

Crime Scene Investigation

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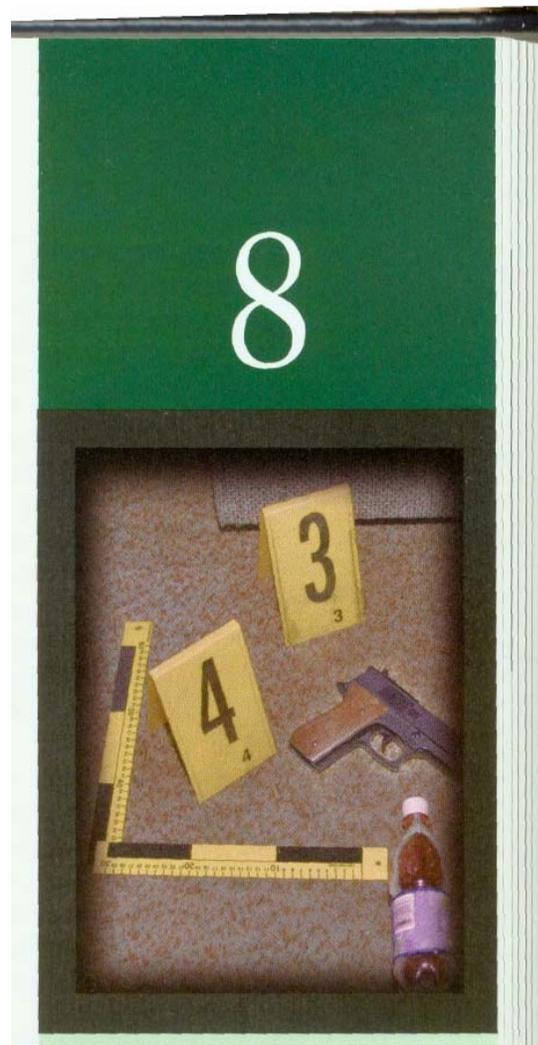
Introduction

From nanogram quantities of DNA to artificial intelligence databases capable of identifying latent fingerprints, forensic science and the analysis of very minute quantities of physical evidence have advanced and improved. Yet, these applications of the science are remote from the crime scene and its investigation. Crime scene investigation is the beginning point for the successful use of physical evidence by the forensic laboratory and the criminal investigator. Now more than ever, the scene of a crime must always be properly managed and investigated in the best possible manner.

Successful, high quality crime scene investigation is a simple, methodical process. It is not rigid; it follows a set of principles and procedures that are reasonable and ensure that all physical evidence is discovered and investigated with the result that justice is served. The basic crime scene procedures are physical evidence recognition, documentation, proper collection, packaging, preservation, and, finally, scene reconstruction. Every crime scene is unique and, with experience, a crime scene investigator will be able to use this logical and systematic approach to investigate even the most challenging crime scenes to a successful conclusion.

Defining a Crime Scene

The only thing consistent about crime scenes is their inconsistency. Because of their diversity, crime scenes can be classified in many ways. First, crime scenes can be classified according to the location of the original criminal activity. This classification of the crime scene labels the site of the original or first criminal activity as the *primary crime scene* and any subsequent crime scenes as *secondary*. This classification does not infer any priority or importance to the scene, but is simply a designation of sequence of locations.



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a Crime Scene

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Scene Management First

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A second classification of crime scenes is based on size. Under this classification, a single **macroscopic crime scene** is composed of many crime scenes. For example, a gunshot victim's body dumped in a field represents the following crime scenes within the overall crime scene of the field: the body, the body's wounds, and the ground around the body. The **microscopic** classification of the scene is more focused on the specific types of physical evidence found at macroscopic crime scenes. Using the previous example, the **microscopic crime scenes** are the trace evidence on the body, the gunshot residue around the wound, and the **tire tread** marks in the ground next to the body.

Other classifications of the crime scene are those based on the *type of crime* committed (homicide, robbery, sexual assault, etc.); the crime scene condition (organized or disorganized); the physical *location of the crime scene* (indoors, outdoors, vehicle, etc.); and the type of criminal behavior associated with the scene (passive or active).

Even with these classifications, no single definition adequately works for every scene. Ultimately, the scene is a combination or adaptation of the classifications that is determined by the investigator. The definition of a crime scene should never establish immovable boundaries. The crime scene investigator must be constantly evaluating and frequently changing the defined area called the crime scene.

with the forensic examination of the scene's physical evidence forms the basis of scientific crime scene investigation. The following are examples of types of information obtained from the examination of physical evidence in a criminal investigation:

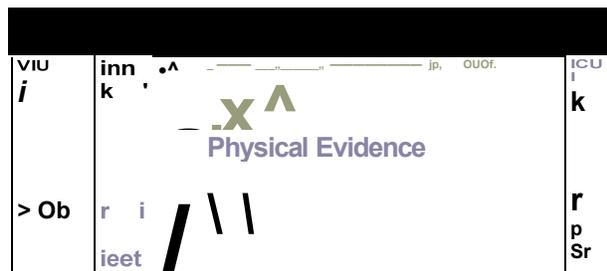
Information on the Corpus Delicti — This is the determination of the essential facts of an investigation — the physical evidence, the patterns of the evidence, and the laboratory examinations of the evidence. The red-brown stains in a kitchen may be significant to an investigation, but may be more relevant if their DNA matches that of a victim.

Information on the Modus Operandi — Criminals repeat their behavior and a certain behavior becomes a criminal's "signature" or preferred method of operation. Burglars frequently gain entry into scenes using the same techniques. Bombers will use the same types of ignition devices repeatedly.

Linkage of Persons, Scenes, and Objects — The Locard Exchange Principle states that whenever two objects come into contact, a mutual exchange of matter will take place between them. Linking suspects to victims is the most important and common type of linkage accomplished by physical evidence in criminal investigations. Linking victims and suspects to objects and scenes can also be accomplished by use of the physical evidence.

