SECTION ONE

Introduction to Criminalistics

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Investigating the Crime Scene

OBJECTIVES

In this chapter, you should gain an understanding of:

- The steps taken to preserve a crime scene
- Documentation of the crime scene
- Ways to systematically search the crime scene
- Methods for collecting, preserving, identifying, packaging, and transporting evidence
- The chain of custody
- The Fourth Amendment and its application to the search and seizure of evidence

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- On the Crime Scene—The JonBenét Ramsey Murder
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YOU ARE THE FORENSIC SCIENTIST

In cases that involve capital crimes (such as murder), it is a standard procedure to establish a pathway that will be used by all who enter the crime scene. This path begins outside the crime scene at the command center and leads to the focal point of the crime—the body. The location of the path is chosen to allow easy access while minimizing its impact on the crime scene.

1. As the location of the path is being decided, what are the constraints placed on the investigators, and how do they minimize these constraints?
2. What are the first steps taken as the path is created?

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Introduction

The collection and preservation of evidence are essential for any successful criminal investigation. Indeed, if all of the evidence and information surrounding the crime are not properly collected, preserved, and analyzed, the entire investigation may be jeopardized. In addition, the collection and preservation of evidence are accompanied by another essential element of crime scene investigation: a record of what occurred at a particular time and location and what actions were taken by specific individuals.

Physical evidence is usually collected by the police or civilian crime scene technician; it includes any and all relevant materials or objects associated with a crime scene, victim, suspect, or witness. Almost any object can be a piece of physical evidence under the right circumstances. Physical evidence can be collected at the scene of a crime from the body or area (such as a car, home, or workplace) of a victim, suspect, or witness. This chapter describes the methods and procedures followed by crime scene investigators in the processing of crime scenes.

Securing the Crime Scene

The first emergency personnel (police, fire, emergency medical support) to arrive at a crime scene are referred to as first responders. The first responder's top priority is to offer assistance to any injured persons. By contrast, it is the responsibility of later responders or police officers to secure the crime scene. To safeguard evidence and minimize contamination, access to the scene must be limited, and any persons found at the scene must be identified, documented, and then removed from the scene. As additional officers arrive, they begin procedures to isolate the area, using barricades and police tape to prevent unauthorized persons from entering the scene.

The scene of a violent crime may be difficult to control. Reporters, friends, or family members of the victim, and curious passersby may all want to get as close as possible. Anyone who enters the crime scene has the potential to (unintentionally) contaminate the crime scene and destroy evidence. The first responder must have the authority to exclude individuals from entering the scene and must also identify the family and friends of victims and/or suspects and remove them from the immediate area. All nonessential persons (including law enforcement officers not working on the case, media, politicians, and other parties) must be kept out of the crime scene.

Identifying, Establishing, Protecting, and Securing the Boundaries

The initial boundary established around the crime scene should be larger than the scene. This boundary can easily be shifted inward later but is not as easily enlarged because the surrounding areas may have been contaminated during the ensuing interval. The responding officers must document all actions and observations at the scene as soon as possible. This step is essential for preserving information that might otherwise be forgotten and for providing information that may substantiate or contradict later investigative leads and theories. Documentation should be permanently preserved as a part of the case record.

The first responder should document the following items:

- The state of the crime scene upon arrival (including the location, condition, and appearance of people and any relevant objects)
- Existing conditions upon arrival (Were the lights on or off? Were doors and windows closed, partially open, or fully open? Was the room ransacked?)
- All personal information concerning witnesses, victims, and suspects.

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ON THE CRIME SCENE—THE JONBENÉT RAMSEY MURDER

On Christmas Day in 1996, John and Patsy Ramsey attended a party a few blocks from their Boulder, Colorado, home along with their 6-year-old daughter, JonBenét. The Ramseys arrived home from the party around 9:30 A.M., carried JonBenét to her room, and put her to bed for the night. Shortly thereafter, the adults also went to bed.

Patsy awoke around 5 A.M. the next morning, went downstairs, and headed into the kitchen to make coffee. On the stairs, she found a ransom note addressed to John, which demanded $118,000 for the return of JonBenét. The letter further stated that the girl was kidnapped by a "small foreign" faction and warned John to comply with the ransom demands or the child would be beheaded. The note also instructed John to expect a call between 8 A.M. and 10 A.M. the next day. Boulder's 9-1-1 center recorded a call from Patsy at 5:25 A.M., and police arrived on the scene 7 minutes later.

Upon entering the Ramsey home, Boulder police focused on the ransom note and its instruction that a call would be forthcoming. The police waited for the call, along with John and Patsy, until the afternoon, but no call ever came. Despite the failure to receive any message from the alleged kidnapper, the police did not conduct a search of the house at this time.

By late afternoon, the police instructed John and a family friend to search the house for anything "unusual." They were not accompanied by a detective or a police officer. Unfortunately, John found the body of his slain child in the basement of the house. JonBenét had been beaten and strangled with a garrote fashioned from a rope and the handle of a paintbrush later found in the Ramsey basement. At this point, the case was transformed from a kidnapping to a murder. Investigators who were brought to the crime scene found two different boot prints, fibers, the ligature used for the garrote, and DNA evidence.

Almost 10 years later, in 2006, John Karr—then living in Thailand—confessed to authorities that he had murdered JonBenét. Karr was extradited to Colorado from Thailand, and DNA tests were performed to ascertain the truthfulness of his admission. The DNA results, however, proved that Karr was not implicated in the crime.

Patsy died in 2006 from ovarian cancer. In 2016, CBS aired a documentary "The Case of JonBenét Ramsey." This documentary raised the possibility of JonBenét's brother, Burke, being her murderer. Following its release, Burke Ramsey filed a $750 million defamation lawsuit against CBS and the two parties reached a settlement in 2019. The murder of JonBenét remains unsolved.

- Actions and statements of witnesses, victims, suspects, and all other personnel who entered or exited the scene.
- Any items that may have been moved and who moved them (Moved items should not be restored to their original condition; crime scenes should be documented exactly as found.)

The first responders must also ensure that physical evidence is not lost, contaminated, or moved. All physical evidence should be preserved for later identification, collection, and submission.

Once the boundaries of the crime scene have been established, a single path into and out of the scene should be created. All personnel are required to use this pathway to exit the scene to help preserve physical evidence. If any evidence is moved—even inadvertently—its original location must be documented. This step is especially important if reconstruction of the crime is attempted later. All personnel at the scene should be identified and their names should be recorded if investigators need to interview those individuals or obtain known samples (fingerprints, hairs, or shoeprints) from them at a later time. By identifying all persons who entered or exited the scene and documenting whether they touched or moved any objects, investigators establish and safeguard the chain of custody.

Once a lead investigator arrives at the crime scene, it is his or her responsibility to direct the investigation (**FIGURE 1-1**). The lead investigator's first task is to evaluate the scene to establish whether the scene should be processed for physical evidence. The collection and analysis of physical evidence can be a very time-consuming and costly process, so in some jurisdictions, physical evidence is collected only if a crime is serious. If the investigators decide to process the scene for collection of physical evidence, the lead investigator will direct and control the processing, starting with the recognition of physical evidence.

Crime Scene Safety

As crime scene investigators prepare to enter a crime scene, they should remember the common sense rules that are contained in **TABLE 1-1**. These rules are

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FIGURE 1-1 The lead investigator directs the investigation.

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TABLE 1-1 Crime Scene Safety Rules

Do not eat, drink, or smoke on the crime scene.
Do not apply makeup or use bathrooms.
Be on guard for biological or chemical hazards.
Be on guard for sharp objects: hypodermic syringes, razors, broken glass, etc.
Never pick up broken glass with your hands.
Search confined spaces with a flashlight and mirror. Do not put your hand into a confined space before you have ruled out concealed dangers.
After contact with any body fluids, decontaminate with either diluted bleach (1/10) or 70% isopropyl alcohol.

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intended to not only protect the investigator from unknown hazards but are also intended to protect the crime scene from contamination. It is also the responsibility of every investigator to be prepared to face possible unsafe and hazardous conditions as he or she enters a crime scene.

Personal Protective Equipment

First responders should never enter a crime scene without the appropriate personal protective equipment (PPE). Crime scenes contain hazards that are both obvious and hidden. Law enforcement agencies train crime scene investigators to comply with rules



FIGURE 1-2 Investigator wearing protective gear while dusting for fingerprints.

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implemented by the Occupational Safety and Health Administration (OSHA), which requires employers to train employees and supply them with appropriate PPE against the hazards they may face (**FIGURE 1-2**).

Gloves

Most investigators wear nitrile (chemical-resistant) gloves. Latex gloves are also effective, but many people develop an allergic reaction to latex products after repeated exposure. Never wear fabric or leather gloves that may allow chemicals to pass through them onto the skin.

Investigators should always wear two pairs of gloves to prevent exposure from a tear in the outer layer. If an investigator's gloves are contaminated, everything he or she touches will become contaminated. Investigators should change gloves often to reduce the probability of a hazard reaching the skin, and they should wash their hands immediately after removing their gloves.

Eye and Face Protection

Investigators should always wear safety glasses. If the investigator suspects that he or she may encounter droplets of fluid (such as blood or liquid chemicals), a face shield should be used. Safety glasses should be worn as the safety shield is positioned over the face. However, a safety shield does not provide adequate protection when used alone.

Inhalation Hazards

Crime scenes may contain airborne hazards that include smoke, fumes, gases, or suspended dust.

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Because inhalation by the investigator poses the most danger, care must be taken in choosing proper protection. A disposable dust mask will filter out suspended particles in the air, but it will not provide protection from other chemical hazards. An air purifying respirator (APR) is required if the investigator is going to enter a contaminated area. In an industrial environment, a self-contained breathing apparatus (SCBA) is recommended.

Protective Clothing

Disposable synthetic coveralls (such as those manufactured by Tyvek or Kleengard) protect an investigator from most hazards. The coveralls are waterproof and provide a barrier that prevents biological and chemical exposures. Shoe covers are always worn to minimize the possibility of cross-contamination as the investigator moves about the crime scene. After finishing a crime scene investigation, investigators should remove the breathing apparatus, shoe covers, and coveralls before removing their gloves. Biohazard bags must be available for the proper disposal of protective clothing after it has been used.

Chemical and Biological Crime Scenes

When encountering a crime scene that may be contaminated with chemicals, extreme caution must be exercised. At a crime scene where murder or suicide may have taken place, investigators should never collect pills or powders until they have put on their protective gloves. Dead animals at a crime scene may indicate that an airborne poison may be present, and the investigator should immediately safeguard against an inhalation hazard. Industrial crime scenes should not be entered until investigators have the proper PPE and SCBA. If a clandestine methamphetamine lab is located, only specially trained personnel should be allowed to enter until all dangerous chemicals have been removed.

Hazard Communication—HazCom

Manufacturers of chemicals are required to properly label chemicals with hazard warnings. The labels, which conform to the Hazardous Materials Identification System (HMIS), have a diamond symbol with four boxes that warn of the hazard posed. As can be seen in **FIGURE 1-3**, the diamond has four boxes: the box on the left indicates health hazards, the box on top indicates flammability, the box on the right reactivity, and the box on the bottom is for special information (such as what PPE to wear). These labels use a numbering system from "0" to "4" to indicate the level of danger; "0" indicates no danger, whereas "4" indicates severe danger.



