



Introduction to Criminal Investigation

CHAPTER 1

STUDENT LEARNING OUTCOMES

Upon completion of this chapter, students will be able to:

- Discuss how criminal investigation developed in England
- Describe how the English system was employed in the United States
- Employ the scientific method as it applies to criminal investigation
- Recognize the objectives of a criminal investigation

■ Early History

In England at the end of the 13th century, the king established a system consisting of justices of the peace and parish constables, a system that served England and the United States until 1829. This system, though inefficient, did maintain a modicum of order in the class-based agrarian societies of this era, where conflict resolution was more often the result of a tradition of deference than of law enforcement; social and geographic mobility was restricted; and transience was virtually unknown. In agrarian societies, people typically are born and die within the confines of the same community, and values important to the community are maintained through community vigilance and a series of informal sanctions, from public rebuke to ostracism. A vigilant community has little need for external sanctions. It takes a village to police its own morals and values.

In the United States and in Western Europe, the Industrial Revolution led to the urbanization of manufacturing centers. The formerly agrarian population began to evolve into a labor pool for industrial complexes. People began moving about the countryside, and community vigilance had little impact on those who were merely passing through. The industrial centers brought strangers together in a new environment in which a sense of community was replaced by exploitation of laborers, deplorable living conditions, ghettos, and poverty. In the United States, a growing tide of European immigrants generated population pressure in Northeastern and Midwestern cities. The flow of immigration created cultural and religious tensions between the new arrivals and the existing inhabitants that caused resentment, segregation, and discrimination.

These evolving industrial problems were not unique to the United States. England had earlier tasted the fruit, sweet and bitter, of industrialization and discovered that the system of social sanctions, justices, and constables that had been somewhat effective in rural areas was totally inadequate to bring order to its industrial centers. In 1829, the creation of a metropolitan police department altered the London system of law enforcement.

London's police department served as a model for other British municipalities as well as for emerging American cities. The rural areas of England and the United States did not require such elaborate policing arrangements, and the simpler constabulary system continued to serve such communities and remains to this day throughout much of rural America. In U.S. cities, however, population increases, high rates of immigration, and economic development made it increasingly difficult to control the violence and criminality inherent in large urban populations (Miller, 1977).

■ Law Enforcement Developments in London and New York City

London

The constabulary system was organized around a group of constables appointed by local justices, to whom they owed their allegiance and continued employment. The **constables** were responsible for patrolling their precincts and could raise an alarm should it become necessary to solicit assistance from citizens to arrest a fleeing wrongdoer. Some constables were held in low esteem, as demonstrated by the failure of the citizenry to come to their assistance and by the ridicule heaped upon them while in pursuit of criminals. This tradition was upheld in the United States, and most states still have a **hue and cry** statute in their penal codes that requires citizens to come to the aid of a police officer when requested to do so. When responding to a police officer request for assistance, a citizen is given the powers and shackled with the responsibilities of a police officer.

Thieves were the primary plague of industrial London. A burgeoning class of unemployed, displaced rural families turned to theft as a profession when they found the doors to industrial employment closed to them. Constables were ineffective in stopping the wave of crime washing

over London. Merchants and others were left to their own devices in trying to protect themselves from robbery and assault. When goods were stolen, it was customary for the victim to use his or her own financial resources to hire a **thief catcher**. Many thief catchers were thieves themselves, or moonlighting constables. Although this was an effective method of recovering stolen goods, hiring thief catchers did nothing to deter theft and may even have encouraged it, for in many instances the thief catcher was the very person who had stolen the goods in the first place.

In 1730, Sir Thomas De Veil was appointed magistrate for the Bow Street district of London. During the 17 years he was in office, he established the most effective police operations in the London area. In 1748, Henry Fielding, best known to us as a novelist, replaced Sir Thomas and continued improving police service in the Bow Street district.

Henry Fielding and his brother John advocated a single, unified police organization. They hoped to establish a systematic criminal intelligence-gathering apparatus, create a coherent police administration, and develop a preventive strategy for crime management (Radzinowicz, 1986). One of Henry's plans was to promote a small force of these catchers, directing and deploying them in a coherent manner about the city of London and its suburbs. Equivalent to bounty hunters, his new paid police, called the Bow Street Runners, were to be under a central command with appropriate administrative supervision and controls (McMullan, 1996). Henry was also responsible for organizing the first police intelligence organization, which published its gathered criminal intelligence in the *Covent Garden Gazette*. By 1800, the Bow Street Police Office was hailed as the leading law enforcement agency in the metropolitan London area (Johnson, Wolfe, & Jones, 2008).

The rising crime rate in London taxed even the Bow Street district police. It was becoming apparent that the traditional methods of law enforcement were inadequate to combat crime in London. Effective enforcement in one precinct caused criminals to move to a less policed or less effectively policed district. Leaving each district to fashion its own law enforcement methodology meant that districts had no uniformity in enforcement and no common grounds for communication or for the exchange of information and policing techniques. Entire portions of London were left without any effective means of preventing or punishing crime.

The first step toward standardizing law enforcement in London came in 1785 as the result of the efforts of William Pitt the Younger, who attempted to introduce a bill establishing a police force that would have jurisdiction throughout the city. Although soundly defeated, the bill served as the blueprint for legislation passed in 1829 creating the London Metropolitan Police (Radzinowicz, 1986). The new headquarters were established at 4 Whitehall Place, and the back entrance, used by visitors, was in Scotland Yard, which led to the headquarters being called Scotland Yard.

The continued high crime rate set the stage for Sir Robert Peel, who proffered a preventive approach to law enforcement. It was the association of the Metropolitan Police with Sir Robert that gave rise to the use of **bobby** as a colloquial term for a police officer. Peel established patrol areas and patrol functions, the collection of intelligence, and the centralization of all law enforcement activities. Police officers eventually accepted the notion of uniforms, although officers originally viewed them as livery, that is, the uniforms worn by servants. Peel's highly visible and mobile force was easily recognized, and it acted as a deterrent on metropolitan streets. The bobby came to know his beat and those who lived and worked on it. Assigning officers to areas other than those in which they lived avoided fraternization with residents. Sir Robert Peel set the structure and the salaries of the new Metropolitan Police force as:

- 8 superintendents (£200 per annum)
- 20 inspectors (£100 per annum)

- 88 sergeants (3s 6d per day)
- 895 constables (3 shillings per day; Tobias, 1979)

The formation of an investigative branch of the Metropolitan Police was inevitable. Patrol responsibilities precluded bobbies from devoting sufficient time to the investigation of crimes whose perpetrators were not apprehended immediately. To solve this problem, carefully selected police officers took on investigative duties. These officers were chosen from the foot patrol police, giving the latter an incentive to develop observational skills and intelligence networks. This method of selecting investigators, along with civil service testing, is still used by most contemporary police agencies (Johnson et al., 2008).

Case in Point

Three men, Weskett, Bradley, and Cooper, burgled the residence of the Earl of Harrington. Fielding's network of thief takers spent 2 years pursuing and eventually apprehending the group. The pursuers were successful in tracing one of the stolen banknotes. They circulated information and descriptions of the thieves throughout the country, and by following leads, they penetrated the burglars' disguises, tricks, and aliases. They fostered the betrayal of a prostitute who knew Bradley, and they apprehended Bradley shortly thereafter. Bradley testified against Cooper, who received 14 years from the King's Bench (Linebaugh, 1991).