Uses for and Information from Physical Evidence in Criminal Investigations

The objectives of any crime scene investigation are to recognize, preserve, collect, interpret, and reconstruct all the relevant physical evidence at a crime scene. A forensic laboratory examines the physical evidence to provide the investigator with information about the evidence in an effort to solve cases. The



Proving or Disproving Witness Statements — Credibility is an important issue with witnesses, victims, and suspects. The presence or absence of certain types of physical evidence will be useful in the determination of the accuracy of their statements. Crime scene patterns or patterned physical

gunshot residue, etc.) are especially well suited for determination of credibility.

Identification of Suspects — Forensic examination is a process of steps: recognition, identification, individualization, and reconstruction. Identification of a suspect is accomplished by the first three steps that result in an individualization or determination of the source of an item of physical evidence. This individualization is facilitated by comparison testing. The best example of a comparison individualization is fingerprint evidence. Recent advances in automated fingerprint identification systems (AFIS) and DNA databases (**CODIS**) allow a single fingerprint or small bloodstain found at a crime scene to identify or more properly individualize a suspect.

Identification of Unknown Substances — The identification of unknown substances is a common use of physical evidence. Identification of drugs, poisons, and even bacteria such as anthrax are good examples.

Reconstruction of a Crime — This is the final step in the forensic examination process. The crime scene investigator is frequently more interested in how a crime occurred than identifying or individualizing the evidence at the scene. The "how" of the crime scene is more important than the "who."

Providing Investigative Leads — Physical evidence can provide direct information to an investigator. However, not all physical evidence at a crime scene will be directly linked to a suspect. Physical evidence frequently provides indirect information or investigative leads. This is the most important and significant use of physical evidence in a criminal investigation. Not every crime scene has individualizing physical evidence such as fingerprints, but every crime scene contains physical evidence that assists the investigator; for example, a **footwear** impression that shows the manufacturer, size, or type of shoe worn by a suspect.

Science and Crime Scene Investigations

Crime scene investigation is not a mechanical process relegated to technicians who go through a series of steps to process a crime scene. It is a dynamic process that requires an active approach by the scene investigator who must be aware of the linkage principle of the evidence, use scene analysis and definition techniques, and be able to offer an opinion on the reconstruction of the scene (Figure 8.1). Scientific crime scene investigation is based on the scientific method. It is methodical and systematic. It is based on the Locard Exchange Principle, logic, and the use of the scientific knowledge of forensic techniques applied in physical evidence examinations to develop investigative leads that will ultimately solve a crime.

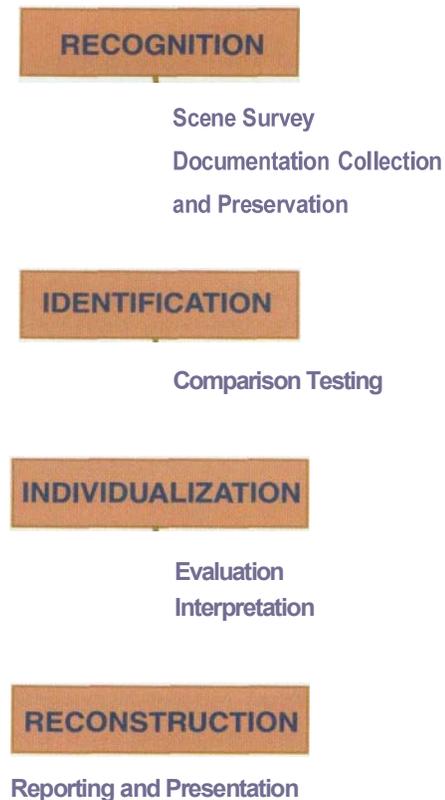


Figure 8.1 Steps to the scientific examination of a crime scene.

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General Crime Scene Procedures

Scene Management

Crimes today are solved by the teamwork of investigators and crime scene personnel and by the combined use of techniques and procedures recognizing the power of crime scenes, physical evidence, records, and witnesses. Unfortunately, numerous cases, routine and complex, have shown that despite available crime scene technologies and specially trained personnel, the productiveness of a crime scene investigation is only as good as the supportive management team. The four distinctive but interrelated components of **crime scene management** are

1. Information management
2. Manpower management
3. Technology management
4. Logistics management

Deficiencies, negligence, and overemphasis of any one of these components will imperil the overall crime scene investigation. These components are all based on the fundamental need for good and ongoing communication

among all personnel throughout the entire investigation process.

The components of crime scene management and the need for continual communication have resulted in some choices of appropriate crime scene investigation models (Table 8.1). Each model has its advantages and disadvantages based on the allocation of personnel and resources, training and expertise, crime rates, types of crimes, jurisdictional issues, and the support services available.

First Responding Officers

The first responders at a crime scene are usually police officers, fire department personnel or emergency medical personnel. They are the only people who view the crime scene in its original condition. Their actions at the crime scene provide the basis for the successful or unsuccessful resolution of the investigation. They must perform their duties and remember that they begin the process that links victims to suspects to crime scenes and must never destroy the links.

The first responders must always maintain an open and objective mind when approaching a crime scene. Upon arrival, safety is a primary concern. When the scene and the victim are safe, the first responders must

Table 8.1 Crime Scene Investigation Models

Model Type	Description	Advantages	Disadvantages
Traditional	Patrol officers and detectives serve as crime scene technicians	Useful if resources and demand are relatively low	Minimal experience and time commitment; conflicts with regular duties
Crime scene technicians	Specially trained full-time civilian personnel	Continuity, specialization, scientific and technical training Primary assignment; increased experience	Minimal investigative experience; no global view of investigation
Major crime squad	Full-time, sworn officers	Superior technical and scientific skills; knowledge of	Transfers out of unit may deplete investigation resource! only for major cases

siDie, they should initiate crime scene security measures. The duties of a first responder are to:

1. Assist the victim.
2. Search for and arrest the suspect if still on the scene.
3. Detain all witnesses because they possess valuable information about the crime scene. Keep witnesses separated to preserve their objectivity.
4. Protect the crime scene. Begin by using barrier tape, official vehicles, or other means to secure the scene. Establish a crime scene security log to record the names of all persons who enter or exit the crime scene. Do not smoke, drink, or eat within the secured crime scene and do not allow unnecessary persons or officials to enter or contaminate the scene.
5. Note and communicate to crime scene investigators all movements and alterations made to the crime scene.