FIGURE 1-3 Warning labels on bottles containing chemicals. Acetone and methanol, which are flammable, have a "3" in the top box to warn the user. Sodium hydroxide, which is not flammable, has a "0" in the top box.

Courtesy of James E. Girard.

Documenting the Scene and the Evidence

The state of the crime scene must be thoroughly documented to permanently record the condition of that crime scene and its physical evidence. Documentation is the most important and time-consuming activity at the scene. It involves four major tasks:

1. Note-taking
2. Photography
3. Sketching
4. Videography

Documentation is critical for a variety of reasons. From a legal perspective, maintaining the chain of custody proves that nothing was altered prior to analysis of the evidence. If any items at the crime scene have been moved, their original locations and the circumstances that led to their relocation must be documented. A photograph of each object should be taken before and after its move. Maintaining the chain of custody also requires documenting who discovered a specific item, when it was discovered, what the item's appearance was, and who took control of the item at each of the stages from the item's recovery to its presentation in court. From a scientific standpoint, documentation helps the analyst understand later how the evidence relates to the overall scene and may suggest which types of evidence analyses to perform.

Even before documentation begins, the lead investigator may have developed a hypothesis about what occurred at the crime scene. The investigator then records facts that may corroborate, refute, or modify this

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hypothesis. The investigator must also anticipate various questions that may arise and be willing to look for evidence to help answer those questions. As the investigation proceeds, the working hypothesis may be modified, and the documentation and preservation of evidence may help lead to the development of a new scenario.

Note-Taking

Notes document the core of the crime scene and physical evidence. Note-taking starts with the first responders, who must log the time and place of arrival, appearance of the scene, names and addresses of persons present, and other pertinent information. Even medical personnel must keep logs of their activities at the scene.

All evidence must be documented in the notes. Notes are the principal way of refreshing a person's memory months or years later, so the notes must contain sufficient details. The condition of the evidence; the time of its discovery; the name of the discoverer; and the placement, collection, packaging, and labeling of the evidence must all be described, as must the eventual disposition of the evidence. This documentation may be done in a separate evidence log. Additionally, every photograph taken must be documented in the notes, including the file name (for digital cameras), frame numbers, date, time, subject matter, location, camera settings, specialized lighting, and other relevant data. Sometimes, such information is included in a separate photography log, which will be discussed later in this chapter.

Written notes tie together all other forms of documentation. During subsequent hours, days, and weeks, the notes may reflect changes in the working hypotheses, a narrowing of the focus to a single hypothesis, additional forensic observations, and eventually, a theory about the crime. During legal proceedings, the investigator's notes are made available to the defendant's attorney before trial. Defense attorneys may point out erasures and misspellings in the notes in order to discredit the investigator—which is why such care must be taken when making the original notes.

Photography

Photographs of the crime scene must be taken without the photographer or anyone else disturbing elements of the scene (**FIGURE 1-4**). Ideally, all items should be in their original, undisturbed state. Any changes made to the items or their environment from the time of their original discovery must be documented in the notes.

A systematic series of photographs is the best way to record the crime scene and any pertinent physical evidence. This photo record should include three types of shots: overall, midrange, and closeup photos (**TABLE 1-2**).



FIGURE 1-4 The items of evidence found at the scene of this safe burglary included a pack of cigarettes, a broken screwdriver, and the safety pin and tag from the fire extinguisher.

Courtesy of William Sherlock.

TABLE 1-2 Guidelines for Photographing a Crime Scene

Type of Shot	Techniques
Overall	Interior: Use the corners of the room as guides, and take overlapping shots. Record all doors and windows. Attach camera to a tripod so that a slower shutter speed can be used in low light to increase the depth of field and decrease shadows.
	Exterior: Record all structures, roads, paths, addresses, and street signs.
Midrange	Record a sequential series of shots that highlight the physical evidence within the crime scene. Use flash to brighten details.
Closeup	Record using side lighting and documentation placards at first. If shadows are present, activate the flash. Take shots with and without a scale or ruler.

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The crime scene investigator should take as many shots as necessary, using proper guidelines.

Each crime scene should be photographed as thoroughly as possible. Overall, photographs should be taken to show where the crime occurred, as well as the surrounding area, entrance, and exit. Midrange photographs should show the location of

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evidence and its relationship to the entire scene. Closeup photographs should record the detail and appearance of evidence at the crime scene, as found by investigators.

If the crime occurred indoors, all walls, ceilings, and floors of the room and of any adjacent rooms should be photographed. If a body is present, midrange photographs should be taken to show its relationship to the crime scene (**FIGURE 1-5**). After the medical examiner's (ME's) staff has removed the body, the area under it should be photographed. Additional photographs should be taken of the crime scene from different angles and perspectives.

A series of closeup photos should be taken to record details about each piece of evidence and any victims, suspects, and witnesses. Close-ups should be taken prior to adding anything to the scene, such as scales of reference or evidence identifiers. After a proper closeup photograph has been taken, the photograph, which contains an evidence identifier (number or letter) and a scale (**FIGURE 1-6**) to establish the proper dimensions of the object, should be taken. It may be necessary to take several shots of the same object under different lighting conditions.

A 35-mm digital single-lens reflex (DSLR) is the camera of choice. Digital cameras also possess the additional advantage that several still shots can be stitched together to form a three-dimensional (3D) panoramic view of the scene. When using such cameras, crime scene photographers must be careful to record the original digital image because digital photos that have been enhanced or altered by computer programs (such as Adobe Photoshop®) may be deemed inadmissible in court without proper documentation.

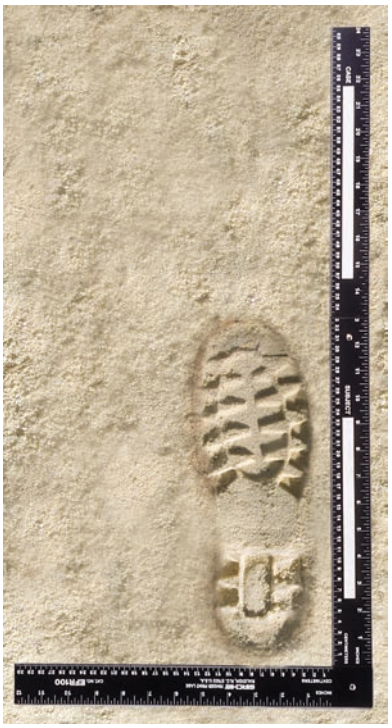


FIGURE 1-6 Scales of reference should be used with closeup photos to record the size of the evidence.
Courtesy of Sirchie Fingerprint Laboratories.

As noted earlier, each photograph taken at a crime scene must be recorded in a photo log. This log should record the following data:

- Date and time
- Camera settings (F-stop and shutter speed)
- File name and exposure number
- Type of shot (overall, midrange, or closeup)
- Distance to the subject
- Brief description



FIGURE 1-5 Crime scene photographs should show the relationship of the victim's body to the rest of the crime scene. The numbered signs in this photo indicate the location of relevant evidence.
Courtesy of Sirchie Fingerprint Laboratories.

Sketching

Although photographs are useful in recording evidence and scene detail, they may produce a false sense of perspective and do not always present an accurate representation of the dimensions and spatial relationships. Therefore, after taking the necessary photographs, an investigator should make a sketch of the crime scene (**FIGURE 1-7**).

The purpose of a sketch is to accurately record distances between objects at the scene. Sketches allow the investigator to emphasize the most relevant objects and features and to eliminate unnecessary details. The sketches produced at the scene are **rough sketches**. That is, the investigator might not be able to accurately draw the scene to scale, but the sketch must contain all

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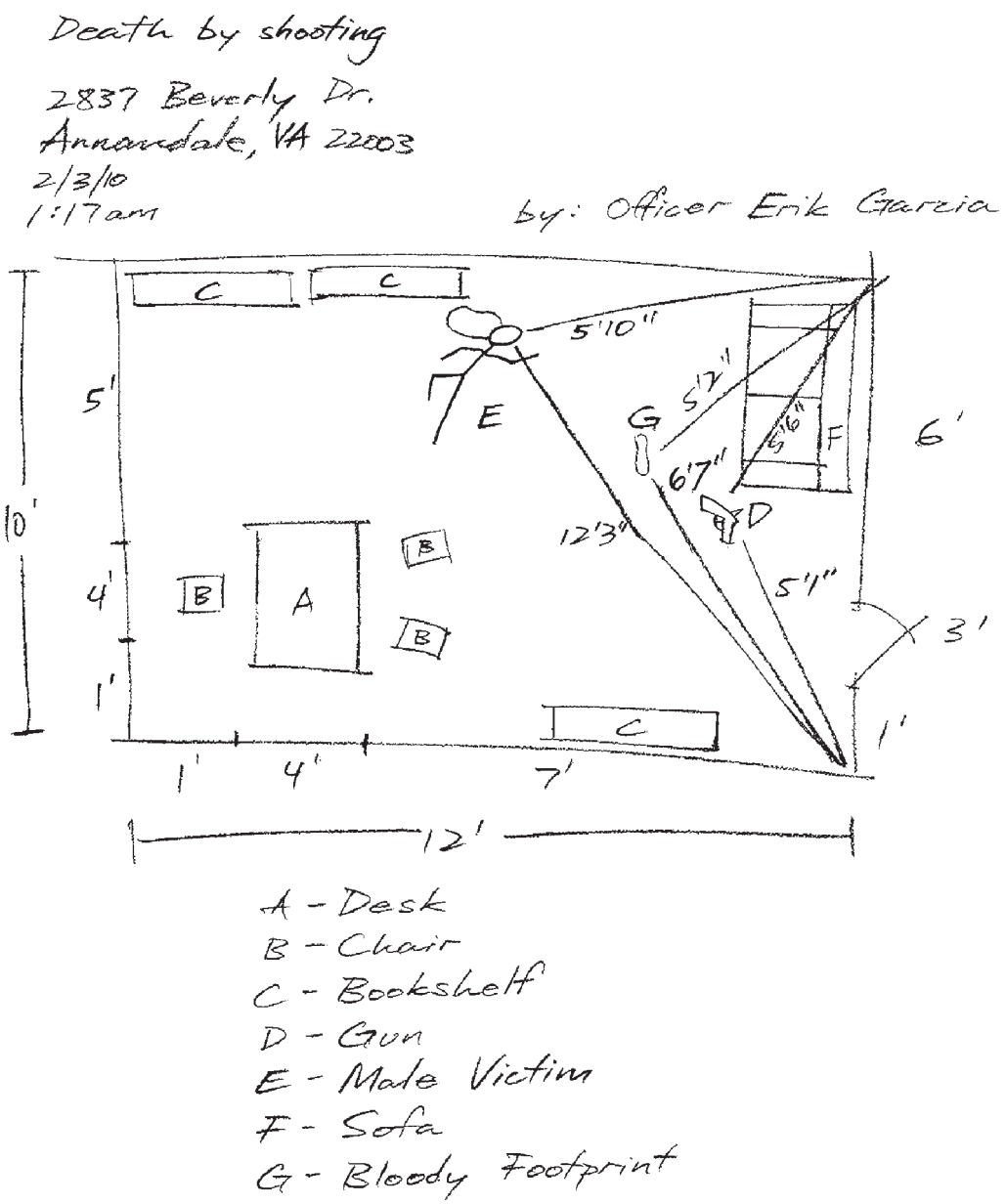


FIGURE 1-7 An example of a rough sketch that records important spatial details of the crime scene.

