

Chapter Overview

A crime cannot be committed without the perpetrator leaving some sort of evidence at the scene, no matter how minute. Trace evidence—small amounts of material physically transferred when two people or objects come into contact with each other—can be in the form of hair, clothing fibers, blood, or skin cells. Trace evidence can help investigators piece together details of a crime. Because this evidence can be easily disturbed, the area in which a crime took place must be properly secured as soon as possible. All evidence from a crime scene must be properly collected and preserved.

The Big Ideas

Crime-scene investigators recognize, document, collect, and organize evidence left at the scene of a crime. Investigators apply specific procedures and techniques to collect trace evidence, a kind of circumstantial evidence. It is extremely important to preserve both *direct* and *indirect* evidence so that professionals can recreate as complete a picture as possible of what took place before, during, and after a crime. Investigators must secure the crime scene; separate witnesses; take photographs and sketch the scene; and search, secure, and properly package evidence.

CHAPTER 2

Crime-Scene Investigation and Evidence Collection

LESSONS FROM THE JONBENET RAMSEY CASE

The 1996 homicide investigation of six-year-old JonBenet Ramsey provides valuable lessons in proper crime-scene investigation procedures. From this case, we learn how important it is to secure a crime scene. Key forensic evidence can be lost forever without a secure crime scene.

In the Ramsey case, the police in Boulder, Colorado, allowed extensive contamination of the crime scene. Police first thought JonBenet had been kidnapped because of a ransom note found by her mother. For this reason, the police did not search the house until seven hours after the family called 911. The first-responding police officer was investigating the report of the kidnapping. The officer did not think to open the basement door, and so did not discover the murdered body of the girl.

Believing the crime was a kidnapping, the police blocked off JonBenet's bedroom with yellow and black crime-scene tape to preserve evidence her kidnapper may have left behind. But they did not seal off the rest of the house,



The Ramsey Home in Boulder, Colorado.

which was also part of the crime scene. Then the victim's father, John Ramsey, discovered his daughter's body in the basement of the home. He covered her body with a blanket and carried her to the living room. In doing so, he contaminated the crime scene and may have disturbed evidence. That evidence might have identified the killer.

Once the body was found, family, friends, and police officers remained close by. The Ramseys and visitors were allowed to move freely around the house. One friend even helped clean the kitchen, wiping down the counters with a spray cleaner—possibly wiping away evidence. Many hours passed before police blocked off the basement room. A pathologist did not examine the body until more than 18 hours after the crime took place.

Officers at this crime scene obviously made serious mistakes that may have resulted in the contamination or destruction of evidence. To this day, the crime remains unsolved. Go to the Gale Forensic Sciences eCollection for more information on this case.

SCENARIO

Divide the class into groups of three or four students, and have each group read the scenario.

As a class, discuss the following questions:

What mistakes were made by the Boulder Police Department in securing the crime scene?

What specific kinds of evidence may have been compromised?

What could the police have done differently to secure the crime scene and the evidence?

KEY SCIENCE CONCEPTS

Biology: blood typing

Earth Sciences: different ways to study soil

Mathematics: calculating odds

OBJECTIVES

By the end of this chapter you will be able to:

- 2.1 Summarize Locard's exchange principle.
- 2.2 Identify four examples of trace evidence.
- 2.3 Distinguish between direct and circumstantial evidence.
- 2.4 Identify the type of professionals who are present at a crime scene.
- 2.5 Summarize the seven steps of a crime-scene investigation.
- 2.6 Explain the importance of securing the crime scene.
- 2.7 Identify the methods by which a crime scene is documented.
- 2.8 Demonstrate proper technique in collecting and packaging trace evidence.
- 2.9 Describe how evidence from a crime scene is analyzed.

VOCABULARY

chain of custody the documented and unbroken transfer of evidence

circumstantial evidence (indirect evidence) evidence used to imply a fact but not prove it directly

class evidence material that connects an individual or thing to a certain group (see *individual evidence*)

crime-scene investigation a multidisciplinary approach in which scientific and legal professionals work together to solve a crime

crime-scene reconstruction a hypothesis of the sequence of events from before the crime was committed through its commission

direct evidence evidence that (if true) proves an alleged fact, such as an eyewitness account of a crime

first responder the first police officer to arrive at a crime scene

individual evidence a kind of evidence that identifies a particular person or thing

paper bindle a folded paper used to hold trace evidence

primary crime scene the location where the crime took place

secondary crime scene a location other than the primary crime scene, but that is in some way related to the crime, where evidence is found

trace evidence small but measurable amounts of physical or biological material found at a crime scene



Teaching Resources

- Instructor's Resource CD-ROM includes:
 - PowerPoint Presentation
 - Lesson Plan and extended Objective Sheets
 - Instructor Notes and Activities
 - Activity Forms
 - Rubric
- ExamView CD-ROM
- E-book on CD-ROM

Web site: school.cengage.com/forensicscience

Engage

Share the following scenario with your students: after seeing a movie, you and a group of friends walk to your car in the movie theater parking lot to find the driver's-side window shattered and the door wide open. Looking inside the car, you find that the car stereo and all of your CDs have been stolen. What specific evidence could have been left in or around your car to help the police find the person or persons who committed this crime? What should you and your friends do to preserve any evidence that may be present?

Explore

Ask students to watch you as you walk around the room picking up or moving certain objects. Then, ask the students to write down exactly what they saw you do. Ask for volunteers to read their accounts aloud. Were all the accounts the same? Were some accounts more detailed than others? (Maybe they described exactly how many steps you took or how many times you picked up a pencil.) Allow students to debate what you did and in what order it occurred. Which account did the students say was most reliable? What does it mean to be a reliable witness? What kinds of things could discredit an eyewitness?

Evaluate

Ask students to discuss these questions. If an eyewitness to a crime is a relative, friend, or acquaintance of the person committing the crime, would he or she be a more or less reliable witness? Why or why not?

INTRODUCTION

How is it possible to identify the person who committed a crime? A single hair or clothing fiber can allow a crime to be reconstructed and lead police to the responsible person. The goal of a **crime-scene investigation** is to recognize, document, and collect evidence at the scene of a crime. Solving the crime will then depend on piecing together the evidence to form a picture of what happened at the crime scene.

Obj. 2.1
and 2.2

PRINCIPLE OF EXCHANGE

Whenever two people come into contact with each other, a physical transfer occurs. Hair, skin cells, clothing fibers, pollen, glass fragments, debris from a person's clothing, makeup, or any number of different types of material can be transferred from one person to another. To a forensic examiner, these transferred materials constitute what is called **trace evidence**. Some common examples of trace evidence include:

- Pet hair on your clothes or rugs
- Hair on your brush
- Fingerprints on a glass
- Soil tracked into your house on your shoes
- A drop of blood on a T-shirt
- A used facial tissue
- Paint chips
- Broken glass
- A fiber from clothing

The first person to note this condition was Dr. Edmond Locard, director of the world's first forensic laboratory in Lyon, France. He established several important ideas that are still a part of forensic studies today. *Locard's exchange principle* states that when a person comes into contact with an object or another person, a cross-transfer of physical evidence can occur. The exchanged materials indicate that the two objects were in contact. Trace evidence can be found on both persons (and/or objects) because of this cross-transfer. This evidence that is exchanged bears a silent witness to the criminal act. Locard used transfer (trace) evidence from under a female victim's fingernails to help identify her attacker.

The second part of Locard's principle states that the intensity, duration, and nature of the materials in contact determine the extent of the transfer. More transfer would be noted if two individuals engaged in a fistfight than if a person simply brushed past another person.

Differentiated Learning



Teaching English-Language Learners

Have students cut 12 three-by-five-inch cards in half. Write a chapter vocabulary word on one side of a card and the definition for the word on the back. Allow students to refer to the cards as often as necessary throughout the study of the chapter. If possible, have students use the last two to three minutes of each class period to review their flash cards.

Differentiated Learning



Teaching Gifted Students

Have students cut out pictures from a magazine and glue them to a large piece of construction paper. The pictures should represent clues to solving some sort of crime. On the back of the paper, have the students list the types of evidence present at the crime scenes on the front, making sure they classify the evidence as direct or indirect.

TYPES OF EVIDENCE

Obj. 2.3

Evidence can be classified into two types: direct evidence and circumstantial evidence (Figure 2-1). **Direct evidence** includes firsthand observations such as eyewitness accounts or police dashboard video cameras. For example, a witness states that she saw a defendant pointing a gun at a victim during a robbery. In court, direct evidence involves testimony by a witness about what that witness personally saw, heard, or did. Confessions are also considered direct evidence.