Securing the Crime Scene

The Locard Exchange Principle is the basis for linking physical evidence from or to the victim, suspect, and crime scene. Anyone entering a crime scene can alter or change the scene and its evidence, so access to the crime scene must be restricted and, if possible, prevented except for essential crime scene personnel. Any physical barriers like vehicles or tapes that help protect the crime scene must be established *as soon as possible* by the first responders.

After scene barriers have been established, one officer shall be designated as the scene security officer. He or she will be responsible for preventing entrance into the crime scene by curious onlookers. A contamination log or security log should be kept to record all entries to and exits from secure areas of the crime scene. Use of a multilevel security approach can successfully prevent

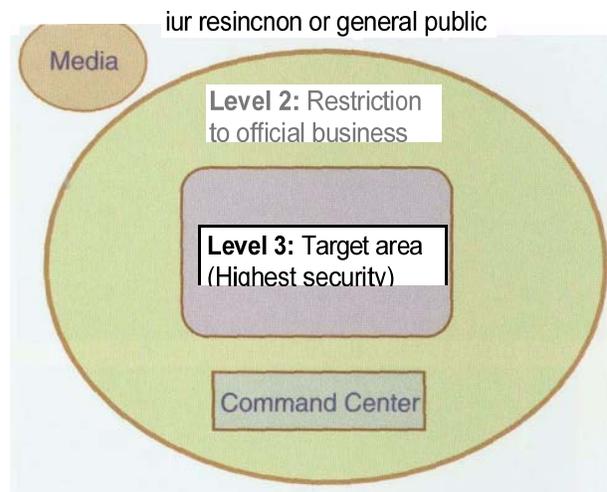


Figure 8.2 Multilevel crime scene security.

unwanted entries (Figure 8.2). Only in rare situations will the crime scene investigator be the first responder. After he or she arrives, the first step is to evaluate the established secure areas and change them if necessary.

Crime Scene Survey

When the crime scene investigator has arrived at the crime scene and scene security has been evaluated, the preliminary scene survey or "**walk-through**" should be done. The crime scene investigator and the first responder will usually perform the scene survey together. The lead investigator or detective, if available, can also benefit from participating. Use of instant photography for preliminary documentation can be helpful. The survey is the first examination or orientation by the crime scene investigator and the following guidelines should be followed:

- Use the walk-through to mentally prepare a reconstruction theory that can and should be changed as the scene investigation progresses.
- Note any transient (temporary) or conditional (the result of an action) evidence that requires immediate protection or processing.
- Be aware of weather conditions and take precautions if anticipated.

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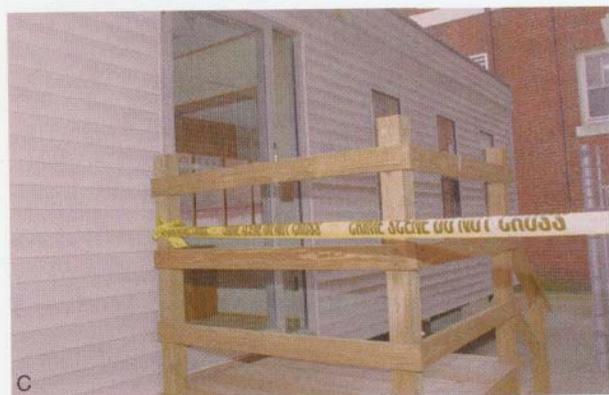
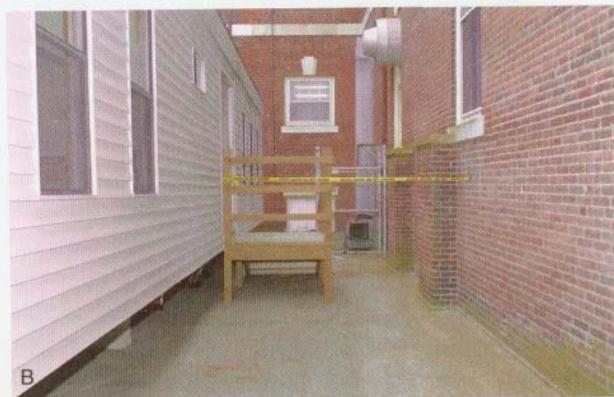
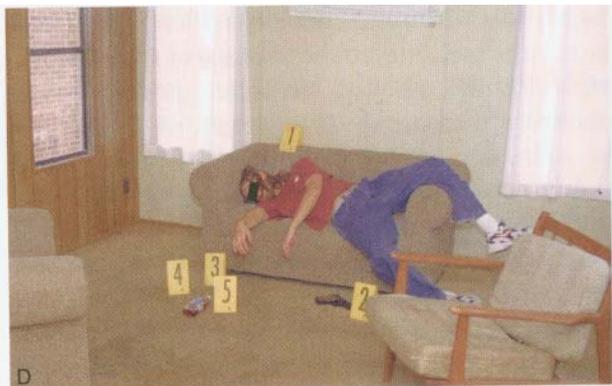


Figure 8.3 Photographic documentation at the scene. (A) Overall view of crime scene. (B) Midrange of point

protection. Be aware of alterations or contaminations of these areas by first responder personnel. Record initial observations of who, what, where, when, and how. Assess the scene for personnel, precautions, or equipment that will be needed and notify superior officers or other agencies as required.

Crime Scene Documentation

After a crime scene has been evaluated by a preliminary scene survey, the crime scene's condition must be documented (Figure 8.3). Documentation is the most important step in the processing of the crime scene. The purpose of documentation is to permanently record the condition of the crime scene and its physical evidence. It is the most time-consuming activity at the scene and requires the investigator to remain organized and systematic throughout the process. Innovation and originality are also needed. The four major tasks of documentation are note taking, videography, photography, and sketching. All four are necessary and none is an adequate substitute for another. For example, notes are not substitutes for photography.