Case in Point

Jack the Ripper

In the years 1888–1891, residents of London's East End regarded the name **Jack the Ripper** with terror, and his name was known the world over. Jack the Ripper is the popular name given to a serial killer who murdered a number of prostitutes in the East End of London in 1888. The name comes from a letter written and published at the time of the murders. The killings took place in the districts of Whitechapel, Spitalfields, Aldgate, and the City of London proper.

SUSPECTS Of the many suspects whose names were bandied about at the time, only four were suspected based on any credible evidence:

- Aaron Kosminski, a Polish Jewish resident of Whitechapel
- Montague John Druitt, a 31-year-old lawyer and schoolteacher who committed suicide in December 1888
- Michael Ostrog, a Russian-born thief
- Dr. Francis J. Tumblety, an American who was arrested in November 1888 for indecency offenses and who fled the country

Of the many murders that had occurred in 1888 that were attributed to Jack, only five are generally accepted as his work:

- Mary Ann (Polly) Nichols, murdered Friday, August 31, 1888
- Annie Chapman, murdered Saturday, September 8, 1888
- Elizabeth Stride, murdered Sunday, September 30, 1888
- Catharine Eddowes, also murdered Sunday, September 30, 1888
- Mary Jane (Marie Jeanette) Kelly, murdered Friday, November 9, 1888

The killer cut the throats of Mary Ann Nichols, Annie Chapman, Elizabeth Stride, Catharine Eddowes, and Mary Kelly. There were abdominal mutilations in all the cases except that of Elizabeth Stride. The killer took Annie Chapman's uterus, Catharine Eddowes's uterus and left kidney, and Mary Kelly's heart.

THE LETTER Jack the Ripper's name was written at the end of a letter that was dated September 25, 1888, and sent to the Central News Agency, which turned the letter over to the police.

Dear Boss,

I keep on hearing the police have caught me but they wont fix me just yet. I have laughed when they look so clever and talk about being on the right track. That joke about Leather Apron gave me real fits. I am down on whores and I shant quit ripping them till I do get buckled.

Grand work the last job was. I gave the lady no time to squeal. How can they catch me now. I love my work and want to start again. You will soon hear of me with my funny little games. I saved some of the proper red stuff in a ginger beer bottle over the last job to write with but it went thick like glue and I cant use it. Red ink is fit enough I hope ha. ha. The next job I do I shall clip the ladys ears off and send to the police officers just for jolly wouldn't you. Keep this letter back till I do a bit more work, then give it out straight. My knife's so nice and sharp I want to get to work right away if I get a chance. Good Luck.

Yours truly

Jack the Ripper

Dont mind me giving the trade name

PS Wasnt good enough to post this before I got all the red ink off my hands curse it No luck yet. They say I'm a doctor now. ha ha. (Begg, 2004)

New York City

New York City had adopted a system of law enforcement similar to the one that preceded the birth of the London Metropolitan Police. New York employed a system composed of locally elected constables and justices of the peace. Just as high crime rates relegated the constabulary system to the refuse heap in London, the same occurred in New York. The evolution of police operations in London prompted New York City to abandon the constabulary system in 1845 and institute instead a uniformed, centrally organized police force. Officers wore a badge made of copper and soon became known as **coppers** (Miller, 1977).

The constabulary system continued to work well in rural areas, where crime was deterred by community sanction and watchfulness. To this day, the only prerequisite for serving as a constable or justice of the peace is widespread recognition and public esteem.

■ The Birth of Scientific Investigation

Criminal investigation involves the application of the scientific method to the analysis of a crime scene. As forensic science evolved, so too did the need for field practitioners to understand forensic science and the information that can be obtained from evidence preserved for forensic evaluation. As early as 1248, the Chinese recognized that the body itself could contain information about the cause and method of death. *Hsi Yuan Lu*, a handbook published in 1250, gave guidelines for the postmortem examination of bodies. It included descriptions of various wounds caused by sharp versus blunt instruments and offered advice on how to determine whether an individual found in the water had died of drowning or had been killed beforehand and whether a burned individual was dead before the onset of the fire.

Doctors and other medical practitioners who, through observation, noted certain consistencies in natural deaths and uncharacteristic aspects of violent deaths took the first steps in the forensic journey. These practitioners were the first medical pathologists. The written records of the development of **forensic pathology** in Europe begin in 1507, when a volume known as the Bamberg Code appeared. Twenty-three years later, Emperor Charles V issued a more extensive penal code, known as the *Constitutio Criminalis Carolina*, for all the lands included in his empire. The two documents recognized the importance of medical testimony as an integral part of trials involving possible infanticide, homicide, abortion, or poisoning.

In the latter half of the 16th century, Ambrose Pare performed official medicolegal autopsies. He reported findings from the examination of the lungs of smothered children and studied the traces left by sexual assault (Thorwald, 1965). As a result of advances in knowledge about violent death, judicial authorities and the police in Europe soon began to call on physicians to help solve fatal crimes.

Most of the larger jurisdictions developed centers, commonly known as institutes of forensic medicine, where experts carried out their investigations.

■ Scientific Investigation in the United States

The historical development of scientific investigation in the United States can be traced to the English **coroner** system. The justice courts authorized the coroner to attach or arrest witnesses or suspects and to appraise and safeguard any lands or goods that might later be forfeited by reason of guilt of the accused. William Blackstone wrote a succinct description of the coroner's duties at the time of King Edward I in 1272:

The office and power of a Coroner are also like those of a Sheriff, either judicial or ministerial, but principally judicial. . . . And consists, first in inquiring, when a person is slain or dies suddenly, or in prison, concerning the manner of his death. And this must be upon sight of the body; for if the body be not found, the coroner cannot sit. He must also sit at the very place where death happened and the inquiry must be made by a jury of 4, 5, or 6 of the neighboring towns over which he is to preside. If any be found guilty by this inquest of murder or other homicide, the coroner is to commit them to prison for further trial and must certify the whole of his inquisition, together with the evidence thereon, to the Court of King's Bench, or the next assizes. (Latrobe, 1861, p. 6)

In 1877, the English parliament enacted a law requiring an **inquest** to be conducted whenever the coroner had reasonable cause to suspect that a violent or unnatural death had occurred or when the cause of death was unknown. This had the effect of granting the coroner wide authority to investigate cases and was in sharp contrast to the practice on the European continent, where prosecutors and police began investigations. Thus, the coroner's office developed as a broad spectrum investigative agency concerned with a large proportion of all deaths. The United States ultimately adopted an act similar to the English law. It is reflected in current statutes that empower the medical examiner's office and lay the jurisdictional foundation for the performance of medical examinations.

In 1789, a professor of physiology at the University of Edinburgh began giving lectures in legal medicine and public health. In general, professors of legal medicine, by doing research and authoring textbooks, were most responsible for establishing legal medicine and pathology as an independent scientific pursuit.