Circumstantial evidence is indirect evidence that can be used to imply a fact but that does not directly prove it. No one, other than the suspect and victim, actually sees when circumstantial evidence is left at the crime scene. But circumstantial evidence found at a crime scene may provide a link between a crime scene and a suspect. For example, finding a suspect's gun at the site of a shooting is circumstantial evidence of the suspect's presence there.

Circumstantial evidence can be either physical or biological in nature. Physical evidence includes impressions such as fingerprints, footprints, shoe prints, tire impressions, and tool marks. Physical evidence also includes fibers, weapons, bullets, and shell casings. Biological evidence includes body fluids, hair, plant parts, and natural fibers. Most physical evidence, with the exception of fingerprints, reduces the number of suspects to a specific, smaller group of individuals. Biological evidence may make the group of suspects very small, or reduce it to a likely individual, which is more persuasive in court.

Trace evidence is a type of circumstantial evidence, examples of which include hair found on a brush, fingerprints on a glass, blood drops on a shirt, soil tracked into a house from shoes, and others (Figure 2-2).

Evidence can also be divided into class evidence and individual evidence. **Class evidence** narrows an identity to a group of persons or things. Knowing the ABO blood type of a sample of blood from a crime scene tells us that one of many persons with that blood type may have been there. It also allows us to exclude anyone with a different blood type. **Individual evidence** narrows an identity to a single person or thing. Individual evidence typically has such a unique combination of characteristics that it could only belong to one person or thing, such as a fingerprint.

Figure 2-1. Classification of types of evidence.

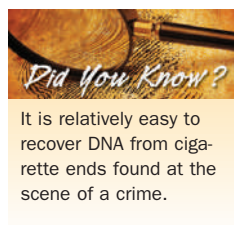
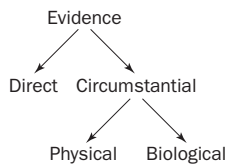


Figure 2-2. Common examples of trace evidence.

Animal or human hair
Fingerprints
Soil or plant material (pollen)
Body fluids such as mucus, semen, saliva, or blood
Fiber or debris from clothing
Paint chips, broken glass, or chemicals such as drugs or explosives

Explore

Ask students to write a paragraph explaining the differences between class and individual evidence, making sure to give examples for each. Have them include answers to the following questions in their discussion:

- Would class or individual evidence be considered direct or circumstantial?
- If evidence is circumstantial, would you classify class or individual evidence as physical or biological? Explain.

Science



Earth Science

Pedologists, or soil scientists, are interested in the way the five soil-forming factors (i.e., parent material, climate, topography, organisms, and time) affect the properties of the soil in its natural, undisturbed state. To help solve a crime, forensic geologists study soil at a crime scene that has been disturbed or moved. They obtain soil samples from in and around crime scenes from which soil may have been transported, perhaps by a tire tread or the bottom of a shoe. Each type of soil has unique characteristics that allow forensic geologists to use soils as evidence in criminal investigations.

Science



Earth Science

Different types of scientists view soil differently. Earth scientists understand soil as mineral or organic material that is formed on Earth's surface by dynamic, complex processes. Engineers study the soil's composition and underlying rock to determine if it will hold large buildings. Agriculturalists think of soil as the top 15 to 30 centimeters of Earth's surface used to grow crops. You might view soil as just dirt.

Science



Biology

Everyone has a blood type. The most common blood-type classification system is the ABO (say "A-B-O") system discovered by Karl Landsteiner in the early 1900s. There are four types of blood in the ABO system: A, B, AB, and O. (There are eight blood types if you include Rh factors.)

Explore

Discuss different crime-scene participants.

Police officers: Most police officers are trained in basic forensic techniques. Officers must have a working knowledge of evidence so they do not inadvertently compromise it. They may be asked to handle or collect evidence, especially in small police departments that do not have a crime lab. Police officers in these towns or communities might bag trace evidence, dust a fingerprint, or use tape to collect hairs or fibers. They would also be a link in the chain of custody.

Specialists: A forensic anthropologist studies human bones to try to determine factors such as sex, age, height, weight, and race of the victim. A botanist might be able to determine the time of year or region of the world in which a crime took place by studying plant material, including pollen that may have been left at a crime scene. An entomologist might be able to determine the time of death by studying insects associated with a death investigation. A forensic pathologist autopsies the body and determines the cause of death.

Evaluate

Record an episode of *CSI*. Show all or part of the program to the class. As students watch, ask them to answer the following questions and be ready to discuss them after watching the show:

- What are some examples of direct, indirect, physical, biological, and/or trace evidence?
- How was the crime scene secured?
- What mistakes, if any, were made in securing the crime scene?
- What evidence could have been compromised?

Obj. 2.4 THE CRIME-SCENE INVESTIGATION TEAM

Who is involved in a crime-scene investigation? The team is made up of legal and scientific professionals who work together to solve a crime. Professionals at the scene of a crime may include police officers, detectives, crime-scene investigators, district attorneys, medical examiners, and scientific specialists. Who is at the scene?

- **Police officers** are usually the first to arrive at a crime scene. A district attorney may be present to determine whether a search warrant is necessary for the crime-scene investigators.
- **Crime-scene investigators** document the crime scene in detail and collect physical evidence. Crime-scene investigators include recorders to record the data, sketch artists to sketch the scene, photographers to take photos of the crime scene, and evidence collectors.
- **Medical examiners** (also called coroners) may be necessary to determine the cause of a death when a homicide has occurred.
- **Detectives** look for leads by interviewing witnesses and talking to the crime-scene investigators about the evidence.
- **Specialists** such as entomologists (insect biologists), forensic scientists, and forensic psychologists may be consulted if the evidence requires their expertise.



Crime-scene investigation teams do not clean up the scene. This dirty job often falls to the victim's family. Professional crime-scene cleaners can be hired in many places to do this job.

Obj. 2.5, 2.6, 2.7, and 2.8 THE SEVEN S's OF CRIME-SCENE INVESTIGATION

SECURING THE SCENE

Securing the scene is the responsibility of the first-responding police officer (**first responder**). The safety of all individuals in the area is the first priority. Preservation of evidence is the second priority. This means the officer protects the area within which the crime has occurred, restricting all unauthorized persons from entering. Transfer, loss, or contamination of evidence can occur if the area is left unsecured (Locard's exchange principle). The first officer on the scene will begin keeping a security log of all those who visit the crime scene. The officer will collect pertinent information and request any additional needs required for the investigation. He or she may ask for more officers to secure the area. Depending on the nature of the crime, the first-responding officer may request various teams of experts to be sent to the crime scene.

SEPARATING THE WITNESSES

Separating the witnesses is the next priority. Witnesses must not be allowed to talk to each other. Their accounts of the events will be compared. This separation is done to avoid witnesses working together to create a story (collusion). The following questions need to be asked of each witness:

Differentiated Learning

Teaching English-Language Learners

Make sure students understand the meaning of *direct* and *indirect* evidence. Ask students to write down the following types of evidence: blood stain on a T-shirt—*indirect*; tire tracks in the mud—*indirect*; lip print on a glass—*indirect*; eyelash found on a bathroom sink—*indirect*; video camera tape from a bank—*direct*. Now have them differentiate between direct and indirect types of evidence collected at a crime scene by writing "direct" or "indirect" next to each type of evidence.



- When did the crime occur?
- Who called in the crime?
- Who is the victim?
- Can the perpetrator be identified?
- What did you see happen?
- Where were you when you observed the crime scene?

SCANNING THE SCENE

The forensic examiners need to scan the scene to determine where photos should be taken. A determination may be made of a **primary crime scene** and **secondary crime scene** and priorities assigned regarding examination. A robbery in front of a store might be the primary scene, and the home of a suspect might be the secondary scene. A murder may have taken place at one location (primary scene) and the corpse found at another (secondary scene).

SEEING THE SCENE

The crime scene examiner needs to see the scene. Photos of the overall area and close-up photos with and without a measuring ruler should be taken. Triangulation of stationary objects should be included in the photos as reference points. A view of the crime scene should be taken from several different angles and distances. Several close-up photos of any evidence and bodies should be taken.