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the information necessary to allow a professional to prepare a finished sketch later on. In particular, the sketch must include the following information:

- Case identifier
- Date, time, and location
- Weather and lighting conditions
- Name of the sketch
- Identity and assignments of personnel
- Dimensions and layout
- Measurements and positioning (as indicated by two immovable objects)
- Key or legend (identifying objects that are given designations in the actual sketch)
- Orientation
- Scale

The sketch is usually drawn from an overhead view. Three techniques can be used to record measurements for crime scene sketches: **triangulation method**, **baseline method**, and **polar coordinate method** (**FIGURE 1-8**). All three techniques require the technician to establish two fixed points. All subsequent measurements of the crime scene are then made relative to these points. Both fixed points must be permanent objects (such as the corner of a room, a tree, or a utility pole) that will not be moved as the crime scene is searched.

- Triangulation method: Measures the location of the evidence (x, y) from fixed points (A, B).
- Baseline method: Draws a line between the fixed points (A, B) and measures the distance to the evidence (x, y) at a right angle from this line.

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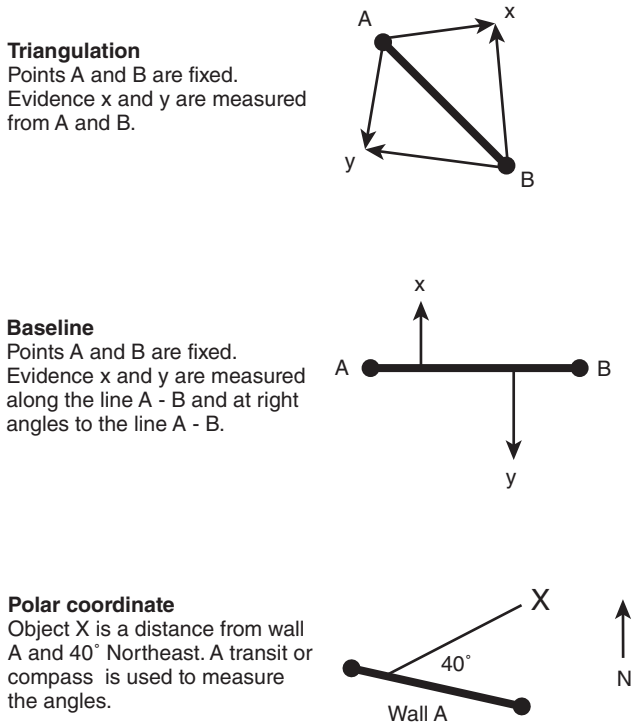


FIGURE 1-8 The three techniques used to record measurements at crime scenes are triangulation, baseline, and polar coordinates.

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- Polar coordinate method: Uses a transit or a compass to measure the angle from the north and the distance to the evidence (X). This method is most commonly used in a large-area crime scene (outside or in a warehouse) when a wall or side of a building is used to establish the fixed points (A, B).

Later, as the case is being prepared for court, a computer professional will use a computer-aided design (CAD) program to prepare **finished sketches** based on the information contained in the investigator's rough sketches (**FIGURE 1-9**). These finished sketches will be suitable for courtroom presentation. In some instances, the CAD program may produce sketches that zero in on certain rooms or areas, showing bodies, firearms, blood spatter, and other items of interest.

Videography

Just as an audio recording can be a valuable addition to written notes, a video recording may be used to complement still photography. A video is perhaps the best way to document the overall view of the scene because it shows the relationships of various pieces of evidence both to one another and to the scene.

Using a video camera is also an excellent way to document the investigation and evidence collection process, and it provides a very convenient way of recording the locations of evidence documented in still photos. Finally, forensic scientists (who are often not present at the scene) frequently find that a video allows them to understand the scene clearly at a later time.

Following are the guidelines for digital recording:

- Begin the video with a placard that contains the case number, date, time, and location.
- Begin with an overview of the area enclosing the crime scene. Follow by recording the crime scene from N, S, E, W.
- Turn off the audio unless there is a narrator. Be careful; anything recorded, even comments recorded from bystanders, is admissible.
- Move the camera slowly and keep the scene in focus.
- If not in sunlight, use good video lighting.
- Avoid zooming.
- The recorded video should never be edited. An original is kept as evidence, and copies are made for distribution.

Documenting the Crime Scene with a 3D Laser Scanner

Documenting a crime scene is a lot of work. When crime scene investigators make a hand-drawn, two-dimensional (2D) diagram of a crime scene, they are continually making decisions about what will be measured and what will not. High-profile items such as human remains, bullet casings, weapons, and signs of struggle should always be located and recorded. Sometimes, less obvious objects, which seem unimportant, may not be recorded. The crime scene cannot be sealed-off forever, and this undocumented information can disappear long before the case is solved. 3D scanners are now being used in forensics to record a 3D image of the crime scene. The 3D overview map is a permanent recording of everything in the crime scene and allows investigators to re-examine details of the crime scene long after the site is no longer a crime scene.

The 3D scanners were originally developed for surveyors who needed to quickly measure the topography of a construction site. 3D scanners can be used to capture a large overview map of a crime scene. This overview map is helpful in understanding the relative position of objects, but the objects themselves are rough 3D shapes. Most 3D scanners today use lasers

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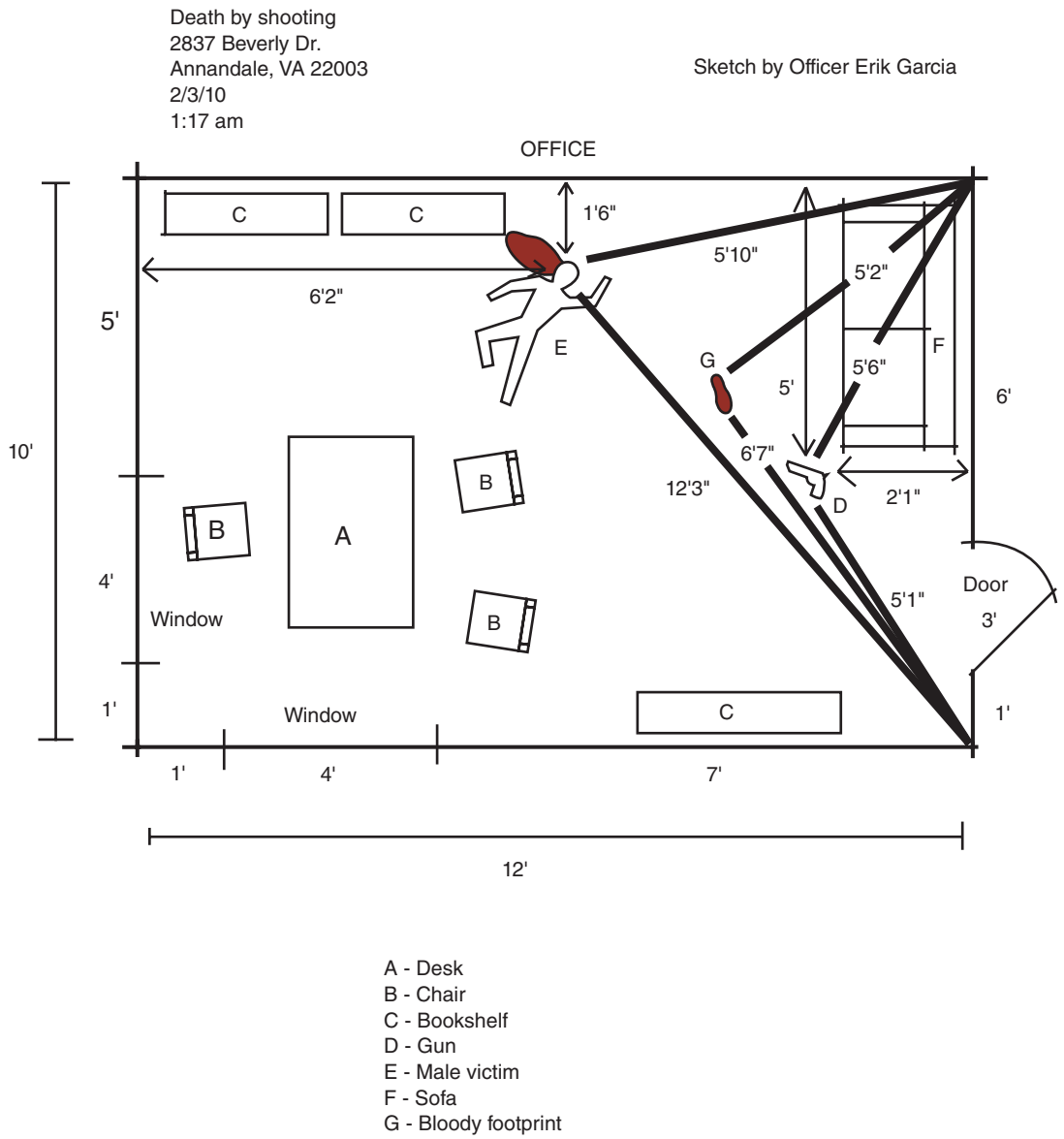


FIGURE 1-9 A CAD program transformed the crime scene sketch in Figure 1-7 into a version that can be used in court to describe the crime scene to the jury.

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to measure 3D information. A laser beam is shot across a target and is recorded by a detector at a slight angle to the laser source. The electrical output of the detector is sent to a computer program that records the information and creates a model of the crime scene. Since the laser does not "touch" any objects in the crime scene, this image capture method is non-contact, so nothing in the crime scene is moved or affected by the measurement. A 3D scanner also provides an image with much more detail than any hand-drawn measurement. This 3D digital record can be readily shared among investigators and can be presented in court years later.

An overview map of the crime scene can be made in 10 minutes or less by using the large format FARO Focus laser scanner. As can be seen in **FIGURES 1-10** and **1-11**, the laser scanning unit can be mounted on a heavy-duty tripod. The scanner can be placed in the crime scene, and its laser beam is shot up, down, and around the crime scene to capture measurements from multiple angles. The millions of individual digital measurements are recorded as a 3D point cloud with one-millimeter accuracy. After the laser measurements are completed, the unit releases a digital camera that takes 1,500 photos of the crime scene from every possible angle.

The results of the laser scanner can be assembled together by 3D software to create a complete 3D map of the crime scene, which is called a 3D point cloud. As can be seen in **FIGURE 1-12**, the 3D point

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FIGURE 1-10 FTFARO Focus^{3D} X 330 Laser Scanner captures millions of data points (called a 3D point cloud) at a crime scene. This point cloud provides an accurate 3D representation of the crime scene and the position of evidence.

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FIGURE 1-11 The 3D scanner can scan in close quarters, dusty areas, rain, or direct sunlight.