American colonists brought the coroner system from England intact. An early definition of a coroner's duties in the colonies can be found in the governor of Maryland's 1640 appointment of John Robinson to be high constable and coroner for St. Mary's County. According to the definition, the coroner, among other duties, was required:

upon notice or suspicion of any person that hath or shall come to his or her death entirely within the limits of that county to warn as many inhabitants of the said county as you conveniently may to view the dead body and to charge the person with an oath truly to inquire and true verdict to grant how the person viewed came upon his or her death according to the evidence. (Browne, 1885, p. 417)

The earliest mention of a physician in connection with the duties of a coroner was in 1860 in Maryland, where the Code of Public General Laws authorized the coroner or his jury to require the attendance of a physician in cases of violent death. Eight years later, the legislature authorized the governor to appoint a physician as sole coroner of Baltimore. In Boston in 1877, the Commonwealth of Massachusetts adopted a statewide system requiring that a physician known as a **medical examiner** supplant the coroner. In 1915, New York City adopted a law eliminating the coroner's office and creating a medical examiner system, authorizing the investigation of any death resulting from

criminal violence, casualty, or suicide; occurring suddenly while the person was in apparent health, was unattended by a physician, or was imprisoned; or occurring in any suspicious or unusual manner (Spitz, Spitz, & Fisher, 2006).

■ The Growth of Forensic Science

The latter part of the 19th century witnessed the emergence of the science of **pathology** as a subspecialty of medicine. At the same time, the related fields of forensic science began to develop. During this period, **Alphonse Bertillon** devised the first scientific system of identification; his anthropometric system was accepted as the most accurate method of criminal identification until the early 1900s.

Bertillon came from a family dominated by medical doctors, naturalists, and mathematicians, but his unassuming air and lack of personal grace resulted in his being assigned to an assistant clerkship in the records room of the French Surete's archives in Paris. It was his task to file identifying data on all criminals apprehended and convicted throughout France, and this tedious task was rendered additionally distasteful by his realization that virtually all of the descriptions were so vague as to be useless. In 1879, he decided, on the basis of his observations and his knowledge of science, that no two people could have exactly the same physical characteristics. If enough measurements were taken, a high degree of individuality could be developed for each person in a police agency's files. By February 1883, his technique was shown to be successful, and it was referred to in the newspapers as *anthropometry* or *Bertillonage*. Bertillon's methods gained immediate attention. In the United States, they were widely adopted, and a central file of measurements was maintained at Sing Sing prison.

Bertillon's system was destined to be short-lived, because it often provided incorrect identification. Henry Faulds, a Scottish physician working in Japan, noticed the practice of identifying pottery and sealing documents through the use of handprints and fingerprints. In 1892, Sir Francis Galton published *Finger Prints*, a book-length monograph that contained a basic system of classification (Galton, 1892). Galton's system was expanded into a practical method of categorization widely adopted throughout the world by 1903.

American fingerprinting efficiency was increased in 1924 when federal prisoner identification files maintained at the federal prison at Leavenworth were combined with the files maintained by the International Chiefs of Police at Sing Sing. The consolidated fingerprint bureau, later to be relocated to the Federal Bureau of Investigation (FBI) in Washington, DC, proved invaluable not only for criminal investigation but also for the identification of the victims of accidents and natural disasters (Johnson et al., 2008).

In the 1870s, a Frenchman, Albert Florence, developed a definitive chemical test for the presence of human semen, and another Frenchman, Ambroise Tardieu, discovered that dot-like blood spots under the pleura (the membrane that lines the chest and covers the lungs) were characteristic of death by rapid suffocation. In 1882, an Austrian, Eduard von Hoffmann, discovered that persons burned alive had soot in their windpipes and lungs and carbon monoxide in their blood.

A German physician, Paul Uhlenhuth, developed a test in 1901 that permitted scientists to distinguish one species of animal blood from another, while his countryman, Karl Landsteiner, discovered that human blood cells could be grouped into what came to be known as A, B, and O types. In 1915, a simple procedure for determining the blood group of a dried bloodstain was developed by Leone Lattes in Italy.

Closely related to blood typing is deoxyribonucleic acid (DNA) matching, which now is used often in criminal investigations. DNA is located in all human cells, and its precise configuration is determined by heredity. DNA is the architect, foreman, and bricklayer of life. In every creature,

DNA carries the coded messages of heredity and governs everything from eye color to toe length. It is present in every one of the trillions of cells in the human body. Based on the work of **Alec Jeffreys** at the University of Leicester, a method was developed to extract DNA from a specimen of blood, semen, or other tissue, slice it into fragments, and tag the fragments with a radioactive probe so that they would expose x-ray film. The resulting pattern of stripes on the film is as distinctive as a fingerprint, and Jeffreys and his colleagues named the process of isolating and reading DNA markers *DNA fingerprinting*.

In one of the first experiments using **genetic fingerprinting**, Jeffreys tested a family group to see if the pattern of inheritance was as simple as he expected it to be. The experiment showed that half of the bands and stripes were from the mother and the rest from the father (Beeler & Wiebe, 1988). Determining whether these characteristics held true for tissues other than blood was his next task. Jeffreys's team took both blood and semen and found that the genetic map was constant, regardless of the kind of cells from which the material had come. To determine test sensitivity, the team tested small quantities of blood and semen. A drop of blood or a tiny amount of semen was sufficient. Jeffreys clearly had developed a laboratory technique that provided seemingly irrefutable results. His concern, however, was to ensure proper identification of the forensic materials available at a crime scene. How effective would his procedure be in identifying degraded DNA? Additional testing on 3-year-old blood and semen stains turned out to be equally successful.

In March 1985, Jeffreys published his first scientific report, in which he estimated that the chance of two people having the same DNA fingerprint (absent identical twins) was zero:

You would have to look for one part in a million million million million million before you would find one pair with the same genetic fingerprint and with a world population of only five billion it can be categorically said that a genetic fingerprint is individually specific and that any pattern does not belong to anyone on the face of this planet who ever has been or ever will be. (Wambaugh, 1985, p. 94)

■ Development of Crime Laboratories

Scientific fields such as chemistry, physics, biology, and microscopy have a long history of separate development. Although the noted German jurist Hans Gross published a textbook in 1893 detailing the application of information derived from these separate fields to criminal investigation, it was not until 1910, when Edmond Locard established the first crime laboratory in Lyon, France, that these specialties were brought together for the sole purpose of improving criminal investigation. The success of Locard's laboratory led to the formation of similar laboratories in different parts of Europe, and, in 1923, the first complete crime laboratory in the United States was established in the Los Angeles Police Department by August Vollmer. Locard's work gives us the foundation upon which forensic investigation is based; a person entering a crime scene leaves something and takes something with him or her. This has since become known as the "Locard Principle."

Because of widespread corruption and brutality among police forces throughout the United States, **August Vollmer** advocated increased police professionalism through higher education. While chief of the Berkeley Police Department, he instituted police training and college requirements for police candidates at the University of California. Vollmer also taught police administration courses at the University of California and the University of Chicago. His department was the first in the country to use radio communications and automobile patrols while other departments were using street corner call boxes. During his tenure as president of the California Police Chiefs Association (CPCA) in 1907 and as president of the International Association of Chiefs of Police (IACP) in 1922, he promoted the hiring of women in law enforcement and the study of human behavior as an integral part of police

training. His contributions to the improvement of police and their work have prompted many to refer to him as the Father of Police Professionalism. To some extent, the fact that you are most likely a criminal justice student as you read this is, in part, a continuing legacy of his many contributions to making law enforcement a profession.