SKETCHING THE SCENE

An accurate rough sketch of the crime scene is made, noting the position of the body (if any) and any other evidence. All objects should be measured from two immovable landmarks. On the sketch, north should be labeled and a scale of distance should be provided. Any other objects in the vicinity of the crime scene should be included in the sketch. This includes doors, windows, and furniture.

If the crime scene is outdoors, the position of trees, vehicles, hedges, and other structures or objects should be included in the sketch. Later, a more accurate, final copy of the crime scene should be made for possible presentation in court. Computer programs are available to later create a neater and more accurate sketch suitable for use in a court proceeding. The sketch should include the information indicated in Figure 2-3.

Figure 2-3. A blank crime-scene sketch form showing the information that must be provided with the sketch.

Teaching Tip

Emphasize to students that first responders also protect the evidence from the elements. For example, shoeprints in snow can melt, precipitation can distort bloodstain patterns or wash away tire tracks, and fingerprints exposed to warm temperatures can become degraded.

Explore

Crime-scene photographs are generally divided into two categories: overall views and items of evidence. Many items-of-evidence photographs require something like a ruler to give the photograph a sense of scale. For instance, a tire track in the mud would be photographed with what's called a "photo scale" next to the impression. The photo scale looks like an L-shaped ruler.

Digging Deeper

Joran van der Sloot lives in Aruba and attends school in Holland. Natalee Holloway lived in Alabama and disappeared in Aruba. So why did Natalee's family sue Joran and his father in New York? Even though New York courts have the jurisdiction to hear this case, the defendant's lawyers argued that New York should not hear the case. The defense attorney asked the judge to decide whether New York had any interest in this case. The judge had to determine whether New York taxpayers should pay for the trial and whether a New York jury should be used when all of the events took place somewhere else. In August 2006, the New York judge dismissed the civil lawsuit filed by Natalee's family.

Teaching Tip

One misconception students may have is that all of the evidence at a crime scene will be found and all of it will be in good shape or useful to the investigation. For instance, many fingerprints are smudged, faint, distorted, or partial prints. This is a good time to remind students why it is so important to properly secure a crime scene. A suspect may be found not guilty because the chain of custody was broken or the procedures within and around a crime scene were not correctly followed.

Digging Deeper

With Forensic Science e-Collection

What happened to Natalee Holloway in Aruba in 2005? This is an unsolved case in which questions have been raised about why crime-scene investigators have not been able to find her body. In fact, investigators searched the island with an array of cutting-edge tools, from a remote-controlled submersible equipped with a video camera and sonar used for probing the water under bridges and in lagoons, to telescoping rods tipped with infrared sensors and cameras used for looking beneath manhole covers and into shadowy caverns. Go to the Gale Forensic Sciences eCollection on school.cengage.com/forensicscience and research the case. Make your own investigation by reading the primary sources available on the Web site. Write a brief explanation that summarizes the forensic tools used to find Holloway's body and any evidence that was discovered during the search.



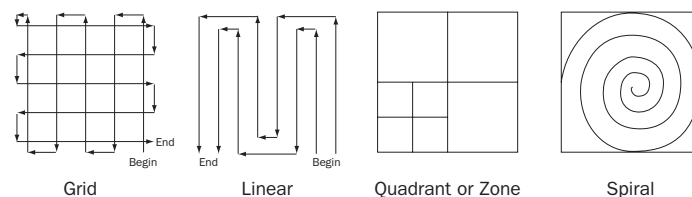
SEARCHING FOR EVIDENCE

Depending on the number of investigators, a spiral, grid, linear, or quadrant pattern should be walked and location of evidence marked, photographed, and sketched. Single investigators might use a grid, linear, or spiral pattern. A group of investigators might use a linear, zone, or quadrant pattern. These patterns are

systematic, ensuring that no area is left unsearched (Figure 2-4).

Additional light sources might be needed to find hair and fibers. A vacuum cleaner with a clean bag is sometimes used to collect evidence but is not the method of choice. The use of a flashlight for examination and forceps for collecting are preferable, because this method avoids picking up extraneous materials.

Figure 2-4. Four crime-scene search patterns.



SECURING AND COLLECTING EVIDENCE

All evidence needs to be properly packaged, sealed, and labeled. Specific procedures and techniques for evidence collection and storage must be followed. Liquids and arson remains are stored in airtight, unbreakable containers. Moist biological evidence is stored in breathable containers so the evidence can dry out, reducing the chance of mold contamination. After the evidence is allowed to air dry, it is packaged in a **paper bundle**. The bundle (or druggist's fold) can then be placed in a plastic or paper container. This outer container is then sealed with tape and labeled with the signature of the collector written across the tape. An evidence log and a **chain of custody** document must be attached to the evidence container.

The evidence log should contain all pertinent information, including:

- Case number
- Item inventory number

- Description of the evidence
- Name of suspect
- Name of victim
- Date and time of recovery
- Signature of person recovering the evidence
- Signature of any witnesses present during collection

Packaging Evidence

The size of the bundle depends on the size of the evidence. If the evidence is small, the bundle can be constructed from a sheet of paper. If the evidence is large, the bundle might be constructed from a large sheet of wrapping paper. The packaging techniques are demonstrated in Figure 2-5. The steps are as follows:

1. Choose the appropriate-size sheet of clean paper for the bundle.
2. Crease the paper as shown in the figure.
3. Place evidence in the X location.
4. Fold left and right sides in.
5. Fold in top and bottom.
6. Insert the top flap into the bottom flap then tape closed. (Continued on page 28.)

Figure 2-5. Demonstration of packaging of dry evidence.



Teaching Tip

Package evidence using either a paper container (Figure 2-5e) or plastic container (Figure 2-5f), depending on whether evidence is wet (into paper) or dry (either container). Each time a bag of evidence is examined, the bag is cut along an *unopened* edge and resealed with the date and the name of the examiner. Emphasize that each time an evidence bag is opened, the examiner must *never* break a seal. The bag is opened along a new edge and resealed with all of the pertinent information. For example, there should be two names written along two different sides of a bag if two people opened and then sealed the same bag of evidence. This process allows others to see who opened the bag and when.

Explore

The prosecution of criminal cases in the United States is incredibly backlogged. This has a lot to do with the time it takes to analyze evidence. Not all forensic labs have all of the personnel, budget, or equipment needed to process all of the evidence. For instance, equipment to analyze DNA is often too expensive for some crime labs, so they must send their DNA samples to another lab and pay for the analysis. Some crime labs hire private firms to do their testing or to confirm their results. All of this takes time and money.

Ask students to research how DNA evidence is processed in their community. Where is the processing center located? What does a DNA analysis cost? Who pays for the testing?

7. Place bundle inside a plastic or paper evidence bag. Fold the bag closed.
8. Place a seal over the folded edge of the evidence bag.
9. Have the collector write his or her name over the folded edge.

If a wet object to be packaged is large, it should be placed in a paper container and sealed to allow it to air dry. Wet evidence should never be packaged in a plastic container while wet. Any DNA present will degenerate and evidence may become moldy and useless.

There are standards for collecting different types of evidence that describe how to collect and store the evidence. The Federal Bureau of Investigation and state police agencies publish descriptions of the proper procedures.

Control samples must also be obtained from the victim for the purpose of exclusion. For example, blood samples found on a victim or at a crime scene are compared with the victim's blood. If they match, the samples are excluded from further study. If the blood samples do not match, then they may have come from the perpetrator and will be further examined.

CHAIN OF CUSTODY

In securing the evidence, maintaining the chain of custody is essential. The individual who finds evidence marks it for identification and bags the evidence in a plastic or paper container. The final container for the evidence is a collection bag, which is labeled with the pertinent information. The container is then sealed, and the collector's signature is written across the sealed edge.

The container is given to the next person responsible for its care. That person takes it to the lab and signs it over to a technician, who opens the package for examination at a location other than the sealed edge. On completion of the examination, the technician repackages the evidence with its original packaging, reseals the evidence in a new packaging, and signs the chain-of-custody log attached to the packaging. This process ensures that the evidence has been responsibly handled as it was passed from the crime scene to a courtroom (Figure 2-6).

Figure 2-6. Chain-of-custody procedures.



a. Original evidence bag

b. Opened evidence bag maintaining signature on first seal

c. Original evidence bag with uncut seal and signature, updated chain-of-custody log in a new sealed and signed evidence bag

Differentiated Learning

Teaching At-Risk Students

Have students practice the concept of chain of custody. Ask all students to sign a completed homework assignment just as if they were signing a piece of evidence as a crime-scene technician. Next, they should take their signed assignment to a student who has been chosen as an intermediary police officer. This student signs the paper and enters the assignment into a log. Finally, the intermediary officer must take the completed assignment and the custody log to be signed by the teacher, acting as the crime lab technician who ultimately receives the evidence.