Documentation, in all its various forms, begins with the initial involvement of the investigator. The documentation never stops; it may slow down, but the need for documentation remains constant. **Crime scene documentation** will be discussed below in the sequence it should follow at a crime scene. The systematic process presented will maintain the organized nature of scientific crime scene investigation.

Taking Notes at the Crime Scene

Effective notes as part of an investigation provide a written record of all of the crime scene activities. The notes are taken as the activities are completed to prevent possible memory loss if notes are made at a later time. Accurate crime scene note taking is crucial at

consider the who, what, when, why, and how, and specifically include:

- *Notification information.* Date and time, method of notification, and information received.
- *Arrival information.* Means of transportation, date and time, personnel present at the scene, and any notifications to be made.
- *Scene description.* Weather, location type and condition, major structures, identification of transient and **conditional evidence** (especially points of entry), containers holding evidence of recent activities (ashtrays, trash cans, etc.), clothing, furniture, and weapons present.
- *Victim description.* In most jurisdictions a body should not be moved or disturbed until the medical examiner has given approval, after which notes can be made of position, lividity, wounds, clothing, jewelry, and identification (presence or absence).
- *Crime scene team.* Assignments to team members, walk-through information, the beginning and ending times, and the evidence-handling results.

Videotaping the Crime Scene

Videotaping a crime scene has become a routine documentation procedure. Its acceptance is widespread, due to the three-dimensional portrayal of the scene and increased availability of affordable equipment with user-friendly features like zoom **lens** and compact size. Jury acceptability and expectation have also added to the recognized use of videography in crime scene investigations.

Videography of the crime scene should follow the scene survey. The videotaping of crime scenes is an orientation format. The operator should remain objective in recording the crime scene. The videotape should not show

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members of the crime scene team or their equipment. It should not be narrated and or include audio discussion of subjective information at the scene. Videotaping of crime scenes is a valuable tool that allows clear perception that is often not possible with the other documentation tasks. It is not an adequate substitute for any of the other tasks. The following summarizes the process that should be followed for effective video taping of crime scenes:

1. Introduce the video; include case number, date and time, location, and videographer; this can be in the form of a printed placard or spoken by the videotape operator.
2. Begin with the scene surroundings. Include roads to and from the scene before taping the general views of the scene. Use the four compass points as a guide.
3. General orientation of the scene. Tape the orientation of the items of evidence in relation to the overall scene; wide-angle views followed by closeup views of the items of evidence work well; do not jump from one item of evidence to another. Use a smooth transition that includes the overall locations of evidence.
4. Victim's viewpoint. Move to a safe location near the victim and tape the four compass points, as viewed away from the victim.
5. Camera techniques. Make smooth movements; use a tripod or monopod if possible. Use additional lighting for interior scenes (most camcorders have low light automatic aperture corrections but additional lighting is

Photographing the Crime Scene

The purpose of still photography documentation of the crime scene is to provide a true and accurate pictorial record of the crime scene and physical evidence present. Still photography records the initial condition of the scene. It provides investigators and others with a record that can be analyzed or examined subsequent to the scene investigation, and serves as a permanent record for legal concerns. Photography of a crime scene is normally done immediately following the videography of the scene or after the preliminary scene survey. A systematic, organized method for recording the crime scene and pertinent physical evidence is best achieved by proceeding from the general to specific guideline (Figures 8.4A and 8.4B).

Adherence to this guideline allows orientation of the entire crime scene, orientation of the evidence within the scene, and provide; **examination quality photographs** of specific items of evidence that may be used for analysis away from the scene. The number of photographs that should be taken at a crime scene cannot be predetermined or limited, *i* crime scene investigator should never doubt whether a photo should be taken — it should always be taken. Table 8.2 shows guideline that should be followed when photographing a crime scene.

Every photograph taken at a crime scene must be recorded in a photo log. The log should show the time and date the photograph was taken, the roll number, the exposure number, the camera settings (f-stop shutter speed), an indication of distance 1

General or Overall Photos

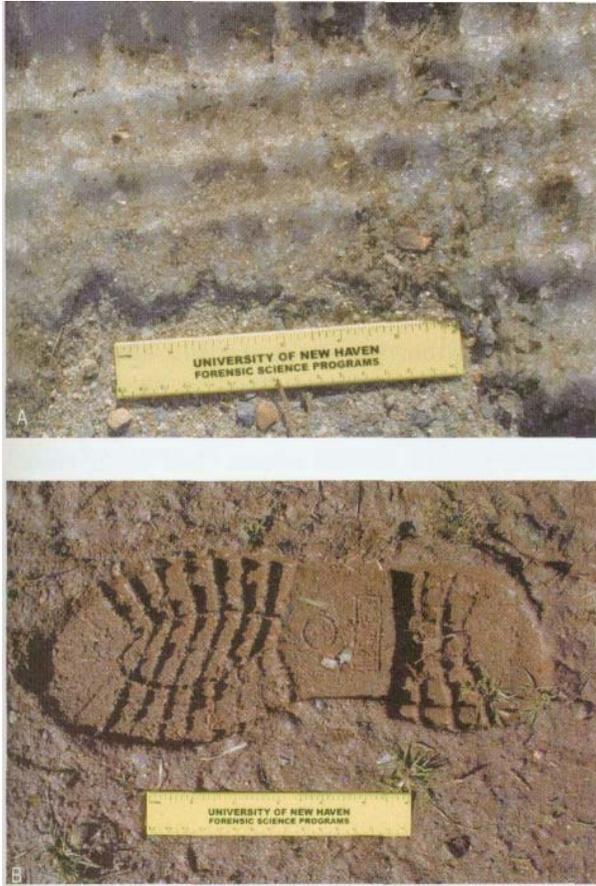


Figure 8.4 (A) Closeup photograph of tire tread mark in snow. (B) Closeup photograph of footwear impression in the soil.

basic equipment needed for photographic documentation of crime scenes:

- Camera (35-millimeter is the most common type)
- Normal lens (50 to 60 millimeters)
- Wide angle lens (28 to 35 millimeters)
- Closeup lens with accessories
- Electronic flash with cord
- Tripod
- Film (color and black and white)
- Label materials (cards, pens, markers)
- Scales or rulers
- Flashlight
- Extra batteries
- Photo log sheets

Sketching the Crime Scene

The final task in documentation of a crime scene is sketching. All of the previous tasks for documentation record the crime scene without regard to the size or measurement of the scene and its physical evidence. Sketching the crime scene is the assignment of units of measurement or correct perspective to the overall scene and the relevant physical evidence identified within the scene.