The **American Academy of Forensic Sciences (AAFS)** was established in 1948 to promote education for and research in the forensic sciences. In an assessment of forensic sciences published in 1999 by the National Institute of Justice (NIJ), titled *Forensic Sciences: Review of Status and Needs*, the forensic sciences were described as being in serious need of education and training. In addition, the assessment included a demand for:

- National standards for education in forensic sciences
- An independent, community-wide, standard-setting body such as a technical working group for education in forensic sciences
- An accreditation system for forensic science education programs

The NIJ established a technical working group for education and training in forensic sciences (TWGED) in 2001 for the purpose of recommending curricular guidelines for educational programs in forensic sciences. The working group acknowledged the importance of an accreditation system for academic programs. In 2002, the American Academy of Forensic Sciences established a committee, called the Forensic Education Program Accreditation Committee, to develop an accreditation system to explore issues related to the development of an accreditation system.

Paul Leland Kirk was a leader in establishing criminology as an academic discipline. He worked as a professor at the University of California, Berkeley, where he wrote the groundbreaking textbook *Crime Investigation* (Kirk, 1953). The book provided a scientific protocol for processing crime scenes and included chapters on fingerprints, firearms, and blood spatter. He was a consultant on numerous criminal cases. During his time at the University of California, he developed a scientific approach to the study of forensics and its application to criminal investigation. In 1937, he was appointed head of the criminology program at the university, and in 1950, along with August Vollmer, he established the first school of criminology at the University of California, Berkeley.

For more than 30 years, forensic scientist **Edward T. Blake** has been considered an expert in DNA analysis. He was the first to use polymerase chain reaction (PCR)-based DNA testing in the United States, during the civil court case *People v. Pestinikas* in 1986. Since that time, he has worked as a consultant to analyze biological evidence in many criminal cases.

Tommie Lee Andrews became the first person to be convicted of a crime in the United States based on DNA evidence. In 1987, Tommie Lee Andrews was sentenced to 22 years for committing rape. In Virginia the following year, a killer dubbed the “South Side Strangler” was convicted of murder after DNA linked him to several rapes and murders in the Richmond, Virginia, area (James, 2009).

A laboratory organized within the FBI that was established in 1932 was the first to make forensic science available nationwide. This laboratory has served as the model for the formation and organization of forensic laboratories at local, state, and national levels throughout the world (Spitz et al., 2006). In modern, well-equipped forensic laboratories, experts from the fields of serology and immunology, ballistics, document analysis, fingerprinting, polygraphy, analytical chemistry, and geology work together to solve crimes and provide scientifically validated evidence. In the past decades, many of the sophisticated analytical techniques and scientific instruments developed primarily for medicine and industry have been incorporated into forensic laboratories. Technologies such as gas-liquid

chromatography, infrared spectroscopy, nuclear magnetic resonance, and mass spectroscopy have found their fullest applications in criminal investigation.

Although much of the testing falls to the scientists, it is the responsibility of the criminal investigator to preserve **physical evidence** and to exercise good judgment in determining which scientific measurements and evaluations are appropriate. The rapid expansion of scientific methods of investigation has placed special demands on the training and financial resources of police agencies. Use of sophisticated techniques requires a high level of formal education, a comprehensive knowledge of modern science, and the ability to work with highly trained professionals in anatomy, physiology, chemistry, and physics. It was under these types of pressures that the old American system of elected coroners began to give way to trained medical examiners after 1935, and the work of police detectives soon came to involve coordinating the investigations of many professional scientists and applying their discoveries to the solution of criminal cases.

■ Fundamentals of Forensic Science

Many see investigation as art or magic—a matter of hunches and theories. From this perspective, arrests and convictions are fortuitous. To the contrary, investigation is largely scientific. There is room for hunch and theory, but only within the confines of a rigid methodology. An understanding of the principles of forensic science (which are the same as for science generally) is essential to successful investigations. Many investigations are resolved within hours of the commission of the crime, primarily as a result of victim and witness statements, but these statements themselves may be bolstered at the time of trial by corroborating **forensic evidence**.

Scientists utilize a **protocol** to structure their investigations (that is, the scientific method). The terminology varies, but the steps are generally the same. The objective is to arrive at a conclusion that others can replicate by applying the same protocol. Scientists have evolved a vocabulary for discussing this protocol; many of the terms are defined in the following sections.

Parsimony

According to the **principle of parsimony**, one should seek the simplest explanation for the phenomenon being examined. For example, if an automobile refuses to start, a mechanic might list possible reasons, from the simplest to the most complex:

1. No gas
2. No spark
 - a. Low water in battery
 - b. Bad battery cables
 - c. Bad battery connections
 - d. Failed battery
 - e. Failed starter

TABLE 1.1 Types of Evidence

- **Physical evidence:** Evidence that can be touched and evaluated tactually
- **Testimonial evidence:** Words communicated by testifying witnesses
- **Circumstantial evidence:** Everything that is not eyewitness testimony
- **Forensic evidence:** Physical evidence that requires scientific validation

A skilled mechanic would check the battery and its connections before replacing the starter. In doing so, he or she would be applying the principle of parsimony.

Specification

In any scientific experiment, **specification** of what exactly is going to be done and how it is to be done is important. Researchers may evaluate the procedure employed to determine if anything in the setup might have affected the outcome in ways other than intended.

Scientific Method

Researchers must first decide which particular phenomenon they wish to observe. It is imperative that the working **hypothesis** formulated by the research group that is utilizing the **scientific method** include an anticipated outcome and a supposed cause (i.e., a variable being tested to see whether it is a cause of the outcome). Only one variable can be examined or changed at a time. Changing or testing more than one variable at a time would render any observed outcome useless, for it would be impossible to tell which of the variables caused the outcome.

Observation

Scientists conduct experiments under controlled conditions to determine what happens when certain variables change. In many instances, what happens cannot be observed with the naked eye. Therefore, scientists use an array of instruments to assist in the **observation** process, such as microscopes, spectrometers, chromatographs, audio recorders, and cameras, to mention just a few. Note that scientists occasionally observe with senses other than sight.

Recording

Most scientific experiments take place over time and involve complex designs. **Recording** each step of the experimental method ensures that other experimenters can replicate the results. It is replicability that moves a phenomenon from art or “magic” to science.

Taxonomy

After the experiment, it may be necessary to group specific characteristics of the observed phenomena to create a **taxonomy**. Firearms examiners use taxonomic characteristics in classifying cartridges, cases, and bullets. During examination, they focus on one characteristic at a time.

Analysis

Data can only be used if broken down into parts. As in the construction of a jigsaw puzzle, the placement of a piece requires a detailed examination of that piece as well as the adjoining pieces. At the crime scene, the investigator gathers information from three separate sources: people, records, and physical evidence (Osterburg & Ward, 2010). Exceptional organizational skills are required to gather information from these sources and to render that information into a usable form. The organization of the information is the first step in the analytic process. It is difficult to analyze anything when overwhelmed by incoming data. Sorting, classifying, and organizing the information allows **analysis** to begin.

Once investigators have interviewed people, reviewed records, and examined evidence, they must **synthesize** the discrete data elements into a working hypothesis. What happened? When did it happen? Where did it happen? How did it happen? Who made it happen? These are the questions investigators

seek to answer. In creating a hypothesis, investigators must try to suggest answers to as many of the posed questions as possible, based not on conjecture but on an examination of the gathered data.