Digging Deeper

with Forensic Science e-Collection

O.J. Simpson is famous for having been tried and acquitted for the murder of his ex-wife Nicole Brown Simpson and her friend Ronald Goldman in 1994. The O.J. Simpson murder trial is often cited as a classic example of how crucial evidence was lost, altered, or contaminated. Go to the Gale Forensic Sciences eCollection on school.cengage.com/forensicscience and research the case. Cite specific examples of how evidence was damaged, lost, or contaminated by crime-scene personnel. Write a brief explanation summarizing your findings, making sure to back up your argument with sources. Carefully check the dates of the publications, and use applied logic to conclude whether you think the forensic evidence was improperly secured.



Digging Deeper

Orenthal James Simpson, or O.J., is now one of the most infamous running backs in American football history. He was a star running back for the USC Trojans, setting NCAA records and winning the Heisman trophy. The majority of his career was spent with the Buffalo Bills, but he ended his career in 1979 with the San Francisco 49ers. Simpson retired from football and served as a sports commentator and actor.

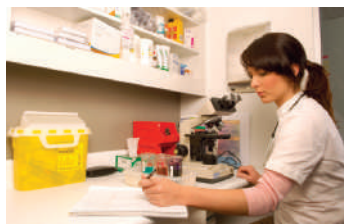
ANALYZE THE EVIDENCE

Obj. 2.9

Following a crime-scene investigation, the forensic laboratory work begins (Figure 2-7). The FBI crime lab is one of the largest forensic labs in the world. A forensic lab processes all of the evidence the crime-scene investigation collected to determine the facts of the case. Unlike what television CSI programs portray, forensic lab technicians are specialized and process one type of evidence.

The laboratory results are sent to the lead detective. Test results eventually lead to crime-scene reconstruction; that is, forming a hypothesis of the sequence of events from before the crime was committed through its commission. The detective looks at the evidence and attempts to determine how it fits into the overall crime scenario. The evidence is examined and compared with the witnesses' statements to determine the reliability of their accounts. Evidence analysis can link a suspect with a scene or a victim, establish the identity of a victim or suspect, confirm verbal witness testimony, or even acquit the innocent. The evidence does not lie, but investigators must consider all possible interpretations of the evidence. Direct evidence is more compelling than circumstantial evidence.

Figure 2-7. A modern forensics laboratory.



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CRIME-SCENE RECONSTRUCTION

Crime-scene reconstruction involves forming a hypothesis of the sequence of events from before the crime was committed through its commission. The evidence is examined and compared with the witnesses' statements to determine the reliability of their accounts. The investigator looks at the evidence and attempts to determine how it fits into the overall crime scenario. The evidence does not lie, but it could be staged. It is important that investigators maintain an open mind as they examine all possibilities.

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Differentiated Learning

Teaching Gifted Students

Several people involved in the Simpson trial have written books about their experiences. Have students choose one of these books and prepare a presentation to give to the class. They should discuss whether crucial evidence was contaminated or made to seem unreliable and what particular factors might have been involved in the not-guilty verdict.



Explore

In 1960, crime-scene investigators only had presumptive blood tests and blood identification tests. The former tests only determine if the sample is blood or not. The latter test will tell if the blood is human or from another animal. Blood identification or typing tests could also tell which of the four types of blood (i.e., A, B, AB, or O) was present. Have students investigate the following topics: the different types of presumptive blood tests, how it is possible to determine whether blood is human or animal, or other blood type information used in forensic blood testing.

Teaching Tip

Make sure students understand that *clemency* means the lessening of the penalty of the crime without forgiving the crime itself. It is a reprieve. Clemency is different from a *pardon*, because a pardon is the forgiveness of a crime and the penalty associated with it.

Staged crime scenes pose a unique problem. The evidence does not match the testimony of witnesses. Here is a list of some common situations in which a crime scene is staged:

- *Arson*. The perpetrator stages a fire to cover some other crime such as murder or burglary.
- *Suicide/murder*. A victim is murdered, and the perpetrator stages the scene to look like a suicide. The death may be caused by alcohol or drug overdose. The motive could be insurance money, release from an unhappy marriage, or simply theft.
- *Burglary*. A burglary is staged to collect insurance money. In the determination of whether a crime scene is staged, the following points should be considered:
 - Initially treat all death investigations as homicides.
 - Do the type(s) of wounds found on the victim match the weapon employed?
 - Could the wounds be easily self-inflicted?
 - Establish a profile of the victim through interviews with friends and family.
 - Evaluate the behavior (mood and actions) of the victim before the event.
 - Evaluate the behavior (mood and actions) of any suspects before the event.
 - Corroborate statements with evidential facts.
 - Reconstruct the event.
 - Conduct all forensic examinations to determine the facts of the case.

SUMMARY

- Locard's exchange principle states that contacts between people and objects during a crime can involve a transfer of material that is evidence of the crime.
- Evidence may be direct, as in eyewitness accounts, or circumstantial, which does not directly prove a fact.
- Evidence may be physical or biological. Trace evidence is a small amount of physical or biological evidence.
- A crime-scene investigation team consists of police officers, detectives, crime-scene investigators, medical examiners, and specialists.
- A crime-scene investigation consists of recognizing, documenting, and collecting evidence from the crime scene.
- First-responding officers must identify the extent of a crime scene, including primary and secondary scenes, secure the scene(s), and segregate witnesses.
- After walking through the crime scene and identifying evidence, the crime-scene investigators document the scene by taking photographs and preparing sketches of the scene.

- Evidence must be properly handled, collected, and labeled so that the chain of custody is maintained.
- Evidence is analyzed in a forensic laboratory, and the results are provided to detectives, who fit the results into the crime scenario.

CASE STUDIES

Lillian Oetting (1960)

Three Chicago socialites were murdered in Starved Rock State Park, Illinois. All three women had fractured skulls. Their bodies, bound with twine, were found in a cave. Near the bodies of the women, a bloodied tree limb was found and considered to be the murder weapon. Because all three women had been staying at a nearby lodge, the staff of the lodge was questioned. Chester Weger, a 21-year-old dishwasher at the lodge, was asked about a blood stain on his coat. He said it was animal blood. He agreed to take a lie detector test and passed it. He was requestioned and took a second lie detector test and passed it as well. The blood was examined by the state crime lab and found to be animal blood as Weger had indicated at questioning. The case reached a dead end.

Investigators decided to revisit the evidence. The rope used to bind the women was examined more carefully. It was found to be 20-stranded twine sold only at Starved Rock State Park. Identical twine was found in an area accessible to Weger. He again became a prime suspect. The blood on his coat was reexamined by the FBI Crime Lab and found to be human and compatible with the blood of one of the victims. Weger submitted to another lie detector test and failed it. Weger was found guilty for the murder of one of the women, Lillian Oetting, and has spent more than 45 years in prison. He recently petitioned the Governor of Illinois for clemency, saying he was beaten and tortured into making the confession. He still maintains his innocence.

The Atlanta Child Murders (1979–1981)

Wayne Williams is thought to be one of the worst serial killers of adolescents in U.S. history. His victims were killed and thrown into the Chattahoochee River in Georgia. Williams was questioned, because he was seen near where a body had washed ashore. Two kinds of fiber were found on the victims. The first kind was an unusual yellow-green nylon fiber used in floor carpeting. Through the efforts of the FBI and DuPont Chemical Company, the carpet manufacturer was identified. The carpet had been sold in only 10 states, one of them being Alabama, where Williams lived. Thus, the fibers found on the victims were linked to carpet fibers found in Williams' home.

Another victim's body yielded the second type of fiber. This fiber was determined to be from carpeting found in pre-1973 Chevrolets. It was determined that only 680 vehicles registered in Alabama had a matching carpet. Williams owned a 1970 Chevrolet station wagon with matching carpet. The probability of both types of fibers being owned by the same person was calculated. The odds against another person owning both carpet types were about 29 million to one. Williams was convicted and sentenced to two life terms.



Think Critically Review the Case Studies and the information on investigating crime scenes in the chapter. Then explain how evidence obtained at a crime scene is crucial to a successful case.