Table 8.2 Guidelines for Photographing a Crime Scene

Type of Photo	Guidelines for Photography
Overall	Exteriors: Surroundings; buildings and major structures; roads and paths of travel into or away from scene; street signs and survey markers; mail boxes and address numbers; take aerial photographs when possible; photograph before 10 a.m. or after 2 p.m. if possible. Interiors: Use the four compass points or room corners as guides; take overlapping views; doors leading into and from structure; use tripod in low light situations for increased depth of focus concerns.
Midrange	Follow a stepwise progression of views; use various lens or change the focal length of the lens to achieve a "focused" view of the individual items of evidence within the original view of the crime scene; add flash lighting to enhance details or patterned evidence.
Closeup	Use documentation placards; detach flash from camera; use proper side lighting effects; fill in with flash when harsh shadows are present; take photos with and without scales.
All	Record in log; use camera settings that achieve good depth of focus; no extraneous objects like team members, equipment, feet or hands; change point of view; be aware of reflective surfaces; when in doubt, photograph!

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Sketching a crime scene is not difficult, but it requires some organization and planning by the investigator in order to assure accurate sketch results. Two basic types of sketches are made during crime scene investigations: rough sketches (Figure 8.5) and final or finished sketches (Figure 8.6). Two types of perspectives are used in crime scene sketches: the overhead or bird's eye view sketch and the elevation or side view sketch. Occasionally, a combination perspective

sketch called a cross-projection sketch is used to integrate an overhead sketch with an elevation sketch. Three-dimensional sketches and scale models are not common, but they can be used as forms of **crime scene documentation**.

Three techniques can be used to obtain measurements for a crime scene sketch: **triangulation**, **base line** (fixed line), and **polar coordinates**. (See Figure 8.7.) All three are based on identifying two starting, fixed points and all subsequent measurements of the crime scene are in relation to those points. The fixed points should be permanent or known points in the event that later reconstruction of the scene will be attempted. Good fixed points are building corners, in-ground survey markers, large trees, or utility poles.

All crime scene sketches require documentation that includes a title or caption; a legend of abbreviations, symbols, numbers, or letters used; a compass designation; if drawn to scale, then the scale used; and the documentation block with the case number, offense type, victim names, location, scene description, date and time of sketch beginning, and sketcher's name.

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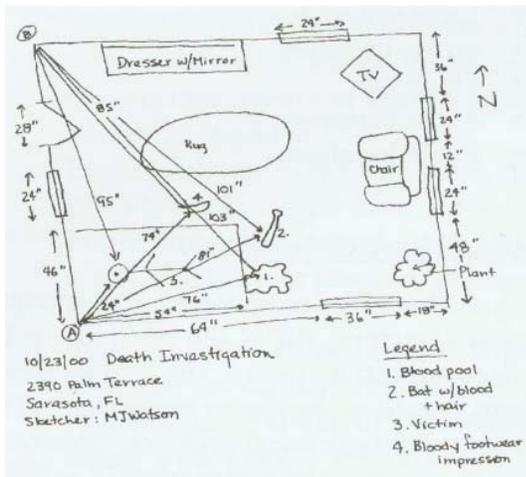
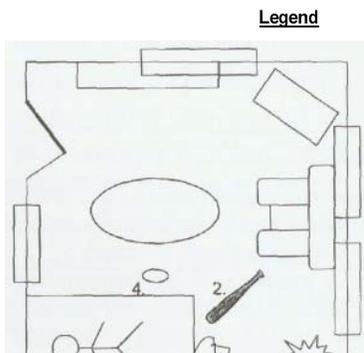
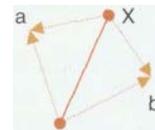


Figure 8.5 Rough sketch.



Triangulation

Points X and Y fixed. Evidence a and b are measured from X and Y.



Baseline

Points X and Y are fixed. Evidence a and b are measured along the line X-Y and at right angles to the line X-Y.

Digital Imaging at the Crime Scene

Digital image technology provides a crime scene investigator with powerful new tools for capturing, analyzing, and storing records of the crime scene and its physical evidence. These digital imaging tools complement the traditional video and still photography used in crime scene documentation. The advantages of digital images include instant access to the images, easy integration into existing electronic technologies, and no need for expensive film processing equipment and dark-rooms. Disadvantages in using digital image technology center on issues of court admissibility because of easy image manipulation. However, it is important to remember the investigator testifies and the image does not. Written and implemented policies and procedures for using digital images can eliminate the disadvantages. The law enforcement community agrees that digital imaging in crime scene documentation can best be used as a supplemental technique and not completely replace the traditional techniques.

Crime Scene Searches

The preliminary crime scene search is an initial quasisearch for physical evidence present at the crime scene. It is an attempt to note obvious items of evidence and it is done for orientation purposes before the documentation begins. After scene documentation as described above is completed, a more efficient and effective search for less obvious or overlooked items of evidence must be done. This intensive search is done before the evidence is collected and packaged. If any new items of evidence are found, then they must be subjected to the same documentation tasks completed earlier.

Crime scene search patterns may vary but they share a common goal of providing organization and a systematic structure to ensure that no items of physical evidence are missed or lost. No single method applies to specific types of scenes. An experienced crime scene investigator will be able to recognize and adapt the search method that best suits the situation or scene. It is important to use an established method. Simple reliance on experi-

ence alone and omitting the search step in the investigation will produce mistakes and significant evidence can be missed.