Hypothesis

A working hypothesis is like an incomplete jigsaw puzzle that comes together a piece at a time. To carry on the analogy, the puzzle is old and in a container other than the original; you do not know what the puzzle picture is; and you do not know if all the pieces are provided or if there are pieces that do not belong to that puzzle. A picture will nonetheless begin to form as you put pieces together. At some point, what the puzzle depicts may suddenly seem apparent, and you will be able to form a hypothesis as to the full image. If subsequent pieces show the image to be different than first guessed, the hypothesis must be revised. Any criminal investigation faces the challenges of arriving at an apparent image without sufficient puzzle pieces and of disregarding the pieces that do not fit. As the investigation progresses, new corroborating facts will be added and the interpretation of some old facts changed. This is the process whereby the hypothesis advances toward becoming a theory.

Theory

As data are added, the hypothesis begins to take on a life of its own. It becomes more solidly based and evolves into a **theory** that begins to explain and predict.

Inductive Reasoning

We all come to answers in life based on experience. A series of similar or repeated experiences allows us to generalize to conclusions. If a person has had a bad experience with drinking water in another country and then suffers a repeat episode, he or she may jump to the conclusion that water in other countries is not safe to drink. This conclusion is incorrect. It may well be that water in the particular village, city, or establishment was tainted, but generalizing to the quality of water in all other countries is an unsupported leap.

Most of life's lessons (which we might place under the rubric "common sense") are brought to us by way of **inductive reasoning**, which is also an integral part of the scientific method. When applying inductive reasoning, you must keep in mind that you are usually dealing with probabilities, not certainties.

Deductive Reasoning

Conclusions can be reached through **deductive reasoning** as well. In a valid deductive argument, if the premises are true, the conclusion must be true. Consider this argument: All other countries have poor-quality water. Canada is a country. Therefore, Canada has poor water quality. The conclusion is certain on the condition that the premises are true. Note, however, that if even one of the premises of a deductive argument is not true, the conclusion remains uncertain. As pointed out earlier, many other countries have stringent sanitation regulations, which means that the first premise of the example deductive argument, far from being known to be true, is known to be false. Therefore, the argument does not help us determine whether Canada has poor-quality water—it may, or it may not.

■ Criminal Investigation and the Scientific Method

The scientific method usually is employed only partially in a criminal investigation. Two variables dictate the determination of which parts can be used: the type of crime being investigated and the type of information available. In a homicide, investigators use a variety of skills that derive from the scientific method. The following scenario identifies the various components of the scientific method and where they come into play.

TABLE 1.2 Applying the Scientific Method

Scientific Method	Criminal Investigation
Describe the phenomenon.	Identify what crime was committed.
Build a hypothesis.	Develop a working hypothesis based on information and evidence.
Collect data.	Gather records, evidence, and corroborative or uncorroborative information.
Test the hypothesis.	Constantly review all the facts, whether consistent or inconsistent with the working hypothesis; focus the case when the facts allow; interview or interrogate the suspect.
Continue to collect data.	As the finger of suspicion begins to point, gather any and all additional corroborative data.
Arrive at a theory.	Once probable cause has been attained, arrest the suspect. Provide all evidence to the prosecution, both inculpatory and exculpatory.

Source: Osterburg and Ward (2010).

It is apparent that an investigation goes through many stages in the attempt to reconstruct the past. What is not apparent is the scientific method employed in most investigations (**Table 1.2**). Investigators may lack the necessary vocabulary or be ignorant of scientific method and thus attribute many conclusions reached during investigations to “street savvy,” hunches, or intuition. Rather, what is really at work is the process of inductive reasoning progressing through to the use of deductive reasoning. Many of the steps may be unidentified or misidentified, but they are still there. If investigators applied the scientific method intentionally and systematically rather than unconsciously or haphazardly, they would be greatly assisted in their reconstruction of the past.

Case in Point

The Scientific Method at Work

A homicide investigator has been called to the scene of an apparent suicide. In the kitchen of a small rural home, a body lies next to an overturned chair and a shotgun. The right foot of the deceased is bare, and a string tied in a bow around the big toe is also tied around the trigger of the shotgun. There is a large wound in the victim's chest and considerable tissue and blood residue on the barrel of the shotgun. Behind the victim is a waist-high hole in the wall about the size of a little finger.

These facts considered in their totality give some support to the hypothesis that this was a suicide. There appears to have been no struggle, and the weapon is in close proximity to the body. The hole in the wall is a bit troubling. The investigator's experience (inductive reasoning) tells him that shot shells do not leave such a hole unless they are chambered for a rifled round (shotguns have a cartridge that contains either numerous pellets or a single projectile). He examines the shotgun (analysis) and discovers that the two chambers of the double-barreled shotgun both contain a shell. One is spent. Upon removing it, he notes that the shell contains pellets. His hypothesis that a suicide occurred does not explain the hole in the wall (synthesis). If he is wedded to his hypothesis, he may choose to ignore this anomaly. Or he may begin to ask some additional questions:

- Who was present at the time of the shooting?
- Did the hole in the wall exist prior to the shooting?
- Are there other weapons on the premises?

Pursuing answers to these questions will provide information that can be used as a basis for further reasoning.

The investigator learns that only the victim's wife was present at the time of the incident, and she does not seem to be aware of any structural flaws in the kitchen wall. She tells the investigator that there is also a 30-caliber hunting rifle in the gun cabinet in the

(continues)

living room. Another hypothesis begins to take shape. Could the wife have murdered her husband? There are only two possibilities if the wife is telling the truth: suicide or homicide (with the wife as the primary suspect).

The investigator notices that the victim is wearing his wristwatch on his left wrist, which suggests he was right-handed. The investigator begins to gather information that he sees as consistent with right-handedness (classification):

- The wristwatch is on the victim's left wrist.
- The victim's wallet is in his right rear pants pocket.
- The victim's right front pants pocket is worn.
- There is a pocketknife in the right front pants pocket.
- There is a ballpoint pen in the left shirt pocket.

The wife confirms that her husband was right-handed.

The investigator begins to gather information that he sees as inconsistent with right-handedness (classification):

- The right foot has been bared.
- The string is tied to the right big toe.

The investigator's assumption, based on experience and reason, is that a right-handed person would have bared his left foot and tied the string to his left big toe (induction). That the facts conflict with this assumption suggests that someone else tied the string (deduction). The investigator suspects homicide (synthesis, theory), and he has the crime scene handled in a manner appropriate for an investigation of a homicide.

The medical examiner confirms that a hole consistent with the passage of a 30-caliber bullet through the body was made prior to the shotgun blast. The laboratory discloses that the bow tied to the victim's big toe was tied not from the victim's position but rather from a reversed position, by someone facing the sole of the foot. The prosecution's theory of the case, which it will attempt to prove by presenting forensic evidence, is that the wife shot her husband with the hunting rifle while they were both sitting at the kitchen table. She then took the shotgun and placed the barrel at her husband's chest and fired, thereby obscuring the original and fatal wound. Stripping his foot bare and tying the string to his toe was her final attempt at making the homicide look like a suicide.

■ Importance of Forensic Evidence

Crime lab reports seem to have an aura of invincibility about them. Maybe we believe that the reported results are based on "science," which, in turn, can be empirically tested. Because report contents can be checked, we assume that no lab technician would falsify a report.

What happens to a piece of forensic evidence from the time of its discovery until it appears in the courtroom? First, we should realize that the discovery itself could affect the integrity of the evidence. After the evidence is discovered, it has to be collected; it is then packaged, labeled, and transported—four more chances for error. It is then stored, removed from storage, and again transported, this time to the laboratory. At the laboratory, the evidence is logged in, placed in storage, again removed from storage, kept from intermingling with other evidence, and documented properly. All of this activity occurs before any tests are performed.