Crime-Scene Investigation and Evidence Collection 31

Evaluate

Have students discuss how this case was handled. What questions do they have about the testing of the blood, time frame of testing, and handling of evidence? How do they feel about the number of times a potential suspect should be questioned or asked to submit to a lie detector test? Why do they think the blood on Mr. Weger's jacket was found to be animal blood during testing by the state crime lab, but after being tested by the FBI crime lab was found to be human blood that matched one of the victims?

Close

Organize students into two teams. Tell them that they will have five minutes to list the potential problems with securing a crime scene and the techniques to avoid those problems. When they have finished, have teams alternate naming a potential problem and its solution.

Science



Math

Probability is the chance of something occurring. It is calculated by dividing the number of favorable outcomes by the number of possible outcomes. The *theoretical probability* of how a coin will land after being tossed 100 times is half, or 50 heads and 50 tails. If you actually flip the coin 100 times, you will find the *experimental probability*, which may be 60 heads and 40 tails, or whatever your results.

Science



Math

Ask students to define probability. How high does the probability have to be for a conviction to occur?

Differentiated Learning

Teaching Gifted Students

Have students discuss the answers to these questions:

- If the victims were found in the river, how were investigators able to find and test fibers?
- Would it be reasonable to assume that fibers on a body prior to being dumped in the river would be washed away over time?
- Would it be possible that these fibers were found somewhere else and traveled down the river and collected on the bodies?
- Have the students become the defense attorney for Wayne Williams. What would their strategy be to create reasonable doubt and allow the jury to find Mr. Williams innocent?



CAREERS

Forensic science is a multidisciplinary science used to provide impartial scientific evidence for use in the courts of law. This multidisciplinary approach draws primarily from chemistry, biology, physics, geology, and psychology. In a forensic science degree program, students learn how to identify a crime scene and search the scene for specific types of evidence. They also take laboratory courses that teach them how to do things such as lift fingerprints and perform basic chemical tests on evidence.

CAREERS IN FORENSICS



Crime-Scene Investigator

The crime-scene investigator has a challenging job. His or her specialty is in securing and processing a crime scene. To be well versed in the field, extensive study, training, and experience in crime-scene investigations are needed. He or she must be knowledgeable in the areas of recognition, documentation, and preservation of evidence at a crime scene to ensure that those recovered items will arrive safely at the lab. Investigators generally turn in the evidence to forensic specialists for analysis. However, they may have to testify in court about the evidence collected, the methods used to recover it, and the number of people who came into contact with the evidence.



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Crime-scene investigators at work in the field.

Is the job of a crime-scene investigator the way it is portrayed on television? Let's ask a real-life CSI. Carl Williams of Jupiter, a retired Pennsylvania state police detective, has 25 years of crime-scene investigation experience. Carl says, "The television shows are for entertainment, not reality. The crime scene doesn't wrap up in an hour, never mind an entire investigation. That can take months. Also, television doesn't show the real horror of what one human being can do to another. Not a lot of people can stomach it. But if you take it, the job can be fascinating work. Every day was different. It was interesting. I helped stop the people who committed horrendous acts before they could

do it again. I'm proud of the work I've done."

What is a typical day like? Here is one scenario: At the beginning of a shift, you might be given a list of calls that have come in from police officers overnight. You will need to prioritize them and plan to investigate them in a logical order. Once you arrive at the crime scene, you will work with the first-responding police officer and decide what the best methods are for you to obtain evidence. You will then record the scene using photography and video, and gather evidence such as shoe prints, clothing fibers, blood, and hair. You may discover fingerprint evidence by brushing surfaces with special powders and take

impressions of fingerprints from anyone who has accessed the crime scene. Finally, you will secure all of your samples in protective packaging and send them to forensic laboratories for analysis.

What does it take to become a crime-scene investigator? It is usually necessary to obtain a degree in crime-scene investigation through college degree programs or certification programs. The crime-scene investigator should have an associate's or bachelor's degree either in an area of science, with emphasis in law enforcement and crime-scene processing, or a criminal justice degree with an emphasis in science.



Learn More About It

To learn more about crime-scene investigation, go to school.cengage.com/forensicscience.

CHAPTER 2 REVIEW

Multiple Choice

1. Locard's exchange principle implies all of the following **except** *Obj. 2.1*
 - a) Fibers can be transferred from one person to another.
 - b) Blood spatter can be used to identify blood type.
 - c) Cat hair can be transferred to your pants.
 - d) Soil samples can be carried from the yard into your home.
2. Transfer evidence can include all of the following **except** *Obj. 2.2*
 - a) the victim's own blood gushing from a wound
 - b) hair that was transferred to a hairbrush
 - c) the blood of the victim found on a suspect
 - d) a footprint
3. The reason it is important to separate the witnesses at the crime scene is to *Obj. 2.5 and 2.6*
 - a) prevent contamination of the evidence
 - b) prevent fighting among the witnesses
 - c) prevent the witnesses from talking to each other
 - d) protect them from the perpetrator
4. Correct collection of evidence requires which of the following? *Obj. 2.8*
 - a) documenting the location where the evidence was found
 - b) correct packaging of evidence
 - c) maintaining proper chain of custody
 - d) all of the above
5. A crime-scene sketch should include all of the following **except** *Obj. 2.5 and 2.7*
 - a) a scale of distance
 - b) date and location of the crime scene
 - c) a north heading on the diagram
 - d) the type of search pattern used to collect the evidence

Short Answer

6. Distinguish between circumstantial evidence and direct evidence, and provide an example of each type. *Obj. 2.3*

Chapter 2 Review

Multiple Choice

1. b
2. a
3. c
4. d
5. d

Short Answer

6. Circumstantial evidence, or indirect evidence, is evidence used to imply a fact but not prove it directly. Circumstantial evidence can be either physical, such as a fingerprint, or biological, such as blood or hair, in nature. Direct evidence is evidence that, if true, proves an alleged fact, such as an eyewitness account of a crime.

7. Class evidence narrows an identity to a group of persons or things. Knowing the ABO blood type of a sample of blood from a crime scene tells investigators that one of many persons with that blood type may have been there. It also allows them to exclude everyone with a different blood type.

8. a. The recorder would need to get the following information from the first responder:

Date, time, location, and name of collector for all evidence that was found by completing an Evidence Summary Sheet for each piece of evidence recovered.

Weather conditions, available light, unusual odors, and other environmental conditions of the crime scene upon arrival.

The security log of all those who visit the crime scene.

A description of how the crime scene was secured.

b. The recorder would need to get the following information from the photographer: Names and descriptions of photographs taken of any victims and possible suspects.

Photos of the crime scene, noting the four points of the compass, the entrance and exit points in the area, any disturbances (damage) at the scene, etc.

Photographs taken of any evidence encountered both with and without a ruler.

c. The recorder would need to get the following information from the sketch artist:

7. Blood type is considered to be class evidence. Although it may not specifically identify the suspect, explain how it still could be useful in helping to investigate a crime. *Obj. 2.3*

8. The recorder at the crime scene needs to work with all of the police personnel at the crime scene. What type of information would the recorder need to obtain from each of the following persons? *Obj. 2.4 and 2.7*

a. first-responding officer

b. photographer

c. sketch artist

d. evidence collection team

9. When the crime-scene investigators arrive at a crime scene, one of their duties is to try to collect all evidence from the victim's body. However, due to the location of the crime scene, some evidence will need to be collected off the body at a later time in the crime lab. For each type of situation below, describe the type(s) of evidence that could be obtained by: *Obj. 2.6, 2.7, 2.8, and 2.9*

a. transporting the body in a closed body bag

b. taking nail clippings from the deceased

34 Crime-Scene Investigation and Evidence Collection

Both the rough sketch that was made at the crime scene and then the computer-generated sketch that is made later.

d. The recorder would need to get the following information from the evidence collection team:

The search pattern in the crime scene.

All properly handled, bindled, and packaged items that are considered evidence.

9. a. Transporting the body in a closed body bag keeps it free from outside contaminants. An autopsy can be done to determine the cause of death. A toxicology report can be made to determine any toxins or drugs found in the victim's blood. Insect evidence which might not be found initially will also be preserved for examination.

b. Material found underneath the nails can be tested specifically for skin (DNA analysis) or soil analysis (location of crime).

c. placing a plastic bag over the hands of the deceased before transporting the person to the morgue

d. brushing the clothing of the victim with a clothes brush

10. Identify the error in each of the following scenarios: *Obj. 2.5, 2.7, 2.8, and 2.9*

Case 1

A dead body and a gun were found in a small room. The room was empty except for a small desk and a chair. The room had two windows, a closet, and a door leading into a hallway. The crime-scene sketch artist measured the perimeter of the room and drew the walls to scale. He sketched the approximate position of the dead body and the gun. He sketched the approximate location of the chair and the desk. What did he forget to do?