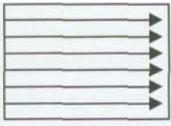
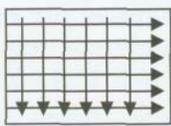
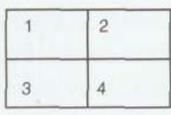
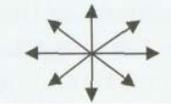
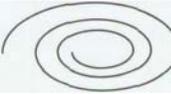
Most commonly employed search methods are geometric patterns. The six patterns are link, line or strip, grid, zone, wheel or ray, and spiral. Each has advantages and disadvantages and some are better suited for outside or indoor crime scenes. Table 8.3 summarizes the patterns. Before any intensive crime scene search is done, care must be taken to instruct the members of the search party. It is tempting for search party members to touch, handle, or move evidence found during the search. Instruct members to mark or designate found items without altering them. With proper training, diligence, and care, no evidence will be mistreated during the search of a crime scene. Found items must be documented before any evidence can be moved or collected.

The practical application of the search methods to the crime scene may be a combination of methods. Also, the search of a crime scene should never diminish or interfere with the other functions of the scene investigation, including the proper documentation, collection, and preservation of the physical evidence. Do not disregard established crime scene procedures. Following chain of custody procedures with regard to the evidence is paramount and can be addressed by restricting the number of searchers for and collectors of the evidence.

Collection and Preservation of Physical Evidence

After completion of the crime scene documentation and intensive search of the scene for physical evidence, the collection and preservation of the evidence can begin. One individual should be designated as the evidence collector to ensure that the evidence is collected, packaged, marked, sealed, and preserved in a consistent manner. No item of evidence will be missed, lost, or contaminated if only one person has the obligation for

Table 8.3 Crime Scene Search Methods

Search Type	Geometric Pattern	Description
Link method Line or strip method		Based on linkage theory; most common and productive; one type of evidence leads to another; experiential, logical, and systematic; works with large and small, indoor and outdoor scenes
Grid method Zone method Wheel or ray method		Works best on large, outdoor scenes; requires a search coordinator; searchers are usually volunteers who require preliminary instructions
		Modified double-line search as above; effective but time-consuming
		Best used on scenes with defined zones or areas; effective in houses or buildings; teams are assigned small zones for searching; combined with other methods; good for warrant searches
Spiral method		Used for special situations; limited application; best used on small, circular crime scenes
		Inward or outward spirals; best used on crime scenes with no physical barriers (open water, etc.); requires the ability to trace a regular pattern with fixed diameters; limited application

this important stage in the investigation (Figure 8.8).

There is no rigid order for collection of the evidence, but some types of evidence, by their nature, should be given some priority of order. Transient, fragile, or easily lost evidence should be collected first. Some items of evidence because of location within the crime scene may have to be moved or repositioned. If items are moved and new evidence is discovered, documentation must proceed immediately. It is difficult to generalize about the collection of physical evidence. Different types of physical evidence require specific or





Figure 8.9 Proper use of primary container.



Figure 8.10 Packaging of primary container inside outer container.

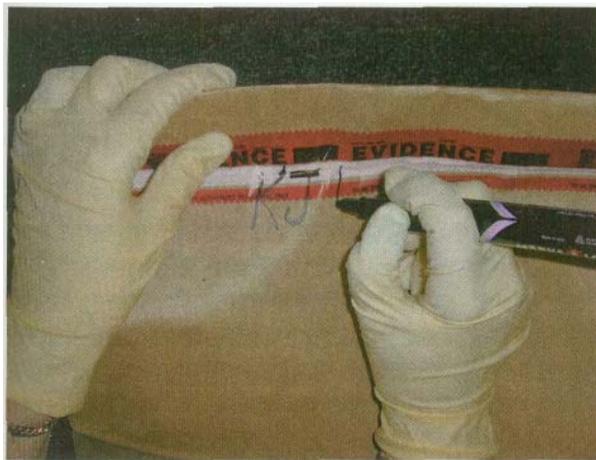


Figure 8.11 Proper marking of sealed evidence.

as primary containers for trace evidence collection and packaging. Larger pieces of paper can be folded around larger items to hold trace evidence in place (Figure 8.9). These folds are then placed inside outer containers, such as envelopes, packets, canisters, paper bags, and plastic bags (Figure 8.10). The outer containers should be completely sealed with tamper-resistant tape. Outer containers should be marked with information about the items contained, identification of the collector, and date, time, and location of collection of the item. The sealing tape or evidence tape should completely cover the opening of the outer container and it should be marked with the initials of the collector and the date and time of collection (Figure 8.11). It is a good idea to have a wide variety of packaging containers, sealing materials, and markers available at a crime scene.

Most items of evidence are solid and can be easily collected, stored, and preserved in the above manner. Liquid or volatile items should be placed in airtight, unbreakable containers. Wet, moist, or living biological evidence can be temporarily packaged in nonairtight containers. It should then be allowed to air dry in a controlled environment and be repackaged with the original containers in new nonairtight containers.

Each item should be packaged separately to prevent cross-contamination. The containers should be sealed and marked at the time of collection to prevent intermingling of evidence during transport to other locations. Control standards, alibi standards, and other control samples can be important to an investigation. The crime scene investigator should always be aware of the types of evidence collected and determine the appropriateness and need for controls to be collected. Controls are especially important for fire investigations, trace evidence, blood and body fluid stains, and **questioned documents**.

Forensic analytical techniques are improving. The amounts of samples required for

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testing have been reduced, and information about probable sources of the evidence has significantly improved. Because of these improving techniques and sensitivities, the proper collection and packaging of physical evidence are extremely important. Advanced lab techniques cannot be used if evidence is lost or contaminated because of improper collection and packaging at the scene.