Next, the evidence is taken to a clean, contamination-free work area, where it must be unpackaged properly. The item must be inspected visually and described properly in detail to document its condition before any work is performed on it. In most instances, it will be photographed, weighed, and sketched. Only then will the lab technician consider beginning any laboratory work.

The technician must figure out what test or tests are appropriate, determine if sufficient amounts of the evidence exist for those tests, and then properly dissect the portion to be tested and properly prepare the testing material, all while continuing to document each step. Only then does any testing begin. Some tests might include as many as five or six separate procedures, each of which must be performed properly and documented, with the evidence afterward being repackaged, relabeled, and once again transported to storage properly. Then the technician interprets what the experiments have disclosed.

The evidence must next be removed from the lab's storage area, logged out, transported to the police evidence area, logged in, and stored properly until the prosecuting attorney decides whether more testing should be performed, at which point the whole process begins anew. Once tested and recorded, the evidence has to make it to the courtroom for the preliminary examination, back to storage, possibly back to the lab for more testing, back to the police, and so on.

It is clear that no other type of evidence is exposed to anywhere near as many opportunities for destruction, mishandling, contamination, or other conceivable catastrophes that can be brought on by human or natural error as forensic evidence. Forensic science in police work is becoming increasingly important, not only because of advances in science but also because of changes in the legal system. In *Miranda v. Arizona* (1966), the U.S. Supreme Court held that a suspect must be told of the Fifth Amendment protection against self-incrimination and the Sixth Amendment right to counsel during interrogations (**Exhibit 1.1**). This decision required police to rely less on confessions and more on forensic evidence in obtaining convictions.

■ Objectives of an Investigation

It is a common misconception that every crime is solvable and that the perpetrator always leaves traces at the crime scene that inevitably lead to his or her door. What is true is that a person cannot enter a crime scene without leaving something and taking something (perhaps only something microscopic). Finding the perpetrator's traces does not guarantee a resolution to the investigation, but it is a step in that direction.

Solving a crime means different things to the public than to a criminal investigator. The public believes a crime has been solved when the perpetrator has been identified and apprehended. However, identification and apprehension are but two of the seven objectives of a police investigation:

1. Crime detection
2. Locating and identifying suspects (Before a crime scene can be processed, individual perpetrators must be removed from the premises because they pose a danger to police, investigators, and others.)
3. Locating, recording, and processing evidence while observing all constitutional considerations

EXHIBIT 1.1

The Fifth and Sixth Amendments to the U.S. Constitution

Fifth Amendment

No person shall be held to answer for a capital or otherwise infamous crime, unless on a presentment, or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the militia, when in actual service in time of war or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy, of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Sixth Amendment

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

4. Arresting the perpetrator(s) while observing all constitutional considerations
5. Recovering property pursuant to Fourth Amendment requirements
6. Preparing for trial, including completing accurate documentation
7. Convicting the defendant by testifying and assisting in the presentation of legally obtained evidence and statements

Presuming a crime has been committed, the search for truth and the reconstruction of the crime scene are of little value if evidence necessary to the trial of the case is lost, destroyed, or contaminated. Recognizing that the evidence recovered and the steps in its recovery are the foundations upon which the prosecution must build its case allows for a wider view of the criminal investigation process.

Finding the perpetrator is often the simplest part of the job. Obtaining evidence in support of a conviction may be more difficult. Some “successful” investigations do not result in convictions, and some “failed” investigations do result in convictions. A less-than-elegant investigation may nonetheless result in a plea bargain, whereas the best-run investigation may run out of leads.

■ Investigator’s Role

The expansion of science and technology raises the question of whether the forensic scientist has replaced the criminal investigator. The answer is clearly no. On the contrary, the investigator’s role has been enhanced, because the evidence collected has increased value in the hands of a forensic specialist who knows how to extract its meaning but who depends on the investigator to put its meaning into context. The investigator and the forensic scientist work cooperatively (albeit frequently physically apart). The investigator recognizes what is important physical evidence, and the scientist processes it. Because of his or her experience, the investigator knows where to look for evidence and how to weigh its significance. The scientist knows how to handle, analyze, record, and interpret forensic evidence.

Many agencies, especially those with a large volume of cases and extensive resources, place an intermediary between the criminal investigator and laboratory scientists. In these agencies, forensic technicians actually recover, tag, and bag all evidence discovered by on-scene investigators. A criminal investigator need only locate prospective evidence and then leave it to the trained technicians to process it. Note that this text will treat the criminal investigator as both the finder of evidence and the person responsible for photographing, tagging, handling, and maintaining all evidence gathered at the crime scene.

OFFICER’S NOTEBOOK

Definition of a Successful Investigation

For the purposes of this text, a successful investigation is one in which the following statements are true:

- All available physical evidence is handled competently.
- All witnesses are interviewed intelligently.
- All suspects are interrogated effectively.
- All leads are developed.
- All documentation is completed comprehensively, clearly, and accurately.

■ Selecting Investigators

A criminal investigator must possess a variety and range of skills not called for in any other profession (**Table 1.3**). In addition, the investigator must be emotionally stable, physically fit, and self-motivated. Where are such extraordinary people found? The story of criminal investigation is the story of men and women who developed an understanding of the criminal mind and criminal motivation while on the street.

Indeed, there has been a time-honored tradition of selecting prospective investigators from the ranks of patrol personnel, with little regard for education and training. It was presumed that any officer

TABLE 1.3 Skills and Competencies Crucial in Criminal Investigators

- *Rational thinking (deductive and inductive reasoning)*. This includes the ability to relate a large number of seemingly unrelated facts. The investigator must let facts determine a hypothesis and theory, rather than fitting facts to a preexisting theory. The hypothesis and theory must be based on scientific (objective) observation and recall.
- *Critical thinking*. The investigator must be able to “see” and not just look; to allow critical thinking to flow as facts are gathered and a hypothesis is synthesized.
- *Analytic thinking*. The investigator must recognize evidence or potential loci of trace evidence and digest information from numerous sources. He or she must have the ability to see where pieces of the puzzle may fit based on the relationship of various bits of information to other bits of information.
- *Ethics and integrity*. The investigator should possess a personal philosophy based on honor, integrity, and duty and should avoid confusion, ambiguity, and corruption.
- *Human anatomy*. The investigator should be able to determine the nature and quality of wounds inflicted on a victim and to separate postmortem (after death) from antemortem (before death) injuries. He or she should be able to recognize defensive wounds and possible rape.
- *Human physiology*. The investigator should know something about putrefaction (gas formation) and decomposition, as well as insect larvae cycles and marine depredation.
- *Psychology*. All human discourse is based on concepts of worth and esteem. An ability to assess the mental state of victims, witnesses, and suspects is essential for successful interviewing and interrogation.
- *Sociology*. Effective communication depends on the ability to recognize socioeconomic factors and their effect on the language, customs, and sensitivities of victims, witnesses, and suspects.
- *Archaeology*. Like field and marine archaeologists, the criminal investigator must locate all evidence geographically (where) and temporally (when).
- *Pharmacology*. In a death or drug investigation, the investigator may need to identify controlled substances, clandestine laboratories, or death as a result of poison.
- *Firearms*. In a society that values self-defense and handguns, the investigator must be able to handle, identify, and process firearms safely.
- *Language and communication*. Approximately 90% of what an investigator does involves language-based communication, from interviews to court testimony.
- *Constitutional law*. Of what value is a superb investigation if, in the process, individual constitutional rights are violated, rendering evidence inadmissible?
- *Law of evidence and its admissibility*. Although it is not necessary to be a lawyer to be a competent criminal investigator, it is necessary to know the evidentiary predicates (formal steps required of a lawyer attempting to admit particular types of evidence) for all evidence to be admitted at the time of trial.
- *Criminalistics (forensic science)*. The more an investigator knows about forensic evidence, the less likely mishandling and contamination are to occur.

who had accrued time in the ranks possessed the basic qualifications needed by a criminal investigator, and few other departmental requirements existed. Whatever skills were required by the job could be readily picked up on the job, supplemented by a brief stint at a school for investigators.