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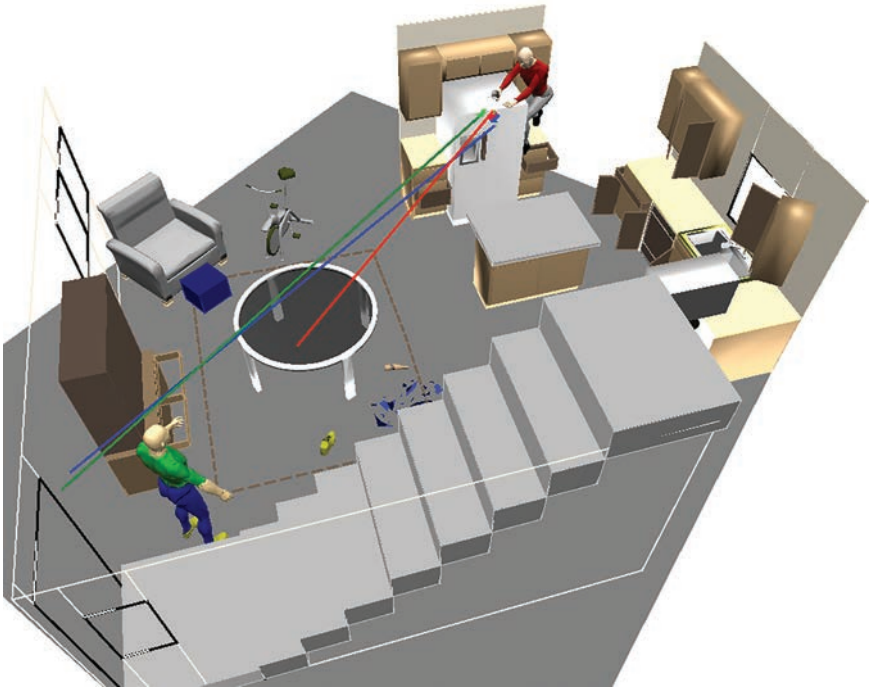


FIGURE 1-12 3D point cloud data can be imported into diagramming software, such as FARO CrimeZone, to create accurate 2D and 3D diagrams, show dimensions, and present photographs.

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cloud data can be imported into diagramming software, which creates accurate 2D or 3D diagrams that show dimensions of the crime scene. The laser data can also be imported into analysis software, and as can be seen in **FIGURE 1-13**, the data can be presented as an image of the crime scene with projections of how a gunshot traveled through the crime scene.

New "closeup" 3D scanners record the image of smaller objects that have been found at a crime scene, such as bones, a skull, or teeth, in full color and high resolution. A high-resolution 3D model of those objects can

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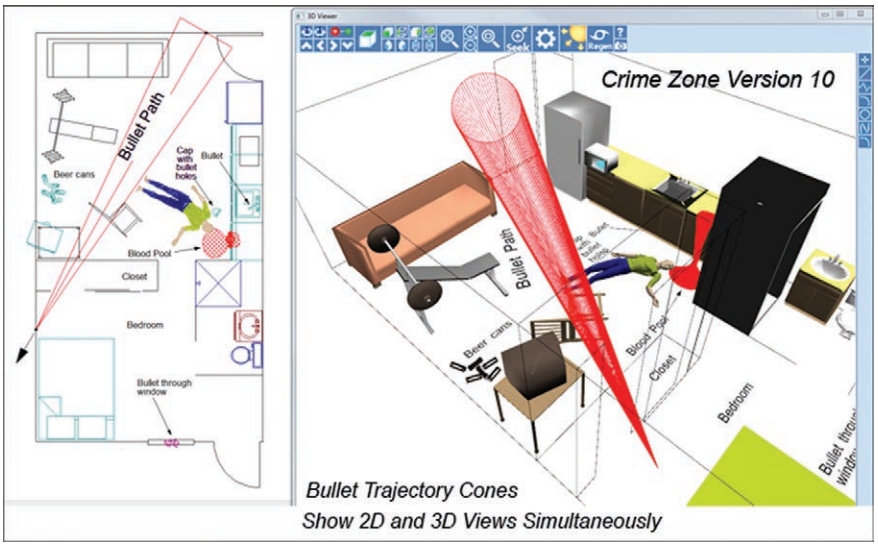


FIGURE 1-13 2D and 3D diagramming, animation, and analysis software such as FARO CrimeZone gives investigators the ability to show bullet trajectories as lines or in cones in 3D diagrams.

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then be made using a 3D printer. This type of measurement is often important in cold cases and archeological-type investigations.

Systematic Search for Evidence

Crime scene investigators must methodically search the entire crime scene to ensure the collection of less obvious pieces of physical evidence. The lead investigator should coordinate this search. To search the scene, law enforcement personnel should select and follow a particular search pattern (**FIGURE 1-14**). **TABLE 1-3** lists common patterns recommended by the Federal Bureau of Investigation (FBI).

In addition, the suspected points of ingress and egress must be searched along with any **secondary crime scenes**, which include all sites where subsequent criminal activity took place. It is not usually necessary to involve the forensic scientist in this search unless the evidence is very complex or the crime is a major one.

No matter which search pattern is selected, the search must be prioritized. Evidence that might potentially degrade must be collected first, and other evidence that is found nearby must not be disturbed. In particular, weather or traffic may impose an order of search that is considered less than ideal. However, if the weather and circumstances permit, it is best to search outside crime scenes in daylight. The lead investigator must also be prepared to use special techniques (e.g., alternative lighting, chemical enhancement of stains) and highly trained personnel (e.g., blood spatter analysts, projectile trajectory analysts), both factors that may further restrict the order in which evidence is documented and collected.

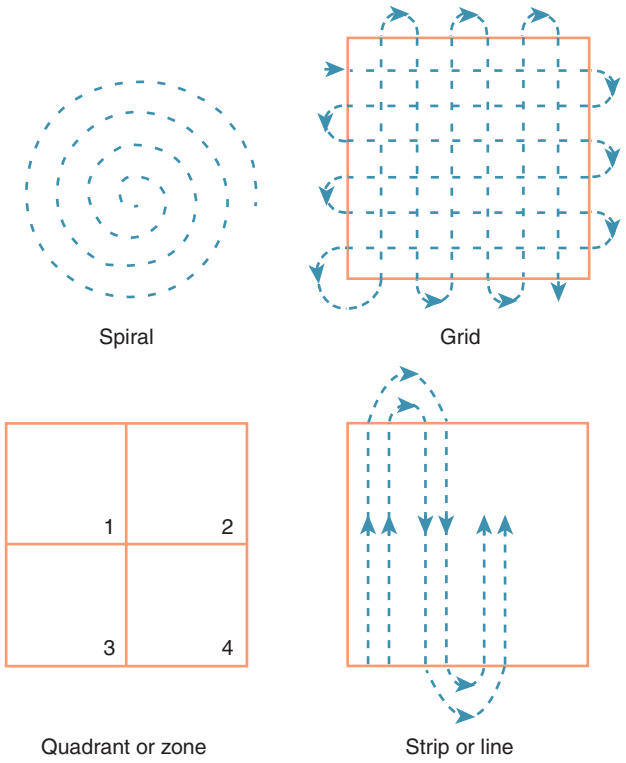


FIGURE 1-14 The most common search patterns.

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TABLE 1-3 Common Search Patterns

Name	When This Technique Is Used
Spiral	Crime scenes with no physical boundaries (e.g., open field, water)
Grid	Large outdoor crime scenes
Strip (or line)	Outdoor crime scenes where a coordinator arranges many searchers
Zone (or quadrant)	Indoor crime scenes where different teams are assigned small areas to search and one searcher is assigned to several areas of equal size

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TABLE 1-4 Evidence to Search For in Relation to the Crime

Crime	Type of Evidence
Homicide	Weapons, bullets, cartridges, and cross-transfer evidence (fingerprints, shoeprints, tire tracks, blood, hairs, fibers, or soil)
Arson	Ignitable liquids and ignition devices
Burglary	Toolmarks, broken glass, blood, fingerprints, and shoeprints
Pedestrian hit-and-run	Cross-transfer on both the vehicle (blood and tissue, fabric, hair, and fibers) and the pedestrian (paint, plastic, glass, and tire impressions)

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Recognition of Physical Evidence

The first step in processing the scene is the recognition of the gross (obvious) pieces of physical evidence (**FIGURE 1-15**). This process may begin as soon as the first responder appears on the scene and continues throughout the crime scene investigation. By the time the scene is ready to be processed, many of the more obvious pieces of physical evidence will undoubtedly have been discovered already.

The ability to recognize what is and what is not evidence is a skill that is best learned through experience. If every object present at the scene were documented, collected, and sent for analysis, the crime laboratory would quickly be overwhelmed. Conversely, if important evidence is not collected, a case might not be prosecuted successfully. Because recognition of physical evidence is so important, many police departments employ specialized evidence retrieval technicians for this purpose. More commonly, however, police on the scene are responsible for evidence recognition, documentation, and collection. The investigator must ask, "What am I searching for?" The answer to this question depends on the nature of the particular crime (**TABLE 1-4**).



FIGURE 1-15 Photograph the crime scene before collecting evidence.

Courtesy of William Sherlock.

Collection, Preservation, Inventory, and Transportation of Physical Evidence

Once the discoverer, time of discovery, location, and appearance of evidence have been thoroughly documented, the evidence must be collected, preserved, inventoried, and packaged in preparation for

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submission to the crime lab. Exactly how this process occurs depends on the type of evidence and local protocols.

Types of Evidence

A physical evidence sample that is collected at the crime scene is called a **questioned sample** (or an unknown sample) because it is an object with an unknown origin. One way to establish a connection between a questioned sample and a particular person or place is to secure a known sample from the relevant person or place for comparison. **Known samples** are also called control samples, reference samples, or standard samples. Sometimes, the known sample must be created by the forensic scientist. For example, a questioned handwritten note may be compared with a known sample by having the suspect submit samples of his or her handwriting. If a crime involves a gun, the forensic scientist will fire the suspect's gun in a way that allows for recovery of the bullet. This bullet then becomes the known sample. The forensic scientist then can compare the scratches (rifling markings) on the known bullet to the unknown bullet and determine if they came from the same gun.

When forensic scientists begin to test evidence, they first try to place the unknown sample in a class of objects, which limits the number of known samples to be used for comparison. The next step is **individualization**, the process of proving that a particular unknown sample is unique, even among objects of the same class, or proving that a known sample and a questioned sample share a unique common origin. Complete individualization is currently possible for only a few types of evidence, including fingerprints, DNA, and physical matches (or "jigsaw fits").

Impression Evidence: Tire Tracks, Footprints, Tool Marks, Latent Fingerprints, and Palm Prints

Impression evidence is often developed or enhanced by use of specialized photographic techniques (alternative light sources and filters) and/or by application of chemical developers (e.g., fingerprint powder, ninhydrin, silver nitrate). Collection may be accomplished by photography, by physical lifting (with tape for fingerprints, gel for bite marks, or cast impressions for tire or shoe impressions), or by actually seizing the entire object that holds the evidence.

Biological Evidence: Blood, Saliva, Semen, and Vaginal Fluids

Biological evidence is not only located visually but also by touch and smell. Often, it needs to be enhanced and/or developed via chemical means before analysis is possible. Swabs and gauze can be used to sample stains. Dried stains can be scraped with a scalpel. In addition, the entire object holding the stain (e.g., clothing, chair, door) may be taken or a portion of the object that is stained is cut out of the object using a scalpel.

ON THE CRIME SCENE—*PEOPLE OF CALIFORNIA V. O. J. SIMPSON*

In the early summer of 1994, Nicole Brown Simpson (ex-wife of former football star O. J. Simpson) and her friend Ronald Goldman were stabbed to death, their bodies found in the front courtyard of Nicole's home. Because of a history of violence between O. J. and his ex-wife, O. J. was an obvious suspect.

At the crime scene, a great deal of blood was found on the ground. To the investigators, the multiple serious stab wounds made to the victims with a knife suggested that this was a personal and emotional crime. Detectives left footprints in the blood, did not follow proper protocol in collecting blood samples, and then drove around town on a hot day with the samples in their vehicles. Investigators entered O. J.'s home without a warrant and moved evidence before photographing and documenting it properly.

