s work.

**Education and Training** Document examiners should possess at least a bachelor’s degree, preferably in a scientific field. Several colleges and universities offer questioned-document or related courses as part of criminal justice, forensic science, or criminalistics degree programs, although no document examination degree programs currently exist. In addition to a college education, the prospective document examiner must complete 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, a member of the American Society of Questioned Document Examiners, or a diplomate of the American Board of Forensic Document Examiners (www.asqde.org/abfde.htm).

**Career Opportunities** Forensic document examiners are often consultants working in private practice, but many large police organizations, as well as most state and federal law enforcement agencies, also employ forensic document experts.

**Forensic Toxicology**

Forensic toxicology deals with the effects of drugs and chemicals on the human body and the application of that knowledge to questions of law. Forensic toxicologists perform a wide range of activities, including determining whether an individual has consumed illegal drugs and identifying the substances involved. Forensic toxicologists are often called upon to determine whether an individual was driving under the influence of alcohol or drugs. They may be involved in postmortem toxicology, which involves determining the contribution drugs or chemicals make to the circumstances of a death. The forensic toxicologist investigates cases as varied as animal poisoning, the use of drugs in sexual assault, and drug use and doping in human and animal sports. Currently, many forensic toxicologists are employed by private laboratories engaged in conducting workplace drug testing and forensic urine testing on employees of organizations and industries associated with the public’s safety or engaged in performing hazardous work.

**Education and Training** Training for a career in forensic toxicology requires a bachelor’s degree in a physical science, ideally including a solid background in chemistry and coursework in pharmacology. Several colleges and universities offer graduate coursework in forensic toxicology at the
master’s or Ph.D. level. Membership in the forensic toxicology section of AAFS requires at least one year of additional experience and further requirements of scholarly work or advanced study. The American Board of Forensic Toxicology and the Forensic Toxicologist Certification Board offer professional certification to scientists with work experience in forensic toxicology. A major forensic toxicology organization is the Society of Forensic Toxicologists (www.soft-tox.org).

**Career Opportunities**  Many forensic toxicologists work in police laboratories, medical examiners’ offices, and workplace drug-testing laboratories. Other career opportunities for forensic toxicologists exist in hospitals, universities, corporations, and agencies that monitor drug use in sports.

### College Courses in Forensic Science

#### Degree Programs in Forensic Science

It is something of an irony that, although most of the careers discussed previously require at least a bachelor’s degree, few colleges and universities in the United States offer undergraduate or graduate degrees in forensic science. As of early 2006, there were only eleven programs in forensic science accredited by the Forensic Science Education Programs Accreditation Commission (FEPAC). Institutions offering FEPAC accredited undergraduate and graduate programs include the following:

- **Arcadia University**, Glenside, Pa.: Accreditation for the Master of Science Degree in Forensic Science.
- **Cedar Crest College**, Allentown, Pa.: Accreditation for the Bachelor of Science Degree in Chemistry, Biochemistry, Biology, and Genetic Engineering with a concentration in Forensic Science.
- **Eastern Kentucky University**, Richmond, Ky.: Accreditation for the Bachelor of Science Degree Program in Forensic Science.
- **Florida International University**, Miami, Fla.: Accreditation for both the Certificate Programs in conjunction with the Bachelor of Science Degree in a natural science such as chemistry or biology and the Master of Science in Forensic Science.
- **Marshall University**, Huntington, W.V.: Accreditation for the Bachelor of Science in Forensic Chemistry Program.
- **Virginia Commonwealth University**, Richmond, Va.: Accreditation for the Master of Science Degree Program in Forensic Science.
- **West Chester University**, West Chester, Pa.: Accreditation for the Bachelor of Science Degree in Forensic and Toxicological Chemistry.
- **West Virginia University**, Morgantown, W.V.: Accreditation for the Bachelor of Science–Forensic and Investigative Science Program.
This is not to suggest, however, that course and degree programs in forensic sciences are not available at other colleges and universities. In fact, more than a hundred schools offer associate’s, bachelor’s, and master’s degrees in some area of forensic science, and others provide seminars and courses in forensic specialties such as DNA typing and profiling. Although most of these programs have not been accredited by the FEPAC, most working forensic scientists obtained their education and degrees from non-FEPAC-accredited schools. A complete list of undergraduate and graduate programs in forensic science in the United States and abroad can be found at the AAFS Web site, www.aafs.org.

A small number of schools have initiated programs and courses in computer forensics. Interested students should search out schools on the AAFS Web site for these programs.

**Required College Courses**

Certain natural science courses are required for any student in forensic science. Unlike other criminal justice professionals, a forensic scientist requires a foundation in chemistry, biology, physics, and mathematics. The minimum general core requirements recommended for undergraduate forensic science programs include the following:

- General chemistry I and II and lab for science majors (eight credit hours).
- Organic chemistry I and II and lab (eight credit hours).
- Biology I and II for science majors (four to eight credit hours). (Classes with laboratory components are preferable, if available.)
- Physics I and II for science majors and lab (eight credit hours).
- Calculus (three credit hours).
- Statistics for science majors (three credit hours).

An undergraduate degree in forensic science is expected to be an interdisciplinary degree that includes substantial laboratory work and an emphasis on advanced coursework in chemistry or biology. Students can use these additional courses to begin to specialize along a forensic science discipline track, such as forensic biology or forensic chemistry. Specialized science courses may be selected from any of the following:

- Biochemistry
- Molecular biology
- Genetics
- Population genetics
- Inorganic chemistry
- Analytical/quantitative chemistry
- Physical chemistry
- Instrumental analysis
- Cell biology
- Pharmacology
- Calculus II
- Microbiology

As you can see, the path to becoming a forensic scientist is neither brief nor easy. It begins with rigorous college coursework, typically followed by additional training and certification in the specific area of forensic science one chooses to pursue. It involves lifelong learning and the dedication to seek out the newest and best methods to gather, analyze, and interpret data needed to solve all types of crimes.
Despite these hurdles, forensic science is a fascinating profession that challenges one’s scientific knowledge, powers of observation, critical-thinking skills, deductive and inductive reasoning, and ability to think creatively and imagine various possible scenarios when presented with facts and physical evidence. Hopefully, this text will provide both a spark of interest and the basic information that will spur you to take the first steps toward pursuing a career in this challenging and ever-evolving field.