Crime Scene Reconstruction

Crime scene reconstruction is the process of determining or eliminating the events that occurred at the crime scene by analysis of the crime scene appearance, the locations and positions of the physical evidence, and the forensic laboratory examination of the physical evidence. It involves scientific crime scene investigation, interpretation of patterned evidence at the scene, laboratory testing of the physical evidence, systematic study of related case information, and the logical formulation of a theory.

Nature of Reconstruction

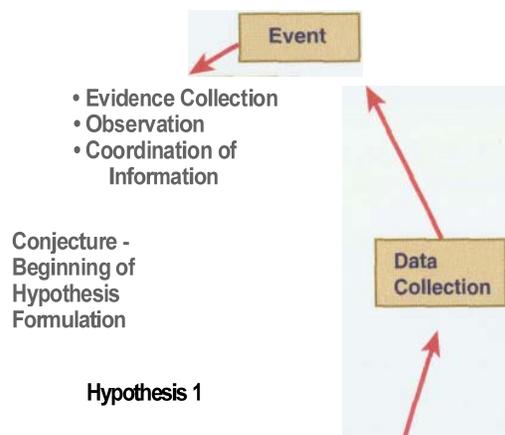
Crime scene reconstruction is based on scientific experimentation and experience of the investigator. Its steps and stages follow basic scientific principles, theory formulation, and logical methodology. It incorporates all investigative information with physical evidence analysis and interpretation molded into a reasonable explanation of the criminal activity and related events. Logic, careful observation, and considerable experience, both in crime scene investigation and forensic testing of

from the victim or witnesses is critical. All data concerning the condition of physical evidence, patterns and impressions, condition of the victim, etc., will be reviewed, organized, and studied.

Conjecture — Before a detailed analysis of the evidence is accomplished, a possible explanation or conjecture of the actions involved in the crime scene may be formulated. It is not a fixed explanation or even the only possible explanation at this point.

Hypothesis Formulation — Additional accumulation of data is based on examination of the physical evidence and continuing investigation. Scene examination and inspection of evidence must be done. Interpretation of **bloodstain** and impression patterns, gunshot residue patterns, fingerprint evidence, and analysis of trace evidence will lead to the formulation of a reconstruction hypothesis.

Testing — After a hypothesis has been developed, additional testing or experimentation must be done to confirm or disprove the overall interpretation or specific aspects of the hypothesis. This stage includes comparison of samples collected at the scene with



known standards, microscopic examinations, chemical analyses, and other testing. Controlled experiments of possible scenarios of physical activities must be done to corroborate the hypothesis.

Theory Formulation —Additional information may be acquired during the investigation about the condition of the victim or suspect, the activities of the individuals involved, accuracy of witness accounts, and other information about the circumstances of the event. When the hypothesis has been thoroughly tested and verified by analysis, the reconstruction theory can be formulated.

A reconstruction can only be as good as the information provided. Information may come from the crime scene, physical evidence, records, statements, witness accounts, and known data. The information-gathering process described above and its use in crime scene reconstruction show the scientific nature of scene reconstruction and as a result, allow its successful use by investigators.

Case Study

If a crime scene is properly investigated with systematic methodology, then it will provide the means for completing criminal investigations and resolving the case. Some of the primary uses of physical evidence found at crime scenes are corroborating the statements of witnesses, assisting investigators in determining the credibility of eyewitnesses, and assisting in the reconstruction of the events leading to the crime including the way in which the crime was committed. The case presented here illustrates that a properly investigated crime scene and evidence can disprove an eyewitness account of a criminal act.

Late one Friday afternoon in April of 1995, a decomposing body was discovered in a bedroom. The dead man was dressed only in a bath towel and was shot twice at close range with a shotgun. Two television sets in the home were turned on and no signs of forced entry or ransacking of the premises were

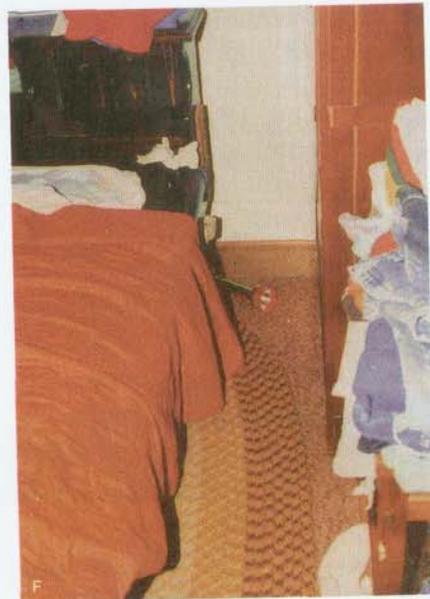
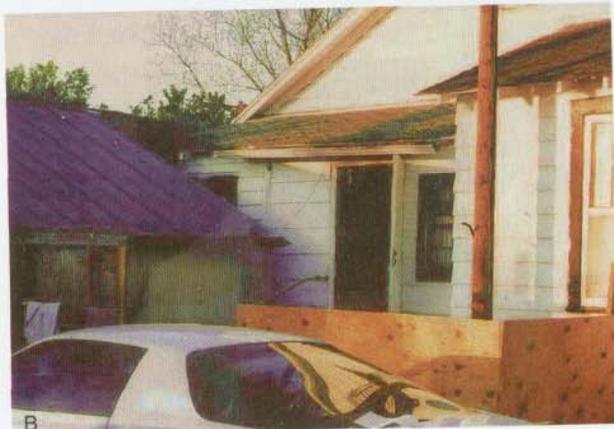
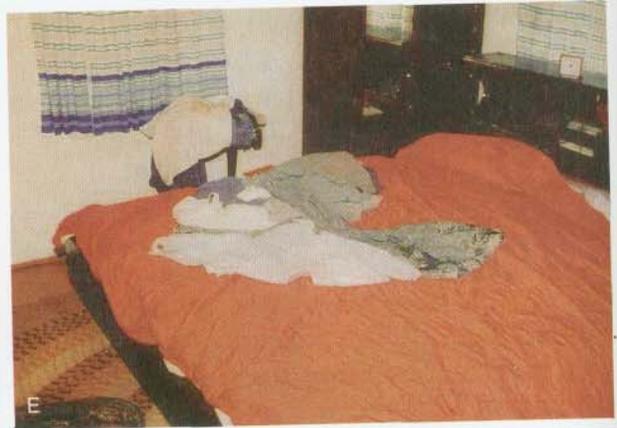
found. The state police crime scene unit responded and began the investigation. The investigators made sure the scene was secure, spoke with the first responders, proceeded with the preliminary scene survey, documented the scene, and collected and packaged the physical evidence found (Figure 8.13).