Case 2

At the scene of the crime, the evidence collector found a damp, bloody shirt. The evidence collector quickly wrapped the shirt in a paper bindle. He inserted the paper bindle with the shirt into an evidence bag. The bag was sealed with tape, and the collector wrote his name across the tape. The evidence collection log was completed and taped to the evidence bag. What did he do incorrectly?

Case 3

A single hair was found on the back of a couch. The evidence collector placed it in a paper bindle. He then inserted the paper bindle into a plastic evidence bag. Using tape, the evidence collector sealed the bag. After completing the evidence log and the chain-of-custody form, he brought the evidence bag to the crime lab. What did he do incorrectly?

Case 4

Often, several different labs need to share a very small amount of evidence. It is important that the chain of custody be maintained. If the chain of custody is broken, then the evidence may not be allowed in a court proceeding. Identify the error in the following case. After obtaining the evidence, the first lab technician removed the tape that contained the signature of the crime scene evidence collector. On completion of her examination of the evidence, the lab technician put the evidence back into a paper bindle, and inserted the

- c. Any material (hair, soil, fibers, blood, etc.) that may be found in the hand will not be lost if it is bagged first. Anything under the fingernails will not be lost either.
- d. Brushing the victim at the scene allows investigators to collect fibers found on the body at the crime scene. While in transport, additional fibers may fall onto the victim no matter how careful investigators are. If they take fiber samples immediately, they are more likely to get only those fibers found on the victim at the time of death.

10. **Case 1:** He forgot to include the closet and hallway doors. All objects should be measured from two immovable landmarks. On the sketch, north should be labeled, and a scale of distance should be provided.

Case 2: The blood on the shirt was not allowed to dry prior to being collected. Tape the label to the outside of the bag or insert it inside.

Case 3: The bindle was not placed in a plastic or paper container. This outer container needs to be sealed with tape and labeled with the signature of the collector written across the tape. An evidence log and a chain-of-custody log must be attached to the evidence container. When taking the evidence to the lab, it should be signed over to a technician, who opens the package for examination at a location other than the sealed edge. On completion of the examination, the technician repackages the evidence with its original packaging, reseals the evidence in a new packaging, and signs the chain-of-custody log attached to the packaging.

Case 4: The evidence bag should be opened along a different edge other than the edge that was sealed and signed earlier. It should then be resealed along the edge that was newly opened and signed. There should now be two signatures and two sealed edges.

bindle into an evidence bag. The technician resealed the bag in the same place as the original crime-scene investigator. After carefully sealing the bag, the lab technician signed her name across the tape. She completed the chain-of-custody form on the outside of the evidence bag and brought the evidence to the next lab technician at the crime lab.

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ACTIVITY 2-1 *Ch. Obj. 2.1, 2.2, 2.6, 2.7, and 2.8*

LOCARD'S PRINCIPLE



Introduction:

Locard's exchange principle states that trace evidence can be exchanged between a crime scene, victim, and suspect, leaving trace evidence on all three.

Objectives:

By the end of this activity, you will be able to:

1. Demonstrate how transfer of evidence occurs.
2. Identify a possible crime-scene location based on trace evidence examination.

Materials:

(per group of four students)

Activity Sheet 2-1

3 fabric squares each about 2½ inches in a separate evidence resealable plastic bag

1 white sock in an evidence plastic bag

4 pairs of tweezers (forceps)

1 permanent marker

2 hand lenses or microscopes

1 roll of clear ¾-inch-wide adhesive or masking tape

2 pencils

4 sheets white paper (8½ × 11")

4 sheets of paper for bindling (8½ × 11")

4 pairs of plastic or latex gloves

4 resealable plastic bags

4 sheets of paper for bindles

1 pair of scissors

4 copies of the Evidence Collection label

Safety Precautions:

Wash your hands before starting work.

Refrain from touching hair, skin, or clothing when collecting evidence.

Wear gloves while collecting evidence.

Scenario:

A dead body has been found. The crime-scene investigators determined that the body has been moved after the killing. Trace evidence was found on the victim's sock. It was determined that the crime could have occurred in three possible locations. Can you match the trace evidence found on the victim's sock with trace evidence collected from three different locations and determine which location was the crime scene?

ACTIVITY 2-1

Background

During this activity, students will demonstrate how transfer of evidence, as described by Locard's exchange principle, occurs.

Students will work in groups of four to collect and examine trace evidence from three different sources (e.g., library, computer lab, hallway, used classroom).

The purpose of this activity is to show how transfer of evidence occurs and to give students a chance to determine, by an examination of the evidence, where a crime occurred.

Safety Precautions

Remind students about ways in which crime scenes are contaminated. To decrease the chance of contamination, students will need to wash their hands before beginning this activity and wear gloves while collecting and examining evidence. If possible, they should change into a new pair of gloves before examining each bag of evidence so they do not transfer evidence from one crime scene to the next. Students should also take care to not touch their hair, skin, or clothing while collecting evidence. After choosing the crime scenes, check that there are no sharp objects on the floor that students might cut themselves with while collecting evidence. Make sure students use caution when cutting the plastic bags open.

Procedures

1. Print, copy, and distribute the Activity Sheets from the IRCD.
2. Use white fabric squares so it will be easier to see the evidence.
3. Make sure to let the students know what they should write in for suspect, victim, and types of offense on the evidence inventory label.
4. You may want to collect evidence on socks and prepare it in bindles yourself. When students are finished examining the evidence they collected from each of the three crime scenes, they can receive the “unknown” sample from you. This will allow all students to stay on-task during the entire activity.
5. This activity has two parts. Make sure students read all procedures before beginning any collection.
6. Before entering the first crime scene, tell students to take all of their materials with them: 3 resealable plastic bags, 3 fabric squares, a permanent marker, 3 sheets of paper for binding, 3 copies of the evidence collection label, and a roll of tape. Often companies will donate tackle boxes to schools for use as evidence collection kits. You might also want to get some disposable cameras for students to use.
7. Remind students that contamination is a concern. Therefore, only the student collecting evidence should be walking directly near the crime scene. Before collecting any evidence, groups should discuss what evidence they see, if any.
8. Whichever group member collected the evidence needs to hold onto that evidence until returning to the classroom to analyze it.
9. During the examination of the evidence, students should open only one plastic bag at



Procedure:

Part A: Evidence Collection

1. After washing your hands and putting on your gloves, visit the school library.
2. Open one of the resealable plastic bags, and rub the floor with a fabric square three times. Place the fabric square in a paper bindle, then into a plastic bag, and seal the plastic bag. Label your plastic bag with the location from which your sample was taken.
3. Complete the evidence label, and either attach the label to the plastic bag or place it inside the plastic bag. Seal the plastic bag.
4. Place a piece of adhesive or masking tape over the sealed edge of the plastic bag and write your name across the tape so that your signature begins on one side of the tape and ends on the other side.
5. Repeat steps 1 through 4 at collection site 2 (determined by your instructor).
6. Repeat steps 1 through 4 at collection site 3 (determined by your instructor).
7. Return to your classroom with the three labeled samples.
8. Be sure to maintain the chain of custody with all samples collected. When an evidence bag is opened for examination, the person handling the evidence must open the bag at a location other than the sealed edge (see Figure 2-6).
9. On completion of the examination, the cut plastic bag and all former contents must be resealed into another plastic bag, and the chain-of-custody log attached to the new evidence container must be updated and attached (see Figure 2-6).

Part B: Evidence Examination and Data Collection

Examination of evidence samples

1. Students should wear gloves while examining all evidence.
2. Open a sample bag and bindle from location 1 as previously described by cutting along an edge other than the signed, sealed one.
3. Using forceps and a hand lens or microscope, examine and identify items found on the sample.
4. Record your findings on the data table provided. Be sure to include:
 - a. Who collected the sample
 - b. When it was collected
 - c. Why it was collected
 - d. Date
 - e. Exact site of collection
5. Press a piece of adhesive tape onto the surface of the fabric to remove any additional evidence that the tweezers cannot pick up. Tape the evidence on white paper and examine it. Add items found to your list of evidence.
6. Return the fabric square for location 1 and all evidence examined to the correct bindle and plastic bag. Seal the plastic bag, relabel it with the chain-of-custody list, and sign off on the plastic bag as described previously.
7. Repeat steps 1 through 7 for location 2 evidence plastic bag.
8. Repeat steps 1 through 7 for location 3 evidence plastic bag.

a time, examine that evidence thoroughly, and reseal the plastic bag properly before examining another one.