Although none of these events was significant enough to compromise the evidence, collectively, they suggested to jurors a lack of attention to detail, laziness, and, perhaps, intentional tampering on the part of the investigators. Although other mistakes were made during the trial, the errors associated with the collection and preservation of evidence were enough to convince a jury that there was reasonable doubt about O. J.'s involvement in the crime.

Even though the DNA of O. J. was found at the crime scene and records showed that he had purchased a knife consistent with the wounds inflicted on Nicole, the errors made during evidence collection were too great for jurors to overcome. This case serves as an important reminder to investigators that how a crime scene is approached is critical to finding the truth and how the scene is handled affects the way evidence will be presented to a jury.

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Firearms and Ammunition Evidence

Firearms and ammunition evidence is usually located by sight. Investigators should consider every firearm to be loaded, so their first priority should be to render the firearm safe (so that it will not discharge accidentally). If the recovering officer is not sure that the firearm has been rendered safe and is unable to do so, the firearms section of the crime laboratory should be contacted so that arrangements can be made to disarm the weapon. Firearms should be placed in properly sealed cardboard boxes. Plastic bags collect moisture, so they should not be used because they can cause the firearm to rust. Firearms should not be marked in any permanent way. Instead, a tag should be attached to the trigger guard with the appropriate identifying information.

Arson and Bomb Evidence

Arson and bomb evidence are often difficult to find. Such scenes are frequently filled with a large amount of debris, and potentially useful evidence may be washed away as the fire is extinguished. Arson evidence is usually located by sight and smell. Collect carpet, wood, and other absorbent materials located close to the suspected origin of the fire or blast, place it in a clean paint can, and seal the can tightly. Material from different areas should be packaged separately. Place any suspected flammable liquids in a small glass bottle with a tight-fitting lid. The smooth surfaces of ignition devices, fuses, and exploded bomb components should be packed in separate bags and preserved for fingerprint development in the crime lab. Evidence collectors should not handle unexploded devices; rather, the bomb squad should be called in such instances.

Chemicals and Controlled Substances

Chemicals and controlled substances are located by visual observation (e.g., drugs, drug paraphernalia), by use of field (spot) tests, or by odor (e.g., humans, dogs). The entire sample found should be packaged, labeled, and sent to the crime lab.

Trace Evidence

Trace evidence includes items that are extremely small and even microscopic. These items are collected in a variety of ways, including with forceps, tweezers, or gloved hand by scraping (e.g., the undersides of fingernails for blood and tissue evidence), taping (for lifting fingerprints), or vacuuming (for collection of hairs and fibers). If necessary, the entire item containing the evidence, such as clothing or cars, can be collected and analyzed later.

When collecting trace evidence, the forensic technician must document and collect not only questioned samples but also known samples. For instance, if a victim is found to have soil on his or her clothing, it should be sampled. At the same time, it is essential to take several known soil samples from various areas of the scene. Also, hair and fiber samples from victims and suspects must be taken for later comparison with questioned hairs and fibers that may have been retrieved via vacuuming the scene.

To ensure the best outcome, the ME and investigators must work cooperatively to collect evidence. If a crime victim undergoes an autopsy, for example, the ME will automatically collect organ and tissue samples for pathological and forensic analysis to establish the cause of death. In addition, blood samples will be taken for toxicological analysis.

The ME will routinely collect samples of the following items from the victim's body:

- Clothing
- Bullets (in case of a shooting victim)
- Hand swabs (to look for gunshot residue in case of a shooting victim)
- Fingernail scrapings
- Head and pubic hairs
- Blood
- Vaginal, anal, and oral swabs (in case of a sex crime)

Packaging Evidence

The type of packaging used depends on the evidence itself. The package must protect and preserve the evidence. Small items such as hairs, fibers, paint chips, or powders can be wrapped in a small paper package that is made by folding a piece of paper so it forms a container. Directions for making the folds can be found in **FIGURE 1-16**. The size of the piece of paper is determined

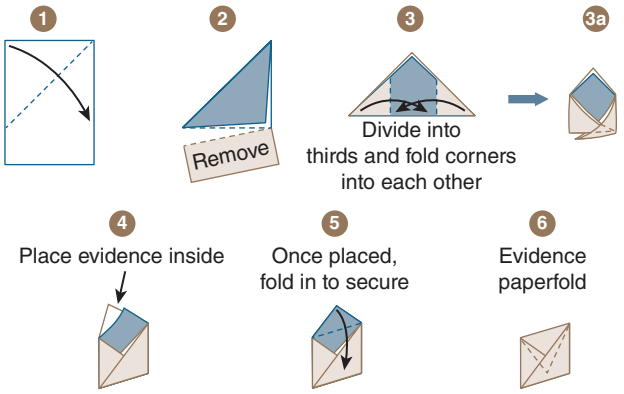


FIGURE 1-16 How to fold a piece of paper to make an evidence container.

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FIGURE 1-17 Brown paper bags used for evidence collection may come preprinted with the necessary chain of custody form. These bags may be used as a secondary container for small items that have wrapped in a folded paper package or as primary containers for larger evidence.
Courtesy of Sirchie Fingerprint Laboratories.

by how much evidence will be placed in it. Although any clean piece of paper can be used, laboratory weighing paper, if available, is the best choice. Laboratory weighing paper is treated so that powders and other small items will not stick to it. Because trace evidence may eventually work its way out of the folded paper, once the evidence is placed in the folded paper, it should be immediately placed in a secondary paper envelope, or polyethylene zip bag. The bags shown in **FIGURE 1-17** can also be used as a primary bag for larger pieces of evidence. For liquid samples, it is crucial that the sample does not evaporate. For small liquid samples, screw-cap glass bottles are satisfactory (**FIGURE 1-18**); larger samples can be put into a new paint can and then sealed (**FIGURE 1-19**).

Blood is of special concern. Although blood is commonly found at crime scenes, the DNA present in blood will degrade if the sample is not preserved properly. Moist blood that is placed in an airtight container readily supports the growth of mold and mildew; unfortunately, a sample that becomes contaminated in this way has no evidentiary value. For this reason, wet blood found at a crime scene should be allowed to air dry in place; once dried, it can be sampled by scraping and



FIGURE 1-18 Wet or liquid samples may be placed in airtight jars. After the top is screwed on, the jar should be sealed with tape to prevent contamination.
Courtesy of Sirchie Fingerprint Laboratories.



FIGURE 1-19 Once the lid is in place, an airtight seal prevents evaporation of liquid evidence. The rubber septum in the lid may be punctured with a syringe later to take a sample for analytical purposes.
Courtesy of Sirchie Fingerprint Laboratories.

placing it in a paper envelope. Alternatively, a wet blood sample may be collected on a swab. The swab should be allowed to dry and then placed in a paper envelope.

Clothing can be put into large paper sacks. No folding of clothing is usually permitted, because this may potentially cause cross-transfer of trace evidence from one area of the garment to another.

Generally, it is best to take the entire piece of evidence as it is found at the scene. This packaging method ensures that other trace evidence in the sample will also be available for the forensic examiner. For example, doors, pieces of drywall, and flooring may be removed from the scene and sent to the lab. In case of a hit-and-run homicide, an entire car may be submitted. Only if the questioned sample is adhering to a huge structure should it be removed and submitted separately from the structure on which it was found.

Submitting Evidence to the Crime Laboratory

When evidence is collected at the scene, it is removed and stored temporarily in a separate evidence collection area, which is constantly guarded. Once all evidence is collected, it is ready to be transported and submitted to the crime lab or to an evidence storage area maintained by the police.

Evidence may be submitted to the crime lab either via mail or by personal delivery. Mail and parcel carriers have special regulations that may apply to shipment of evidence from a crime scene. Unloaded rifles and shotguns can be shipped by any person via the United States Postal Service (USPS), although the shipment must be to an addressee who holds a Federal Firearms License (FFL). Unlicensed individuals cannot ship

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unloaded handguns via the USPS, but those with an FFL can. Postal regulations prohibit the shipping of live ammunition, but both FedEx and United Parcel Service (UPS) permit such shipments. Postal regulations in the United States also prohibit the shipping of certain chemicals, radiological agents, and explosives, but such materials and items can often be transported via either UPS or FedEx. Etiological agents (viable microorganisms and their associated toxins that can cause disease in humans) can be shipped in specially marked and constructed containers via registered mail.

BACK AT THE CRIME LAB

After assisting injured individuals at a crime scene, the responding officer needs to ensure that the following steps are executed with the utmost proficiency to avoid compromising the investigation at this initial stage:

- Physically define the perimeter of the crime scene well beyond the actual observed crime site.
- Establish a single path in and out of the crime scene.
- Limit access to the crime scene.
- Record all actions and observations as soon as possible.
- Identify, document, and remove any person(s) at the crime scene.

Each item sent to the laboratory should be packaged separately. In addition, every shipment must include an evidence submission form, which provides essential details about the sample: the submitter's name, a case number, a list of items sent, a list of analyses requested for each piece of evidence, and a brief case history. However, the forensic scientist is not limited by the investigator's request for particular tests. In some cases, the results from the requested list of tests may prompt the forensic scientist to perform additional analyses. In other cases, the forensic scientist may decide that the requested examinations cannot be performed if the sample of evidence submitted is too small.

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Chain of Custody

Once the case has moved to court, all evidence will be subject to questions about maintenance of the **chain of custody**, which is a written chronological record of each person who had an item of evidence in his or her possession. The prosecution must account for the evidence every step of the way—from its discovery, to its collection, analysis, storage, transfer, and any modification while being analyzed. Throughout the process, including court proceedings and appeals, the prosecution must maintain secure custody of the evidence.

The chain of custody starts with the original discoverer. Evidence should not be moved prior to its documentation and retrieval. If it is moved prior to its documentation and if all of the facts surrounding that movement are not documented completely in the notes, the chain of custody has been broken, and a court may subsequently rule that the evidence is tainted and inadmissible. The chain of custody is also part of the reason why, when possible, evidence is sent in large pieces with identifying marks directly on it (such as the collector's name or initials, date, and description) rather than by cutting out or removing smaller portions that cannot be labeled individually. The case identifier and other pertinent information listed on packaging materials holding the evidence provide yet another means of trying to document the chain of custody. The chain of custody is preserved by making certain that the investigator's notes completely document everything that happens to each piece of evidence at the scene.

A chain of custody form should be attached to each evidence container (**FIGURE 1-20**). Failure at any stage to properly document who has possession of the

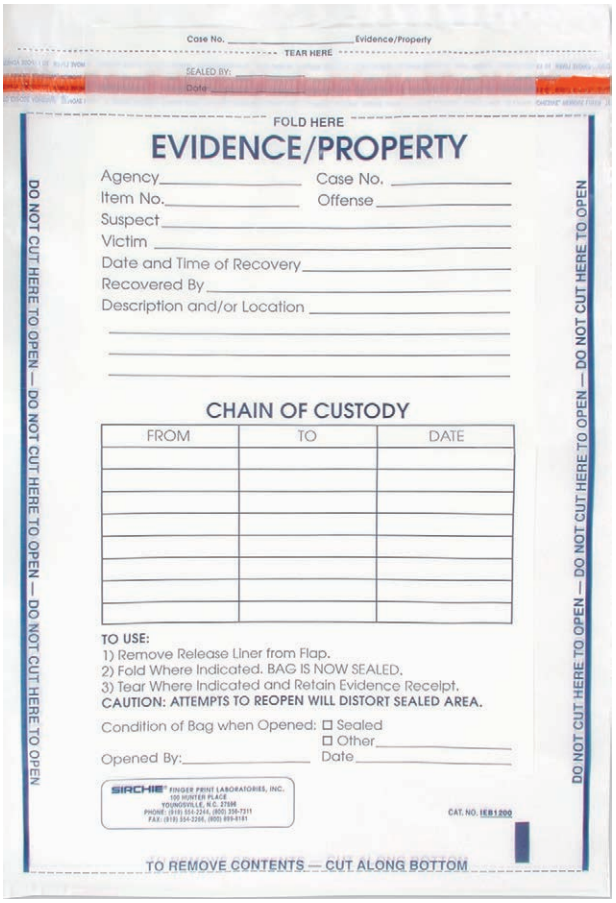


FIGURE 1-20 Each individual who handles a piece of evidence must complete the chain of custody form.

