Forensic science is the application of science to law. Criminalistics is the application of science to criminal and civil laws that are enforced by police agencies in a criminal justice system. In recent years these topics have become increasingly fascinating to the general population. The popularity of true crime stories has sparked a number of documentary-type television programs on both cable and network television.

History of Forensics

Sir Arthur Conan Doyle had a considerable influence on popularizing scientific crime-detection methods through his fictional character Sherlock Holmes. It was Holmes who first applied the principles of fingerprinting, firearm identification, and document examination—long before these new techniques was adopted by criminal investigators. In 1814, Mathieu Orfila published the first scientific procedures for detection of poisons and their effects on animals. It is for this text Orfila is now known as the father of forensic toxicology. Then, in 1892, Francis Galton undertook the first study of fingerprints. He focused primarily on developing a methodology for classifying fingerprint patterns. Galton published a book entitled Finger Prints, which contained the first statistical proof supporting the uniqueness of his method of identification. His work describes the basic principles that form the present system of identification of fingerprints.

In the early twentieth-century, a technique was developed for matching a fired bullet with a suspect gun. The determination of such information requires a comparison of the suspect bullet with one that has been test-fired from a suspect weapon. Calvin Goddard, a U.S. Army colonel, refined the techniques by utilizing the comparison microscope (two microscopes with a shared field of view).

Development of computer technology and improvement of scientific criminalistics in recent years has significantly advanced forensic science. New techniques and technology are being developed daily to link criminals to their crimes. With the use of DNA typing, we now have the ability to identify a person from a single hair or from saliva. The ultimate goal of forensic science is to accurately and reliably link every criminal to his or her crime. Innovation in this field has vastly improved the proficiency of criminal prosecutions, punishing more criminals and exonerating the innocent.
Basic Services Provided by Crime Laboratories

Crime labs vastly differ in size, type, specialties, and personnel management. Regardless of varying configuration, most labs can be categorized into one of the following:

**Physical Science Unit** The physical science unit applies principles and techniques of chemistry, physics, and geology to the identification and comparison of crime scene evidence (such as drugs, glass, paint, explosives, and soil).

**Biology Unit** The biology unit deals in the identification and grouping of dried bloodstains and other body fluids, comparison of hair and fiber, and the identification and comparison of botanical materials (such as wood and plants).

**Firearms Unit** The examination of firearms, discharged bullets, cartridge cases, shotgun shells, and ammunition of all types is conducted by the firearms unit. Garments and other objects are also examined in order to detect firearm discharge residues and to approximate the distance from a target at which a weapon was fired.

**Photography Unit** A complete photographic laboratory is maintained by the photography unit to examine and record physical evidence.
The Functions of the Forensic Scientist

First and foremost, the forensic scientist is responsible for collection and analysis of physical evidence. A forensic scientist must be skilled in applying the principles and techniques of the physical and natural sciences to the study of many types of evidence that may be recovered during a crime investigation. In so doing, the scientist must also be aware of the demands and constraints that are imposed by the judicial system.

Provision of Expert Testimony

The work product of a forensic scientist may ultimately be a factor in determining a person's guilt or innocence; he or she may be required to testify in court regarding collection methods and conclusions. It must be recognized that it is not possible for the expert to render any conclusion with absolute certainty. At best, one may only be able to offer an opinion that is based on a reasonable certainty derived from training, experience, and sound scientific procedure. Obviously, the expert is expected to defend vigorously the techniques and conclusions of the analysis, but at the same time there must be no reluctance to impartially discuss those findings that could minimize the significance of the analysis. Any attempt to do so would jeopardize the investigator’s credibility. The forensic scientist should not be an advocate of one party’s cause, but only and advocate of truth.
Standard Procedure for Approaching a Crime Scene

Certainly the most important part of a crime scene is the physical evidence. Physical evidence encompasses any and all objects that can be used to establish that a crime has been committed or can provide a link between a crime and its victim or a crime and its perpetrator. Many crimes scenes contain a large amount of possible evidence. The investigator’s challenge is to find the most applicable evidence for each particular crime scene.

It is the responsibility of the first officer arriving on the scene of a crime to take steps to preserve and isolate the crime scene. Primarily, one should be concerned with personal safety and the well being of any victims. All efforts should be made to obtain medical assistance for individuals in need before focus shifts to perpetrator.

Next, investigators should record the crime scene. There is but a limited amount of time to examine a crime site in its unadulterated state. Although it is possible to seal off most scenes, many (like city streets or public buildings) are more difficult or impossible to secure for a significant amount of time. The opportunity to permanently record the scene in its original state must not be lost. Photography, sketches, and notes are the three methods utilized in crime scene recording.
The most important prerequisite for photographing a crime scene is to approach it in its unaltered state. Objects must not be moved until they have been photographed from several angles, from all entryways, and close-up. The crime scene itself and its surroundings must be photographed as completely as possible. As items of physical evidence are discovered, they are photographed to show their position and location relative to the entire scene. When the size of an item is of significance, a ruler or other measuring scale may be placed in the picture with the object as a point of reference.

Once photographs are taken, the crime scene investigator will sketch the scene. Initially, a "rough" sketch is constructed containing an accurate depiction of the dimensions of the scene, showing the location of all objects having a bearing on the case. Later, a finished sketch will be drawn by a professional draftsman. An example of a crime scene sketch appears below.

Recording observations in the form of notes must be a constant activity throughout a crime scene’s processing. These notes must include a detailed written description of the scene with the location of items of physical evidence recovered. There should be a minimum of one note for each letter assigned on the sketch key. These notes should be descriptive, but concise. They may also include other sketches or references to pictures. Furthermore, notes should identify the time an item of physical evidence was discovered, and by whom it was discovered. The names of persons involved in packaging and labeling evidence will also appear in notes. Notes taken during the investigation may be the only source of written information about the scene, and may be used months, or perhaps years, after the scene was analyzed. The notes must be sufficiently detailed to anticipate this need.
Collecting Evidence

The following are examples of evidence which are often found and packaged, as a matter of routine, and sent to the forensic laboratory:

- Victim's clothing
- Fingernail scrapings
- Head and pubic hairs
- Blood (for typing purposes)
- Vaginal, anal, and oral swabs (in sex-related crimes)
- Recovered bullets from the body and/or surrounding area
- Hand swabs or washings from shooting victims (for gunshot residue analysis)

The final task at a crime scene is to collect and package the physical evidence. Physical evidence must be handled and processed in a way that prevents any contamination between the time it is removed from the crime scene and the time it is received by the lab. In addition to foreign substances which could cause contamination, there are other problems that must be guarded against such as breakage, evaporation, accidental scratching or bending, or loss through improper or careless packaging. To protect against such contamination, each item collected must be placed in a separate container. Some pieces of evidence may require layered packaging. Packaging evidence separately and properly prevents damage, loss or degradation of samples, and prevents cross-contamination.

Whether obtained at the crime scene, from suspects, or a database, controls are one of the most important parts of investigation. Controls are items, information, or evidence taken from a known location or individual. The examination of evidence—whether it is soil, blood, glass, hair, fiber, or others—often requires a comparison with a known standard or control. In fact, many types of evidence are useless without controls. For instance, hair found at the crime scene will be of optimum value only when compared to control hairs removed from a suspect or victim. A hair found without a control may be identified as human, but cannot be linked to the crime. Likewise, bloodstained evidence must be accompanied by whole blood controls obtained from all relevant crime scene participants, or a match cannot be made.