10. Students should examine the side of the fabric that was rubbed on the floor using a hand lens and forceps first, and then use the forceps to place the fabric square under the microscope. They should record as much detail as possible about what each group member sees. Only after examining the fabric under the microscope should they use tape to collect additional evidence from the fabric square.

11. Students should decide who will return to one of the evidence rooms only after all three evidence bags have been examined. This person should make sure to take all of the materials he or she needs: resealable plastic bags, fabric square, a permanent marker, sheet of paper for binding, evidence collection label, and a roll of tape.
12. Remind the students returning to a crime scene to put the sock on over their own sock and walk around. They should not simply rub the sock on the floor.

Return to collect more evidence

1. Choose one member from your group to return to one of the three previous areas examined (i.e., location 1, 2, or 3).
2. The chosen group member should then decide which of the three previous sites should be considered the crime scene. He or she should then return to that location and put on gloves. This group member will not divulge the crime-scene location to his or her fellow examiners.
3. The group member puts on the sock from the plastic bag over his or her own sock. The group member walks around in the selected location. This sock will serve as the victim's sock, which is now covered with trace evidence from the crime scene.
4. While at the crime scene, the chosen team member carefully removes the sock and places it in a bindle and then a plastic bag. It should then be sealed and labeled with "crime scene," date, time, and collector's name, etc. as before.
5. The group member returns to the meeting room to have his or her partners examine the sock evidence.
6. Crime-scene trace evidence should now be treated as described in steps 1 through 7, "Examination of evidence samples."
7. Your team must try to determine which of the three original locations matches the crime-scene location.
8. Complete the Crime Scene report, listing all evidence collected from the sock with your partner investigators.

**Questions:**

1. Based on your examinations of the trace evidence, which of the three sites was probably the crime scene? Justify your answer.
2. Did your team correctly identify the crime scene?
3. How might the adhesive tape interfere with your evidence collection?
4. Why were gloves necessary in the collection and handling of trace evidence?
5. What other instruments could be used to improve on your ability to identify evidence?
6. A suspect's shoes and clothing are confiscated and examined for trace evidence. What kind of trace evidence might be found on the clothes or shoes? List at least five examples of trace evidence from the shoes or clothing that might be useful in linking a suspect to a crime scene.
7. A home burglary has occurred. It appears the perpetrator entered after breaking a window. A metal safe had been opened by drilling through its tumblers. A suspect was seen running through the garden. Three suspects were interrogated and their clothing examined. List at least three examples of trace evidence that might be found on the suspect.
8. Some examples of trace evidence are listed. For each item, suggest a possible location where the trace might have originated. For example, broken glass fragments—headlight from a hit-and-run accident.

Answers

1. Answers will vary.
2. Answers will vary.
3. Adhesive tape may pick up items from your own clothing or elsewhere, which may not be actual evidence from the crime scene.
4. Gloves are necessary so evidence will be collected in the form in which it was found at the crime scene. By not wearing gloves, trace evidence may be transferred from the person collecting the evidence to the evidence itself.
5. Luminol or Bluestar® could be used to look for blood-stains that may have been washed away or cleaned up. A stereomicroscope, black light, and flashlight can also be used.
6. Possible answers: mud or dirt, blood from the victim, carpet fibers, hair, glass fragments, or plant parts
7. Possible answers: mud, dirt, plant parts or pollen from the garden on their shoes, metal fragments on their clothing or shoes from drilling into the safe, glass fragments from the broken window, or matching fingerprints on the safe or window

8. Possible answers:

- kidnapping from a beach location
- theft from a paper mill
- found in the bed of an abandoned pickup truck
- makeup found on a murder victim
- on the end of a pipe thought to be used as a murder weapon
- a rug used to wrap up a murder victim
- drugs found at the scene of a crime matching drugs found in the car of the suspect
- found below a safe that was broken into
- car oil stain found on the ground outside a bank that was robbed
- found in a tire tread
- maggots found on a decaying body

ACTIVITY 2-2 Ch. Obj. 2.5, 2.6, 2.7, and 2.8

CRIME-SCENE INVESTIGATION



Objectives:

By the end of this activity, you will be able to:

1. Explain the correct procedure for securing and examining a crime scene.
2. Demonstrate the correct techniques for collecting and handling evidence.

Introduction:

The crime scene presents a wonderful hands-on way to review many of the skills described in this chapter. A crime has occurred, and you and your investigative team must secure the area and properly collect the evidence.

Time Required to Complete Activity: 60 to 90 minutes (six students per team)

Scenarios:

Two crime scenes prepared in advance by your instructor

Materials:

(Per group, with six students in each group)

- Checklists 1–5
- evidence Label
- 10 evidence inventory labels of sheets
- 10 resealable plastic bags, 6-gallon size
- 10 resealable plastic bags, 6-quart size
- 4 paper collection bags
- 2 marking pens
- 4 pairs plastic gloves
- 1 roll crime-scene tape
- 4 compasses
- 1 videocamera (optional)
- “bunny suit” (optional)
- 6 forceps (one pair per person)
- 4 flashlights or penlights (one per person)
- 2 floodlights
- 1 digital camera
- 10 bundle paper sheets, both large and small
- 6 hand lenses
- sketch paper
- 2 photographic rulers
- 1 25-foot tape measure
- 1 roll ¾-inch masking tape

Procedure:

Your crime-scene team is composed of six students. Each team of students has a first officer, a recorder, a photographer, a sketch artist, and two designated evidence collectors.

ACTIVITY 2-2

Background

Two crime scenes are prepared in advance for students to enter. Students will use the knowledge gained throughout this chapter to secure and examine the crime scene and properly collect evidence. Students should work in teams of six, with each student assigned to a specific job: first responder, recorder, sketch artist, photographer, and two evidence collectors. Each crime-scene team will complete and turn in an investigation log, checklists 1 through 5, two sketches, photographs, and bagged evidence.

Safety Precautions

Remind students about ways in which crime scenes are contaminated. To decrease the chance of contamination, students must wash their hands before beginning this activity and wear gloves while collecting and examining evidence. If possible, they should change into a new pair of gloves before examining each bag of evidence so they do not transfer evidence. Students should also be careful to not touch their hair, skin, or clothing while collecting evidence. Emphasize that they use caution when cutting the plastic bags open.

Differentiated Learning

Teaching At-Risk Students

During this activity, allow students to pick their role in the group. Allowing them to choose being the photographer, sketch artist or recorder will give them the chance to choose something that interests them and will play to their strengths. A student who likes to draw or is interested in computers will choose a role that fits his or her interests, making that student more motivated to learn.



Procedures

1. You may need to set up more than two crime scenes depending on the size of your class. Another alternative is to have two crime scenes and have two groups (total of 12 students) go in and perform all parts of the activity. The rest of the class will stay in the classroom and complete an alternate assignment, possibly viewing a video of the processing of a crime scene. The next class period, the students who watched the video will go to the crime scenes and perform the activity. This will allow you time as well to go into the crime scenes and set them back up after the first group gets finished. During the second day, the students who have already secured the crime scene and collected evidence are ready to stay in the classroom and analyze the evidence.
2. Students should read all directions before beginning this activity.
3. Remind students of the importance of securing the scene, because this will be the only time the scene will be pristine, without outside contamination.
4. Make sure students do all cursory investigation first and limit who enters the crime scene to decrease contamination.
5. Photographs should be taken before evidence collection.
6. Have students go through each checklist to make sure all steps are followed.