Many agencies now have incorporated a civil service examination to standardize the requirements for criminal investigators. The future will see men and women selected as criminal investigators because of their background in science or the law. University criminal justice curricula will require more science, computer, and law courses and will favor minors in science rather than sociology or psychology. Most agencies recognize that detective candidates need:

- An active imagination
- Patience
- An ability to be a team player
- An ability to communicate
- An ability to recognize his or her audience
- An understanding of search and seizure law and its application
- An understanding of *Miranda vs. Arizona* and the line of cases flowing from it
- Tenacity
- Honesty and integrity
- Good physical condition
- Excellent writing skills
- An ability to recognize discrimination and remove it from the investigative process
- An ability to testify objectively and professionally
- An ability to be a leader

■ The Legal Team

Investigators and prosecutors are the most visible members of the criminal investigation team. Mutual respect fosters communication and assists in the trial and pretrial process, but the relationship between prosecutors and police frequently is adversarial or nonexistent. Police think that prosecutors often dismiss good cases or plea-bargain cases that should be tried. In most instances, their attitude toward prosecutors is a product of a difference in the legal criteria police and prosecutors use in carrying out their duties. Whereas police need only **probable cause** to arrest a suspect, prosecutors must prove a case **beyond a reasonable doubt**—two different standards. When this fact is noted, it makes sense that conflict will sometimes arise between police, who may believe they have a good case and made a “righteous” arrest, and prosecutors, who may not see sufficient evidence to win a conviction. Police may have done everything correctly and their case may still not satisfy the legal requirements for a conviction.

Police are bound by Fourth Amendment considerations in the delivery of their services to the community (**Exhibit 1.2**). Police must have probable cause to search or to seize people or property. The seizure of people is called **arrest**, and it must be predicated upon information that would convince a reasonable person that a crime has been or is about to be committed. In trying to understand the standard of probable cause, it is often useful to view it as requiring a 51% probability that the individual has committed or is committing a crime (i.e., it is more likely than not).

Prosecutors, on the other hand, must evaluate evidence in its entirety, including that which justifies the arrest, and must determine whether they can convict the defendant on evidence beyond

EXHIBIT 1.2

The Fourth Amendment to the U.S. Constitution

The right of the people to be secure in their persons, houses, papers and effects, against unreasonable searches and seizures, shall not be violated, and no warrants shall issue, but upon probable cause, supported by oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

a reasonable doubt. For comparison purposes, we can consider reasonable doubt as approximately equivalent to requiring more than a 90% probability that the person has committed the crime for which he or she is charged. That 39% difference (between 51% and 90%) constitutes a considerable gap and partly explains why arrest rates are higher than conviction rates. Police and prosecutorial staff will find it easier to cultivate a good relationship if they understand and appreciate that difference.

Prosecutors prosecute those cases in which they have confidence. That confidence is based on the quantity and quality of evidence, the quality of documentation supporting an investigation, and the ability of investigative witnesses to communicate from the witness stand.

If the conditions are favorable to the prosecution, the case will be prosecuted or a severe plea bargain reached. Victories do no damage to a prosecutor's career, or to an investigator's. Victory is self-perpetuating. If an investigator's cases consistently meet the conditions described above, they will be prosecuted consistently and conviction will result frequently. If, on the other hand, a case fails to meet one of these conditions, the probability of prosecution or conviction (if the case is prosecuted) diminishes. A prosecutor who has serious misgivings about a case or about an investigator is less likely to prosecute not only the case in question but also future cases handled by that investigator.

■ Admissibility of Evidence

It is the investigator's job to collect all of the available evidence, and it is the prosecutor's and the court's job to weigh the significance of the evidence. The first threshold that evidence must pass is that of proof of admissibility in court, called the **predicate**. All investigators must have not only an understanding of the rules of evidence admissibility but also a working knowledge of the foundation upon which all types of evidence are ushered before the court. It also pays to have a working relationship with the prosecutor and an understanding of the prosecutor's style when he or she asks formal questions allowing evidence to be admitted. New prosecutors may be less familiar with required evidentiary predicates than an experienced investigator. Absent the appropriate predicate, evidence otherwise admissible will not be admitted. It is helpful if the testifying investigator can assist the prosecutor in establishing the necessary predicates and can anticipate the types of questions that will establish those predicates. For example, the predicate for admitting photographs is not complicated, but the standard could remain unmet if either the prosecutor or the testifying investigator is not familiar with the format.

All evidence has a specific predicate that must precede its submission to the court. In essence, all evidence comes to the jury through the mouth of a witness. A piece of evidence will have no bearing on the outcome of the case, despite having been appropriately handled, stored, and presented to the prosecution, if the **evidentiary foundation** (predicate) for its admissibility is lacking. Once evidence has passed the test of admissibility and is made a part of the court record, it has the potential to influence the outcome of the trial. Such evidence is said to be **probative** (more likely than not to prove a

fact in issue). Evidence is not the same as a fact. Facts are derived from evidence. Evidence may tend to prove a fact, or may not, or it may be just strong enough to create a reasonable doubt.

OFFICER'S NOTEBOOK

Proper In-Court Admission of Evidence

Q: Lieutenant, I hand you what has been marked as State's Exhibit No. 1 and ask you if you recognize it.

A: Yes.

Q: What is it?

A: A photograph of the bedroom at 337 Sisterdale Road.

Q: Does it fairly and accurately portray the scene as you remember it?

A: Yes.

The prosecution would then offer the photo to the defense for any objections. Once those objections had been addressed, the prosecution would offer the photograph to the court as evidence.

The investigator must know what evidence is required to determine the issue of guilt; whether such evidence indicates or fails to indicate guilt; and, when guilt is apparent, whether such evidence is likely to prove guilt beyond a reasonable doubt. The success of an investigation, as already noted, depends on the evidence collected and its legal significance. It is important to remember that a verdict of acquittal does not mean the defendant is innocent, but rather that the defendant has not been proven guilty beyond a reasonable doubt. A not-guilty verdict is not always a vindication, contrary to what defendants usually claim, as evidenced by findings of negligence in a civil suit based on the same testimony and evidence.

SUMMARY

In this chapter, we were introduced to the world of the criminal investigator, and we discovered some of the players and some of the contributors to the methodology employed in processing a crime scene. It must be noted that an entire academic life could be spent studying the history of criminal investigation in the United States and in England and that the purpose of this chapter is to provide only a historical perspective. The ultimate objective of all the work done by criminal investigators, laboratory personnel, and prosecutors is to be able to present the discovered evidence in a court of law. Recent news reports tell us of serologists and DNA technicians who have fabricated evidence in an effort to save time and effort. Even in the trial of O.J. Simpson, where the suspect was accused of multiple homicides, forensic personnel handled evidence with their bare hands and a criminal investigator lied on the witness stand. To what end is the best investigation if what we discover cannot be presented at trial?