Courtesy of Sirchie Fingerprint Laboratories.

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evidence and what that person did with it (and when) can lead to contamination of the evidence and its subsequent exclusion at trial. Because every person who handles the evidence must be able to show an unbroken chain of custody, it is best practice to keep the number of individuals who come in contact with the evidence to an absolute minimum.

Reference and Control Samples

When evidence is brought to the crime laboratory, it may undergo an examination in which it is compared with a known standard or reference sample. In some cases, the reference sample may be as simple as a hair of a potential suspect or a fiber from the victim. We have all seen CSI episodes where reference DNA samples are taken from the cheek of a suspect by a technician using a buccal swab; this is done to compare it with DNA found at the crime scene. Investigators must remember that reference samples are just as important as evidence and they must be treated just as carefully.

In some cases, substrate controls are also collected. These are materials collected in the proximity of the crime. For example, in a crime scene, carpet areas containing blood stains would be cut out and labeled as evidence and taken for analysis. The investigator would also take a portion of the same carpet that is not stained as the substrate control. This ensures that if, during subsequent analysis of the blood-stained carpet, some unexpected substance is found, the analyst would have a clean sample to determine if the substance is present only in the blood-stained carpet or if it is also in the unstained portion, or substrate control. If it is also present on the substrate control, it probably isn't a factor in the crime.

THE CHAIR BURGLAR—CAUGHT BY CRIME MAPPING

For several years, a series of brazen burglaries occurred in the affluent neighborhoods of Irvine, California. Investigators and police set up surveillances, searched databases of past arrestees, and searched pawn shops for stolen jewelry, but they failed to identify suspects or recover any stolen items as the burglaries continued. The thieves were stealing mostly cash and jewelry. As the number of burglaries grew past 50, the similarities in the modus operandi of the crimes began to add up, and police wondered if they were actually looking for just one very busy burglar.

The Irvine police noticed that in many of the burglaries, they found a lawn chair next to a fence at the back of the house. Because footprints were found on the chairs, they theorized that the chairs were being used to aide a quicker escape. Assuming these crimes were linked, the police gave the culprit the name "chair burglar." In other locations, a large potted plant was left next to the fence, and they theorized that in these cases, the chair burglar couldn't find a lawn chair and had to use the potted plant instead.

Police know that most crimes are committed within 2 miles of the criminal's residence. But in this case, the target residences were in very affluent neighborhoods. The police realized that they were probably looking for a criminal "poacher": a criminal who doesn't live in the neighborhood but targets residences in the affluent neighborhoods. After getting nowhere close to apprehending the burglar, in 2005, the police changed tactics and rather than trying to catch the thief in the act of the burglary, they began trying to find him as he searched for his next target.

They decided to use Crime Mapping and geographic profiling theory to see if they could predict where the serial burglar might strike next. Potential targets were identified using geographic profiling software, which uses crime data to estimate where future similar crimes might occur and where the culprit might live. They used Canadian-based software, Rigel, from Environmental Criminology Research Inc. (ecricanada.com). Geographic profiling is based on research in the field of environmental criminology, which is how the environment around us influences crime. Environmental criminology in general and geographic profiling in particular focus more on the "where" than the "why" of crime. Geographic profiling doesn't depend on what motivates the criminal. It is based on the practical details of how and where offenders find their targets. Geographic profiling is a spatial analysis technique that analyzes the known locations of incidents to determine where the unknown base is most likely located. A geographic search is based on movement through the physical environment. If the offender does not conduct a geographic search for targets, then a geographic profile is not applicable. For example, if an offender finds potential victims on the internet or in obituary notices in the newspaper, that offender's search is not geographic. The target backcloth is the general availability of crime targets in the environment. If the targets are rare or very unevenly distributed, it may distort or invalidate the geographic profile based on those sites.

At this time, there were 42 burglaries over two years that seemed linked. The burglar only chose single-family homes that backed onto a green space or park. This allowed him to case targets on public property and establish an escape route, which was always out the rear of the property. The burglar stole only cash, coins, or jewelry, items that would easily fit in his pockets or a small bag. The police knew they were dealing with a skilled, proficient burglar. Crime

(Continued)

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THE CHAIR BURGLAR—CAUGHT BY CRIME MAPPING (*Continued*)

scene investigators (CSI) carried out blind swabbing for trace DNA at 21 of the burglaries. Although they knew they would find the homeowners' DNA in most samples, they hoped to find a common DNA profile at two or more locations. The DNA lab confirmed that they found samples from three of these locations that contained a unique DNA sequence that was common to one person, who was male.

Based on the burglar's previous behavior, the Rigel software predicted that the burglar would most likely commit his next burglary on a Friday, Saturday, or Sunday between 17:00 and 22:00 hours. The past crimes had been committed within the same 17-square-mile area. The software pinpointed a peak area of geographic interest. The police deployed unmarked cars in this area earlier in the days considered to be those the burglar would most likely strike. They planned to scan license plates of vehicles driving through the neighborhood for a period of 5 days. The license numbers were then used to identify nonlocal drivers by scanning the California DMV database.

On the very first day of surveillance, a vehicle was scanned driving through the neighborhood and identified as a rental car. The car rental company indicated that driver, Raymond Lopez, had been renting cars weekly for the past 20 years. Police records showed Lopez to be an ex-convict who lived in Los Angeles, some 30 miles from the target. Lopez was put under surveillance and over the next week was observed casing homes in various residential neighborhoods. CSI investigators swabbed the steering wheel of the rental car he returned and found that the DNA on the steering wheel matched the DNA from the three burglaries.

In late October 2005, Lopez was arrested, and at the time of his arrest, he was in possession of jewelry from a burglary he had just committed. When police searched his home, they found cash and gold bricks that were cast by melting stolen jewelry. Detectives found more than $500,000 of rare coins and jewelry. A local pawnshop indicated that Lopez and his acquaintances had pawned property there regularly for at least 20 years.

Irvine police estimate that Lopez committed 139 burglaries in less than 2 years (January 2003 through September 2005) and stole more than $2.5 million. Police in neighboring areas uncovered information that indicated that Lopez was probably working in other neighborhoods as well. In 2006, Raymond Lopez pleaded guilty to 14 felony counts, including burglary and possession of stolen property, and began serving a 13-year prison sentence.

The investigators at the Irvine Police Department have won multiple awards for their work on this case, including the prestigious International Association of Chief of Police ChoicePoint Award for Excellence in Criminal Investigations. Geographic profiling analysis is now being used for robbery, burglary, auto theft, vandalism, and stolen credit card cases.



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Map of locations where the "chair burglar" struck.

Data from Hill, B., & Paynich, R. (2014). *Fundamentals of crime mapping* (2nd ed.). Burlington, MA: Jones & Bartlett Learning.
Rossomo, D. K., & Verlarde, L. (2008). Geographic profiling analysis: Principles, methods and applications. In S. Chainey & S. Thompson (Eds.), *Crime mapping case studies, Practice and research* (pp. 35–43). Chichester, UK: John Wiley & Sons
Smith, S. O. (2005, November 4). Irvine "chair burglar" suspect arrested. *Orange County Register*.

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Criminal Evidence and the Fourth Amendment

One of the most frustrating experiences for police is the exclusion of incriminating evidence at trial. After expending all the effort involved in searching, identifying, packaging, shipping, and analyzing physical evidence, having that evidence later excluded from the court proceedings can be demoralizing. Although evidence may sometimes be excluded because of improper or undocumented chain of custody, it is more often the case that somewhere during the investigation, the suspect's **Fourth Amendment** privileges were violated. This situation most often occurs as a result of "unreasonable" search and seizure of evidence, as determined by the court. The seizure of all evidence must be done in compliance with the Fourth Amendment, which states:

> *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.*

To obtain a **search warrant**, a law enforcement officer presents an affidavit to a neutral magistrate attesting to the fact that he or she has probable cause to believe that criminal activity is taking place on the premises to be searched. An **arrest warrant** is obtained in the same way, except that the officer declares that there is probable cause to believe that the person to be arrested has committed a crime. In either case, law enforcement officers can expect that they, and perhaps others, will have to give testimony explaining how they arrived at the conclusion of probable cause.

Probable cause is not defined in the Fourth Amendment but rather is purely a judicial concept based on case law. Probable cause is a fairly minimal standard and is to be determined according to the "factual and practical considerations of everyday life on which reasonable and prudent men, not legal technicians, act" (*Brinegar v. United States*, 1949). The courts have ruled that:

> *In determining what is probable cause . . . we are concerned only with the question whether the affiant had reasonable grounds at the time of the affidavit . . . for the belief that the law was being violated on the premises to be searched; and if the apparent facts set out in the affidavit are such that a reasonably discreet and prudent man would be led to believe that there was a commission of the offense charged, there is probable cause . . .* (Dumbra v. United States, *1925)*

In particular, the magistrate will give significant weight to the following sources of information:

- An informant who has previously been proven reliable
- An informant who implicates himself or herself
- An informant whose testimony has been at least partly corroborated by police
- A victim of the crime being investigated
- A witness to the crime being investigated
- Another police officer

The list of what may be seized with a search warrant is extensive. Contraband and the "fruits and instrumentalities of crime" are subject to seizure. The 1967 case of *Warden v. Hayden* also established that such evidentiary items as fingerprints, blood, urine samples, fingernail and skin scrapings, voice and handwriting exemplars, conversations, and other documentary evidence may be obtained via warrants. However, what the magistrate will allow has limits. For example, law enforcement personnel are not permitted to induce vomiting or to require a suspect to undergo surgery under anesthesia to retrieve a bullet from the chest. By contrast, an individual may be detained on the reasonable grounds that his or her natural bodily functions (i.e., defecation, urination) will produce evidence that is held internally.

Exceptions to the Fourth Amendment

Even though the Fourth Amendment requires officers to have a warrant before conducting a search, the vast majority of searches and seizures occur without a warrant. Over time, the U.S. Supreme Court has issued a number of exceptions to the rights that are afforded by the Fourth Amendment, including border searches, consent searches, search incident to an arrest, plain view doctrine, emergency exceptions, open fields, stop-and-frisk procedures, and vehicle inventories.

Border Searches

A customs search at a border was authorized by the First Congress. Such searches and seizures require no warrant, no probable cause, and not even any degree of suspicion.

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Consent Searches

An individual can waive his or her Fourth Amendment privileges and consent voluntarily and knowingly to a search of either his or her person or premises by an officer without a warrant.