By the completion of this part of the activity, each team of students must submit the following:

- A log maintained by the first responder
- Checklists 1 through 5 completed, dated, and signed
- Two sketches—a rough sketch and a quality sketch, both with accurate measurements
- A series of 8 × 10 photographs that adequately encompass the crime-scene location; close-up shots of any evidence, evidence numbered and photographed next to a ruler
- Evidence bags properly packaged, labeled, and sealed

Part A: Securing and Preserving the Crime Scene

1. The crime scene is secured by the first officer to arrive. His or her job is to limit access to the crime scene and preserve the scene with minimal contamination. He or she has primary responsibility for:
 - Securing the safety of individuals at the scene; approach the scene cautiously (look, listen, smell) and determine if the site poses any danger
 - Obtaining medical attention for anyone injured at the scene; call for medical personnel for the injured
 - Calling in backup help, including medical personnel to help the injured and/or lab personnel
 - Separating the witnesses so they may be interrogated separately to see if their stories match.
 - Performing an initial walk-through of the area (scan the scene) to provide an overview of the crime scene
 - Searching the scene briefly (scan the scene) to notify lab personnel what equipment is needed
 - Collecting information, including the crime-scene address/location, time, date, type of call, and the names and addresses of all parties involved and present
 - Securing the integrity of the scene by establishing the boundaries of the crime scene by setting up a physical barrier (tape) to keep unauthorized personnel (and animals, if present) out of the area
 - Protecting the crime scene by remaining alert and attentive
 - Documenting the entry and exit of all authorized personnel
 - Providing a brief update to the next-of-command officer to arrive on the scene

The first-responding officer can use checklist 1 to complete all necessary procedures.

Note: Later-arriving police or CSI will set up barricades to prevent unauthorized persons from entering the crime-scene area.

Part B: Search and Evidence Collection

Once your designated crime-scene specialists arrive, evidence collectors will actually collect the evidence for processing back in the lab.



2. The recorder has the responsibility of working with the primary officer to maintain updated records. The recorder will complete checklist 2. The recorder will:
 - Document by date, time, location, and name of collector all evidence that is found.
 - Work with the sketch artist to measure and document the crime scene.
 - Help search for evidence, if necessary.
3. The sketch artist has the responsibility of drawing accurate and detailed sketches of the area designated as the crime scene. At the crime scene, a rough sketch is made, complete with accurate measurements. At a later time, a neater (or computer-generated) sketch is completed. Checklist 3 outlines those responsibilities. The sketch artist working with the recorder will complete that checklist.
4. The photographer has the responsibility to:
 - Work with the sketch artist and recorder to document the crime scene.
 - Photograph any victims and possible suspects.
 - Take photos of the crime scene, noting the four points of the compass, the entrance and exit points in the area, any disturbances (damage) at the scene, etc.
 - Note and photograph any evidence encountered both with and without a ruler.
 - Complete photographer's checklist.
5. The evidence collectors have the responsibility to:
 - Mark off the area around the victim and keep all unnecessary spectators out.
 - Work within the crime scene, wearing gloves to collect evidence.
 - Walk an appropriate search pattern in the crime-scene area. The pattern will be chosen by your instructor. It may be a spiral, grid, or linear pattern, or the area may be divided into zones for examination.
 - Properly handle, bindle, and package any materials considered to be evidence. Remember that the size of the bindle can vary from very small to large enough to package evidence as large as an overcoat.
 - Complete evidence collector's checklist.
6. The proper handling of evidence includes being aware that:
 - Wet or damp evidence should be placed in a paper bag and sealed.
 - Dry evidence should be placed in a paper bindle and then packaged in plastic bags or envelopes and sealed.
 - Liquid evidence should be stored in sealed, unbreakable containers.
 - Care must be taken to prevent any contamination or damage to the evidence collected.

Answers

Each crime-scene team will complete and turn in an investigation log, checklists 1 through 5, two sketches, photographs, and bagged evidence. Students can be graded on accuracy and completeness of each item. Group participation can be graded by having each student draw a circle and divide that circle up into pieces—like pieces of a pie—based on how they feel each group member performed (i.e., if all group members performed their jobs equally and accurately, then the circle would have six equal pieces).



- Flashlights and penlights can be used to search for hair, fibers, and other small or fine trace evidence.
- All evidence containers should be identified with an evidence label or Evidence Inventory Sheet taped to the container or placed inside the container. Such labels or inventory sheets will be provided by your instructor. The name or initials of the collector should be written over the tape sealing the container. The last page in this activity has a copy of an evidence label.
- If for any reason an evidence container is opened, it should be opened at a location other than the sealed edge. It must be repackaged and resealed with the names of all those who have handled the evidence, along with the original packaging. The name of the new packager should be written over the new seal. This chain-of-custody information is also located on the Evidence Inventory Sheet.

Examining the Evidence

Thorough examination of the crime scene will hopefully lead to a comprehensive collection of evidence. After careful examination of all the evidence and after interviewing the suspects, each team of investigators will collect information helpful in solving the crime.

Checklist 1: First Responder's Responsibilities

Place a check mark by each of the following responsibilities as completed:

- I approached the scene cautiously (look, listen, smell) and determined if the site poses any danger.
- I checked to see if medical attention was needed by anyone injured at the scene.
- I called in backup to help the injured.
- I secured and separated any witnesses present.
- I completed an initial walk-through of the area (scan the scene) to provide an overview of the crime scene.
- I notified superiors of the need for additional police officers and CSI technicians at the crime scene.
- I secured the integrity of the scene by establishing the boundaries of the crime scene by setting up a physical barrier (tape) to keep unauthorized personnel (and animals, if present) out of the area.
- I collected and recorded information, including my name and badge number, case number, address/location of crime scene, time, date, type of call, names of all involved and present parties, as well as the names of everyone present.
- I protected the crime scene by remaining alert and attentive.
- I documented the entry and exit of all authorized personnel.
- I provided the next-in-command officer with a brief update of the situation.

Date _____ Signed _____

Checklist 2: Recorder's Checklist

Place a check mark by each of the following responsibilities as completed:



- I documented by date, time, location, and name of collector all evidence that was found by completing an Evidence Summary Sheet for each piece of evidence recovered.
- I documented weather conditions, available light, unusual odors, and other environmental conditions.
- I worked with the sketch artist to measure and document the crime scene.
- I helped search for evidence.
- I helped document the location and direction of what was photographed.
- I helped document the location and direction of what was sketched.

Date _____ Signed _____

Checklist 3: Sketch Artist's Checklist

Place a check mark by each of the following responsibilities as completed:

I will prepare two sketches of the crime scene—a rough sketch and a carefully detailed sketch—each of which includes:

- All directions of the compass correctly labeled
- All objects and landmarks within the crime scene labeled in correct position and to scale (each sketch should contain two immovable objects at a measured distance)
- A series of carefully measured distances to add to the accuracy of my sketches
- Working with the photographer to document the exact location and direction from which photographs were taken

Date _____ Signed _____



Checklist 4: Photographer's Checklist

Place a check mark by each of the following responsibilities as completed:

- I worked with the sketch artist, recorder, and evidence collectors to document the crime scene.
- I took photos of the crime scene, noting the four points of the compass, the entrance and departure points into the area, any disturbances (damage) at the scene, etc.
- I took photographs of any injured persons at the crime scene.
- I took close-up photographs of the victim and/or immediate location of the crime.
- I took a series of distance photos to give perspective to the crime scene.
- I noted and photographed any evidence encountered, both with and without a ruler, and had the recorder and sketch artist also record the location of the evidence.
- I took a series of at least eight to ten photographs pertinent to the crime scene. These are of sufficient quality that they could be used in a courtroom reconstruction.

Date _____ Signed _____

Checklist 5: Evidence Collector's Checklist

Place a check mark by each of the following responsibilities as completed:

- I marked off the area around the victim and kept all unnecessary spectators out.
- I worked within the crime scene, wearing gloves to collect evidence.
- I walked an appropriate search pattern in the crime-scene area. The pattern walked was _____.
- I properly handled and packaged all materials considered evidence into a bundle.
- I properly bindled and packaged all materials considered evidence into a bag or plastic bag and completed the Evidence Inventory Sheet for each evidence bag.
- I properly sealed and labeled all evidence containers.
- I wrote my signature across the seals on all evidence I collected.
- I completed the chain-of-custody information for each evidence bag.

Date _____ Signed _____

Evidence



Case # _____ Inventory # _____

Item #	Item description
_____	_____
_____	_____
_____	_____

Date of recovery _____ Time of recovery _____

Location of recovery _____

Recovered by _____

Suspect _____

Victim _____

Type of offense _____

Chain of custody

Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM
Received from _____	By _____
Date _____	Time _____ AM or PM

Further Research and Extensions

Have students write a crime novel. Have them describe a situation and leave clues as to “who dunnit” or how.