Everything brought to the crime laboratory came from a crime scene. As such, the next chapter deals with crime scenes and the information needed to understand the nature, breadth, and scope of what is left to be processed after a crime has been committed.

KEY TERMS

Alec Jeffreys: Scientist who developed the method of DNA fingerprinting

Alphonse Bertillon: Person who developed the first scientific system of identification for use in criminal investigation

American Academy of Forensic Sciences (AAFS): The professional organization governing the forensic sciences

analysis: Rendering information into a form that allows it to be used

arrest: To place a person in the custody of a law enforcement agency

August Vollmer: The father of law enforcement professionalism

beyond a reasonable doubt: The standard of certainty necessary to convict someone of a crime

bobby: Colloquial term for a police officer, which arose due to the close association of Sir Robert Peel with the Metropolitan Police Department in London

circumstantial evidence: Everything that is not eyewitness testimony

constables: Law enforcement officers in London appointed by local justices, to whom they owed their allegiance and continued employment

copper: Colloquial term for a police officer, coined because the members of the first uniformed police force in New York City wore badges made of copper

coroner: In the English coroner system, this person was authorized by the justice courts to attach or arrest witnesses or suspects and to appraise and safeguard any lands or goods that might later be forfeited by reason of guilt of the accused

deductive reasoning: Drawing conclusions based on premises that are certain (known to be true)

Edward T. Blake: Provided the DNA testimony and evidence for the first DNA trial in the United States

evidentiary foundation: Basis for a conclusion that was determined using collected evidence; predicate

forensic evidence: Physical evidence that requires scientific validation

forensic pathology: Area of medicine pertaining to studying the causes of human death

genetic fingerprint: The DNA fingerprint of an individual

hue and cry: Alarm sounded by constables to summon help from citizens to apprehend a criminal

hypothesis: Prediction of outcome made in advance of testing a particular phenomenon

inductive reasoning: Drawing conclusions based on probabilities rather than certainties

inquest: A formal inquiry

Jack the Ripper: The popular name given to a serial killer who killed a number of prostitutes in the East End of London in 1888

medical examiner: A physician who works for a law enforcement agency to investigate the cause of any death that could have resulted from a crime or that occurred in a suspicious or unusual manner

Miranda v. Arizona: Supreme Court decision that requires that a suspect be told of the Fifth Amendment protection against self-incrimination and the Sixth Amendment right to counsel during interrogations

observation: Determination of what happens in an experiment when certain variables are changed

pathology: The branch of medicine associated with the study of structural changes caused by disease or injury

Paul Leland Kirk: Established criminology as an academic discipline and wrote *Crime Investigation*

physical evidence: Evidence that can be touched and tactually evaluated

predicate: Proof of admissibility in court

principle of parsimony: Principle that one should seek the simplest explanation for the phenomenon being examined

probable cause: Information that would lead a reasonable person to believe that a crime has been or is about to be committed

probative: Likely to prove a fact

protocol: Set of steps followed to arrive at a conclusion that can be replicated by others using the same set of steps

recording: Making note of each step of the experimental method employed so that the experiment can be repeated and the results replicated

scientific method: Formulation of a hypothesis and development of a protocol to test a hypothesis to identify factors causing a particular phenomenon

specification: Designation of what is going to be done and how it is to be done

synthesize: Combining data to form a working hypothesis

taxonomy: Classification of observed phenomena into groups that share specific characteristics

testimonial evidence: Words communicated by testifying witnesses

theory: A hypothesis that is supported by data

thief catcher: A person hired to locate someone's stolen goods; this person was often a thief himself or a moonlighting constable

Tommie Lee Andrews: The first person to be convicted in the United States based on DNA evidence

REVIEW QUESTIONS

1. Are all crimes solvable?
2. What are the seven objectives of a police investigation?
3. What was the significance to investigators of the U.S. Supreme Court decision in *Miranda v. Arizona*?
4. What are the steps and characteristics of a successful criminal investigation? Mention these in the course of describing such an investigation.
5. What types of skills and competencies should a criminal investigator possess?
6. What is the purpose of using the scientific method?
7. What is meant by "all evidence comes to the jury through the mouth of a witness"?
8. What type of law enforcement system was established in early colonial America? Where did it come from and what were its shortcomings?

9. What were thief catchers, and what role did they play in the evolution of law enforcement in London?
10. Who were the Bow Street Runners, and what contribution did they make to the evolution of English law enforcement?
11. How did the office of coroner evolve, and what was its impact on the establishment of the office of medical examiner?
12. What is DNA?
13. What was Alec Jeffreys's contribution to the study of DNA?
14. What role does the AAFS play in the standardization of forensic processes?
15. What was Edward T. Blake's contribution to forensic science?
16. What crime did Tommie Lee Andrews commit?
17. Who was Paul Leland Kirk?

REFERENCES

- Beeler, L., & Wiebe, W. R. (1988). DNA identification tests and the courts. *Washington Law Review*, 63, 903.
- Begg, P. (2004). *Jack the Ripper: The facts*. London: Robson Books.
- Browne, W. H. (Ed.). (1885). *Archives of Maryland*. Vol. 3. Baltimore: Maryland Historical Society.
- Galton, F. (1892). *Finger prints*. London: MacMillan.
- James, R. (2009, June 19). A brief history of DNA testing. *Time*. Retrieved August 14, 2011, from <http://www.time.com/time/nation/article/0,8599,1905706,00.html>
- Johnson, H. A., Wolfe N. T., & Jones, M. (2008). *History of criminal justice* (4th ed.). Burlington, MA: Elsevier.
- Kirk, P. L. (1953). *Crime investigation*. New York: Interscience.
- Latrobe, J. G. (1861). *Justices' practice under the laws of Maryland* (6th ed.). Baltimore: Lucas.
- Linebaugh, P. 2003. *The London hanged: Crime and civil society in the eighteenth century*. London: Veros.
- McMullan, J. L. (1996). The new improved monied police: Reform, crime control, and the commodification of policing in London. *British Journal of Criminology*, 36, 85–108.
- Miller, W. R. (1977). *Cops and bobbies: Police authority in New York and London, 1830–1870*. Chicago: University of Chicago Press.
- National Institute of Justice. (1999). *Forensic sciences: Review of status and needs*. Retrieved August 13, 2011, from: www.ncjrs.gov/pdffiles1/173412.pdf
- Osterburg, J. W., & Ward, R. H. (2010). *Criminal investigation: A method of reconstructing the past* (6th ed.). New Providence, NJ: LexisNexis Group.
- Radzinowicz, L. (1986). *A history of English criminal law and its administration from 1750*. London: Stephens.
- Spitz, W. U., Spitz, D. J., & Fisher, R. S. (2006). *Spitz and Fisher's medicolegal investigation of death: Guidelines for the application of pathology to crime scenes* (4th ed.). Springfield, IL: Charles Thomas.
- Thorwald, J. (1965). *The century of the detective*. New York: Harcourt World.
- Tobias, J. J. (1979). *Crime and police in England 1700–1900*. London: St. Martin's Press.
- Wambaugh, J. (1985). *The bloodying*. New York: Bantam.