Search Incident to an Arrest

Arrests can occur in one of two ways. First, an arrest warrant may be obtained and then executed with an ensuing arrest. Second, a law enforcement officer is allowed to arrest a person in a public place and without a warrant. The person must have, on probable cause, committed a felony or have, in the presence of the officer, committed a misdemeanor. Searches of the arrestee and the area under his or her immediate control are permitted to protect the officer from harm, prevent the destruction of evidence, and seize items that the arrestee might otherwise use to escape.

Plain View Doctrine

If law enforcement officers are legally in a position where they can plainly see contraband or other evidence, they can seize it without a warrant. The reasoning is that a person's expectation of privacy is small for those things that he or she willingly exposes to others, including things exposed in the individual's home.

Emergency Exceptions

When police arrive at the scene of a crime, if they have reasonable suspicion that an injured person is inside a dwelling, they may enter the premises without a warrant to render emergency medical attention. They may also do a sweep of the premises looking for additional victims and perpetrators. During this sweep, they can look only in exposed areas and likely hiding spots. Police may also enter locations without permission to assist at fire scenes and other emergencies.

Open Fields

This exception is similar to the plain view doctrine. It holds that an individual has no expectation of privacy in open fields, which, by their very nature, are open and exposed to public view.

Stop-and-Frisk Procedures

Law enforcement officers may pat down a suspicious person whom they fear may be armed and dangerous.

Vehicle Inventories

Vehicles present a special law enforcement problem. Because a vehicle may quickly leave the jurisdiction of the investigating officers, whenever a driver or an occupant of a vehicle is arrested, the need to search the vehicle may be immediate.

The U.S. Supreme Court and the Fourth Amendment

The U.S. Supreme Court has ruled in two cases involving seizure of evidence at)a crime scene without a warrant.

Mincey v. Arizona (1978)

On October 28, 1974, an undercover police officer and several plainclothes officers raided an apartment occupied by Rufus Mincey, who was suspected of dealing drugs. A shootout ensued, during which Mincey shot and killed the undercover officer. Three occupants of the apartment were wounded, including Mincey. The only actions taken by the narcotics agents at the scene were a search for additional victims and a call for medical care for the wounded individuals. Within 10 minutes of the shooting, two homicide detectives arrived and took charge of the scene. They conducted a four-day search of the apartment, without a warrant, including extensive sketching and photographing; opening drawers, cabinets, and cupboards; examining all objects contained therein; ripping up carpets; digging bullet fragments out of floors and walls; emptying clothing pockets; and completing an inventory of the contents of the premises. In total, they confiscated 200–300 objects.

Mincey, who was interrogated in the hospital by detectives while he was barely conscious, was indicted for, and later convicted of, murder, assault, and various narcotic offenses. Both during the original trial and during the subsequent appeal, Mincey's attorneys complained that much of the evidence against him was obtained during the warrantless, four-day search and that his statements made in the hospital were not voluntary. The Arizona Supreme Court reversed the homicide and assault convictions on state grounds but let the narcotics convictions stand, holding that the evidence obtained in the search of a homicide scene was proper and that the hospital statements were voluntary. In essence, the Arizona Supreme Court reasoned that a warrantless search of a homicide scene is reasonable, given the seriousness of the crime. Upon appeal to the U.S. Supreme Court in 1978, the court ruled in Mincey's favor, saying:

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> *The search cannot be justified on the ground that no constitutionally protected right of privacy was invaded, it being one thing to say that one who is legally taken into police custody has a lessened right of privacy in his person, and quite another to argue that he also has a lessened right of privacy in his entire house. Nor can the search be justified on the grounds that a possible homicide inevitably presents an emergency situation, especially since there was no emergency threatening life or limb, all persons in the apartment having been located before the search began.*

The court ruled that the seriousness of Mincey's offense was not enough to necessitate a warrantless search because there was no indication that evidence would be lost, destroyed, or removed while investigators obtained a search warrant, and there was no indication that a warrant would have been difficult to obtain.

SEE YOU IN COURT

In the early 1980s, in a juvenile court in Canton, Ohio, an attorney appointed to represent two juveniles facing serious felony charges made a startling discovery. The two suspects had been charged with the brutal armed robbery of an elderly couple in the couple's own home. Using a hammer as a weapon, the perpetrators beat the couple and took two pillowcases full of stolen property. Within minutes after police received the call, officers had located the two juveniles, each of whom was carrying a bag. This is where the problem began.

Officers from three jurisdictions—city, county, and township—caught the suspects, and each wanted a part of the case. Hence, the officers divided the stolen goods into three piles, never noting which item came from which pillowcase. The officers returned to the scene of the crime for a "show up," where witnesses can identify the suspects. The officers pooled all of the goods on the hood of a police car and asked the victims to identify the stolen goods, which they did. The officers then re-divided the stolen property for "bagging and tagging."

The two juveniles were facing a hearing motion, known as a waiver, to be tried as adults. The state admitted each piece of evidence on the record, employing one officer who obligingly identified each item as well as the person who bagged the evidence and initialed the bag. On cross-examination, a second officer was called to the stand and testified that the first officer was the one who had bagged and tagged the evidence. The trial court judge halted the hearing and ordered counsel into chambers.

Because the chain of custody had been destroyed, the trial could not continue. The suspects pled guilty to juvenile charges and went to juvenile detention for the maximum sentence of three years. As these officers discovered, the chain of custody is critical every step of the way, from the crime scene to the courtroom.

The primary error on the part of the officers was the division of evidence. Here is where the chain of custody was destroyed. Evidence is valuable only in context with its location at the scene and other items of evidence. When the officers divided the evidence in what appeared to be a random method, the evidence lost its value. The second mistake was the re-pooling of evidence at the scene for the witnesses to look over. Evidence was mixed together, with no note of each item's location and context. Third, the evidence was re-divided for "bagging and tagging," again with no context. All items of evidence must be collected singularly from the scene. On the chain of custody form, the investigator must note the location of each item relative to other items at the scene (both permanent landmarks and other items of evidence) with measurements and those notes must be accompanied by a photo of the item, including an evidence marker.

Although the chain of custody command may vary from jurisdiction to jurisdiction, there is no argument about one point: the evidence collection procedures must ensure that the item of evidence is collected at the scene in context with the scene itself.

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Michigan v. Tyler (1978)

In this U.S. Supreme Court case, a local fire department responded to a call about a fire in Loren Tyler and Robert Tompkins' furniture store, shortly before midnight on January 21, 1970. Plastic containers holding a suspected flammable liquid were discovered at about 2 A.M., and the chief summoned police investigators. A detective took several photos but stopped his investigation because of extensive smoke and steam. By 4 A.M., the fire had been extinguished, and the chief and detective left, taking the plastic containers with them. At about 8 A.M. the next day, the chief and an assistant reentered the scene to make a cursory inspection. An hour later, the assistant and the detective made another examination and removed evidence. On February 16, 1970, a member of the Michigan State Police arson section visited the site and took photos; the same investigator subsequently made several additional visits. During those visits, various pieces of physical evidence were retrieved, including a portion of a fuse.

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Tyler and Tompkins were charged with conspiracy to burn real property and other offenses. Evidence retrieved from the building as well as the arson investigator's testimony were used to obtain their convictions. The defendants' attorneys objected to the testimony and evidence, saying that neither was a warrant issued nor had consent been granted for the searches and seizures. The Michigan State Supreme Court reversed the verdicts and remanded the case for a new trial. The State of Michigan appealed to the U.S. Supreme Court, which upheld the ruling of the Michigan Supreme Court, saying:

> *A burning building clearly presents an exigency of sufficient proportions to render a warrantless entry "reasonable," and, once in the building to extinguish a blaze, and for a reasonable time thereafter, firefighters may seize evidence of arson that is in plain view and investigate the causes of the fire.*

The U.S. Supreme Court concluded that the later warrantless entries were not part of the initial emergency circumstances and, therefore, violated the Fourth and Fourteenth Amendments. The court excluded evidence obtained during these entries from the respondents' retrial.

Conclusion

The underlying message of the rulings of the U.S. Supreme Court is clear. Although various Fourth Amendment exceptions permit law enforcement officials and medical personnel to enter a crime scene, render aid, and collect evidence in plain view, officers must obtain a search warrant before they conduct a careful, detailed examination of the crime scene.

Wrap Up

You Are the Forensic Scientist Summary

1. The investigators must make a calculated estimate of the path taken by the criminal at the crime scene and, if possible, the path taken by the victim. The pathway that the investigators use to access the scene must not coincide with the path taken by either the perpetrator(s) or the victim(s).
2. During its creation, the route of the pathway is carefully photographed. The photos should include long- and medium-range shots to record the pathway's overall appearance before many individuals travel on it. Additionally, images of the focal point(s) of the crime scene should be taken from the pathway using a telephoto lens before it is disturbed in any way. Any items of evidence located on or near the path must be photographed and then packaged.

Chapter Spotlight

- When arriving at the crime scene, the first responsibility of an investigator is to identify, establish, protect, and secure the boundaries of the crime scene. Upon arrival, the investigator should document the state of the crime scene, any existing conditions, and any personal information concerning witnesses, victims, and suspects.
- A piece of evidence is either a questioned sample or a known sample. A questioned sample (also called an unknown sample) must be compared with evidence with known origins.
- The search for evidence may occur in several patterns: spiral, grid, strip, zone, or wheel.
- Evidence is first placed within a class of objects, which limits the number of known samples to which it may be compared. After classification, evidence undergoes individualization—the process of identifying the sample as a unique specimen.
- The treatment of evidence, including its collection, transportation, and preservation, is specific to the type of evidence involved. For example, blood samples need to be treated in a very different manner than hair, alcohol, or glass fragment samples.
- A clear and concise chain of custody is vital to maintain the best prosecutorial case.
- Documenting the scene requires specific and exact notes that allow the investigator to recall—sometimes years later—the process of events and the details uncovered.

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- Search and seizure rules are continually undergoing revisions through court challenges.
- Scene documentation should include the following measures:
  - A working hypothesis of the crime
  - Notes, either handwritten or tape recorded (to be transcribed later)
  - Overall, midrange, and close-up photographs
  - Video for setting the scene and providing a better sense of item placement
  - Sketches based on three main orientation techniques—triangulation, baseline, and polar coordinate

Key Terms

Arrest warrant A judicial order requiring that a person be arrested and brought before a court to answer a criminal charge.

Baseline method A technique used to record measurements for crime scene sketches that draws a line between the fixed points (A, B) and measures the distance to the evidence (x, y) at a right angle from this line.

Chain of custody The chronological record of each person who had an item of evidence in his or her possession and when they had it.

Finished sketch A drawing made by a professional that shows the crime scene in proper perspective that can be presented in court.

Fourth Amendment This amendment in the U.S. Constitution gives citizens the right to be secure in their persons, houses, papers, and effects against unreasonable searches and seizures.

Individualization The process of proving that a particular unknown sample is unique, even among members of the same class, or proving that a known sample and a questioned sample share a unique, common origin.

Known sample Standard or reference samples from verifiable sources.

Physical evidence Any object that provides a connection between a crime and its victim or between a crime and its perpetrator.

Polar coordinate method A technique used to record measurements for crime scene sketches, using a transit or a compass to measure the angle from the north and the distance to the evidence (X). This method is most commonly used in a large-area crime scene (outside or in a warehouse) when a wall or side of a building is used to establish the fixed points (A, B).

Questioned sample A sample of unknown origin.

Rough sketch A drawing made at the crime scene that indicates accurate dimensions and distances.

Search warrant A court order that gives the police permission to enter private property and search for evidence of a crime.

Secondary crime scenes Sites where subsequent criminal activity took place.

Trace evidence Evidence that is extremely small or is present in limited amounts that results from the transfer from the victim or crime scene to the suspect.

Triangulation method A technique used to record measurements for crime scene sketches, measuring the location of the evidence (x, y) from fixed points (A, B).

Putting It All Together

Fill in the Blank

1. A physical evidence sample that is collected at the crime scene is called a(n) _____ sample.
2. Known samples are also called _____ samples.
3. A known sample that has been produced is sometimes called a(n) _____.
4. _____ has the responsibility of securing the crime scene.
5. The boundary around the crime scene should be _____ than the scene could possibly be.
6. As soon as is possible, the responding officer at a crime scene should _____ all of his or her actions and observations at the scene.
7. The first responders must ensure that _____ is not lost, contaminated, or moved.
8. The _____ has the responsibility of directing the crime scene investigation.
9. Once the boundaries of the crime scene have been established, a(n) _____ path into and out of the scene is created.
10. The taking of _____ documents the core of the crime scene and the physical evidence.
11. Photographs of the crime scene must show all items in their _____, _____ state.
12. _____ photos are used to record details about each piece of evidence.
13. An investigator only needs to draw a(n) _____ sketch of the crime scene.
14. As the case is being prepared for court, a(n) _____ will prepare finished sketches of the crime scene based on information in the investigator's rough sketch.
15. Four common search patterns recommended by the FBI are _____, _____, _____, and _____.
16. Impression evidence is developed or enhanced by the use of specialized _____ techniques and the application of _____ developers.

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17. Biological evidence is developed by _____ means.
18. The first priority of an investigator who locates a firearm at a crime scene is to _____.
19. Carpet samples close to suspicious fires are collected and placed in a(n) _____.
20. Trace evidence is collected manually by _____, _____, and _____.
21. List four types of evidence that may be retrieved by the medical examiner from a deceased victim: _____, _____, _____, and _____.
22. Whenever possible, evidence should be _____ (left on or taken off) the object on which it is found.
23. As evidence is collected, it is temporarily stored in a collection area that is constantly _____.
24. Crime laboratories require a(n) _____ to accompany all evidence shipments.
25. From its original finding through court proceedings, the prosecution must maintain the _____ of the evidence.
26. Evidence is most often excluded from trial because of violations of the defendant's _____ rights.
27. To obtain a search warrant, a law enforcement officer must show _____.
28. In determining probable cause, the magistrate may consider _____, _____, _____, and _____.
29. When police arrive at the scene of a crime, if they think an injured person is inside, they can enter the premises without a warrant because of the _____ exception to the Fourth Amendment.

True or False

1. A forensic scientist working in a crime lab is able to perform only those tests that are requested by the investigating officer.
2. If evidence is moved prior to documenting the crime scene, the chain of custody is broken.
3. Probable cause is clearly defined in the Fourth Amendment.
4. What a warrant allows to be seized is strictly limited.
5. Searches at U.S. borders require warrants.
6. If illegal contraband is in plain view, a law enforcement officer can seize it without a warrant.
7. In the case of *Mincey v. Arizona*, the Supreme Court ruled that a warrant should have been obtained.
8. In the case of *Michigan v. Tyler*, the Supreme Court ruled that no Fourth Amendment violations were committed by the firefighters' entry to extinguish the fire.

Review Problems

1. One evening about dusk, a man was walking his dog along a local street when the dog started to bark and then ran into the bushes along the road. When the man chased after his dog, he discovered his dog barking at a dead body concealed in the bushes. It was midsummer, the temperature was 78°F, and the day had been sunny. Heavy rain was predicted for the next day. Luckily, the man was carrying his cell phone; he called 9-1-1 to report his findings. He investigated the body from a safe distance and learned that the victim had been bleeding from his chest. After 10 minutes, the police responded and began to interview the man. Describe, in detail, the responsibilities of the first responding officer.
2. The lead investigator arrived on the scene of the crime described in Problem 1 and determined that the scene should be searched for physical evidence. One of the officers drew a rough sketch of the crime scene (**FIGURE 1-21**). Describe, in detail, how the lead investigator should now complete the search for physical evidence. Which steps will he or she take to ensure that the evidence is not cross-contaminated?
3. One of the officers searching the scene, described in Problems 1 and 2, found a bloody knife on the footpath at the entry to the woods. From a distance, it appeared to be the murder weapon, and the handle of the knife may have fingerprint impressions left in the blood. How should the knife be handled? Should a swab sample be taken? If so, where on the knife? How can the possible fingerprints be preserved? How should the officer proceed?
4. When the following objects are transported to the crime lab, how should they be packaged?
   a. Blood (wet)
   b. Blood (dry)
   c. Paint chips
   d. Arson liquid accelerant
   e. Carpet from arson scene
   f. Firearms
   g. Impression evidence
5. An officer responding to a homeowner reporting a burglary found a broken window at the rear of the house on the first floor. He determined that

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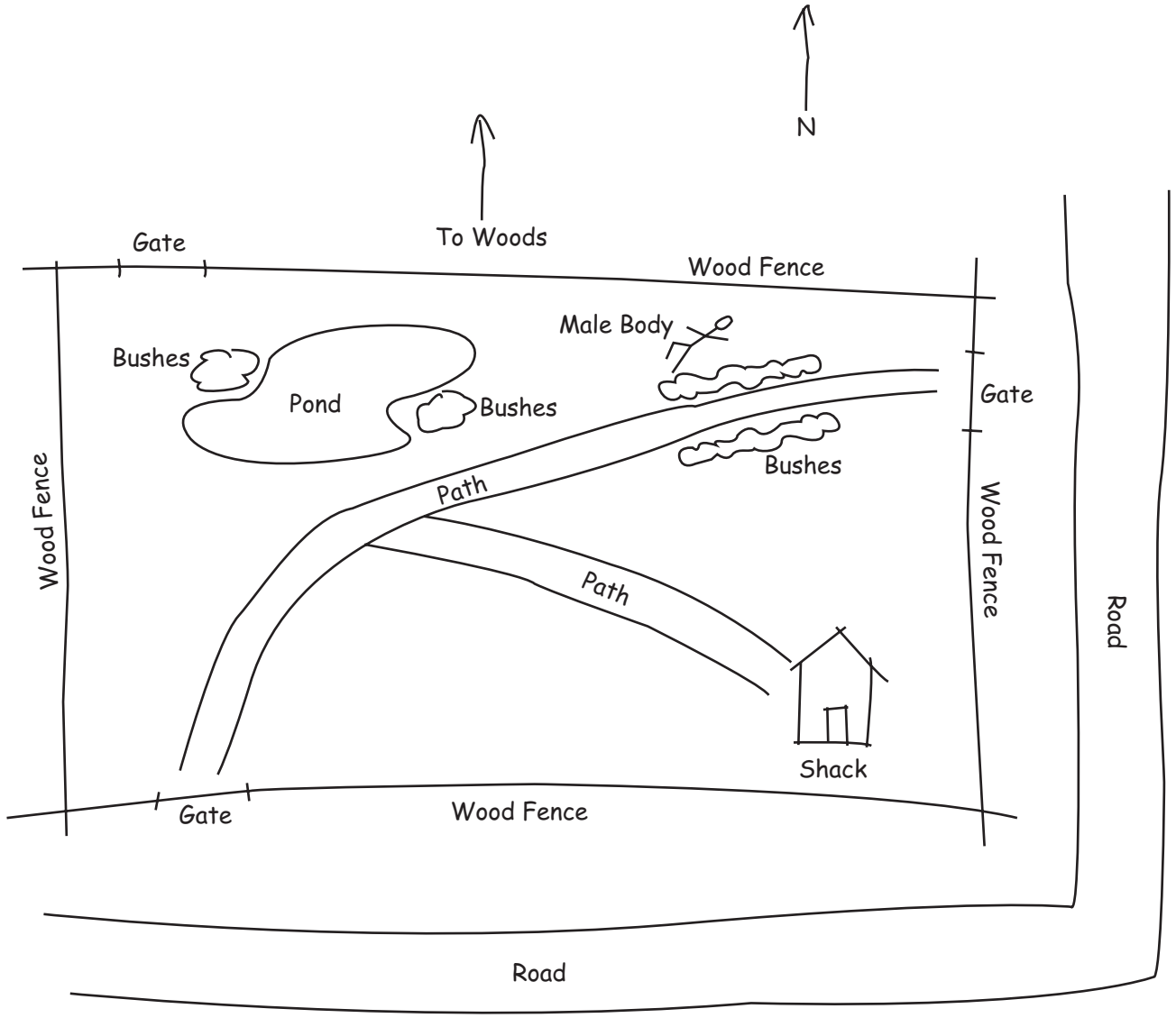


FIGURE 1-21 Rough sketch of the crime scene.

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the burglary had taken place while the owner was away and that the owner had discovered the robbery when he returned home. The officer called the crime lab, and a forensic examiner arrived on the scene. List, in detail, which steps the examiner should take to recover all possible evidence that might have been left at the scene of the crime.

Challenge Problems

1. Law enforcement has been training dogs for a variety of tasks, including narcotics detection, criminal apprehension and firearm detection. Using Google Scholar (case law), describe in detail the arguments in *Illinois v. Cabellas* (2005). Is a warrant necessary before allowing a K-9 to sniff for drugs?
2. Describe the difference between an administrative warrant and search warrant. What is the purpose for an administrative warrant. Using Google Scholar (case law), review *Camara v. Municipal Court* and *See v. City of Seattle.*
3. An original document, photograph or recording is always preferred by courts. At one time this was known as the "Best Evidence Rule." Review Federal Rule of Evidence 1001, 1002, and 1003 and discuss what is considered primary evidence and when a duplicate may be admissible.
4. Report on the use and legal implications of testimony developed under hypnosis. When was hypnosis first used in court? Is it allowed to be used today? Search the Archives of the U.S. Department of Justice.

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5. A big problem for families experiencing a traumatic event, such as a suicide, traumatic accident, or a violent crime, is the consequential clean-up of their residence. ServiceMaster, a clean-up firm that has provided clean-up for fire or flood damage for many years, is now providing services for traumatic events. Search the ServiceMaster website and list hazards for each type of trauma, the protective gear, and decontamination procedures needed for each.
6. The FBI's National Incident-Based Reporting System (NIBRS) will be fully implemented in 2021. NIBRS records details on each single crime incident—as well as on separate offenses within the same incident—including information on victims, known offenders, relationships between victims and offenders, arrestees, and property involved in crimes. Log on to NIBRS and create a report on crime and number of homicides in your home state and how that data differs from neighboring states.
7. Search for the major factors that should be considered when attempting to secure a search warrant on the basis of information supplied by a confidential informant.
8. (CS) Law enforcement officers have a sworn duty to preserve evidence. Investigate and report the case of *Swofford v. Eslinger,* and the behavior of deputies, sheriff and general counsel.
9. (CS) Using Google Scholar (case law), investigate the Columbus County, NC, case of *Katie Brooks (plaintiff) v. Marion A. Davis.* Discuss the importance of the chain of custody of the evidence in the outcome of this case.
10. (CS) Using Google Scholar (case law), investigate the case of *Silverthorne Lumber Co, Inc. v. United States.* How did the unlawful search in this case affect the verdict of the trial?

Further Reading

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