Within weeks of the discovery of the body, the investigation focused on two teenaged girls who were friends of the 50-year-old victim. One of the girls periodically visited and drank alcohol with the victim during the 3 years before his death. Both girls knew the suspect. The second teenaged girl had been romantically involved with the suspect. At first, both girls denied knowledge of the death. However, when the investigation focused on them, they claimed that the suspect said he had shot the victim. The girl who drank alcohol with the victim gave an even more detailed statement. She said she was an eyewitness to the shooting and that robbery was the motivation.

Her detailed eyewitness account of the shooting specifically stated that the suspect hid behind the door to the bedroom and emerged to face the victim who was entering the bedroom from the hallway, and shot the victim twice. The first shot was in the hallway near the door to the bedroom. The second shot was fired as the victim stumbled forward into the bedroom. According to the eyewitness, the victim then fell in the position in which investigators found his body. The eyewitness said the victim was facing toward the bedroom when he was shot and that the suspect faced toward the hallway entrance to the bedroom. She also told investigators that the suspect held a pillow in front of the shotgun when he shot the victim and that both blasts were fired while the suspect was partially hidden behind the bedroom door.

Use of Physical Evidence and Crime Scene Investigation

Several items of physical evidence documented and collected from the crime scene, including the shotgun pellets, bloodstain patterns, and tears in a pillowcase, were determined by crime scene investigators to be



crime could not have occurred in the way described by the eyewitness.

Shotgun Pellets and Trajectory Marks at Crime Scene

A not-to-scale crime scene sketch prepared by an investigator showed the locations of various items of physical evidence (Figure 8.14). This sketch reveals shotgun pellets were found in the bedroom at locations marked 7 through 10. The photographs and crime scene videotape revealed additional shotgun pellets and trajectory marks (Figure 8.15). The crime scene report by the note taker at the scene shows that in the scene investigation, no shotgun pellets or wadding were found in the hallway and that all the pellets were found in the bedroom as documented in the photographs, videotape, and sketch.

room led the investigators to believe that the shotgun was pointed not towards the hallway, as described by the eyewitness. It was fired into the bedroom from the hallway (Figure 8.16). The positions of the pellets, the trajectory marks, the position of the wadding, and the absence of pellets in the hallway, as documented by the crime scene investigators, contradicted the eyewitness' account of the criminal act.

Bloodstain Patterns at Crime Scene

The crime scene videotape and photographs showed various bloodstain patterns in the bedroom and in the area of the hallway nearest the bedroom (Figure 8.17). The bloodstain patterns are consistent with arterial gushes from wounds similar to those suffered by the victim. Their documented locations indicate that the victim was standing in the bedroom facing the door into the hallway when shot. The bloodstains contradict the eyewitness' account. Also, the documentation of the bedroom door shows no bloodstains. If, according to the eyewitness, the victim received his chest wound as he entered the bedroom and the shotgun was fired from inside the bedroom toward the hallway then arterial gush bloodstains should have been present on the door, the floor around the door, and the door frame opposite the area where they were found.

Other crime scene photographs and videotape segments of the crime scene showing bloodstains in the hallway leading into the bedroom were used by investigators to contradict the eyewitness' account of the criminal act (Figure 8.18). The bloodstains documented by the crime scene investigators were from the victim's chest wound and they confirm that the victim was inside the bedroom facing the hallway when he was shot.

Tears in Pillowcase from Crime Scene

A final piece of physical evidence documented at the crime scene was the pillowcase removed from the pillow. The pillowcase was

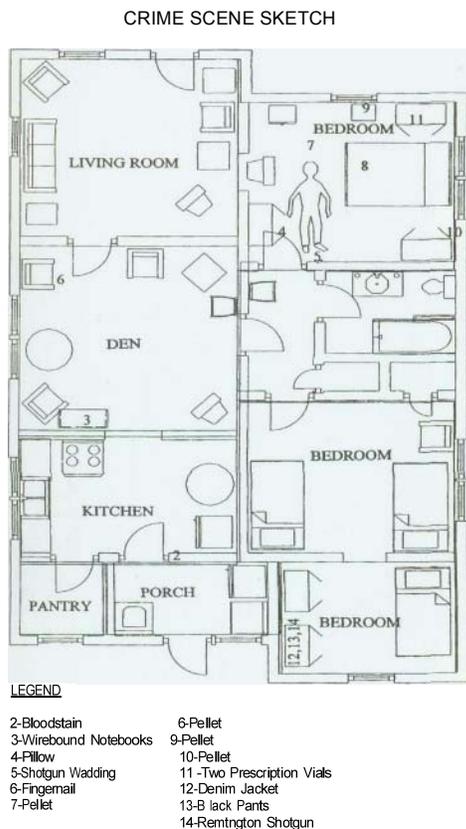
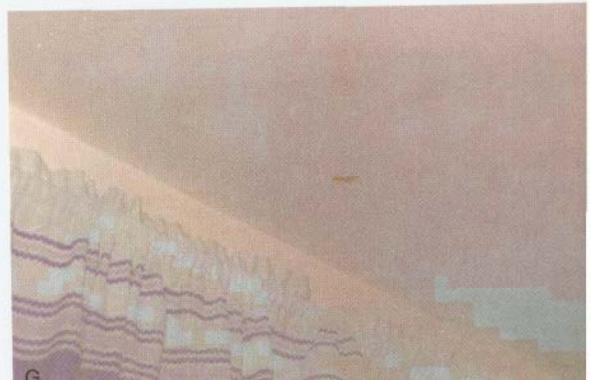
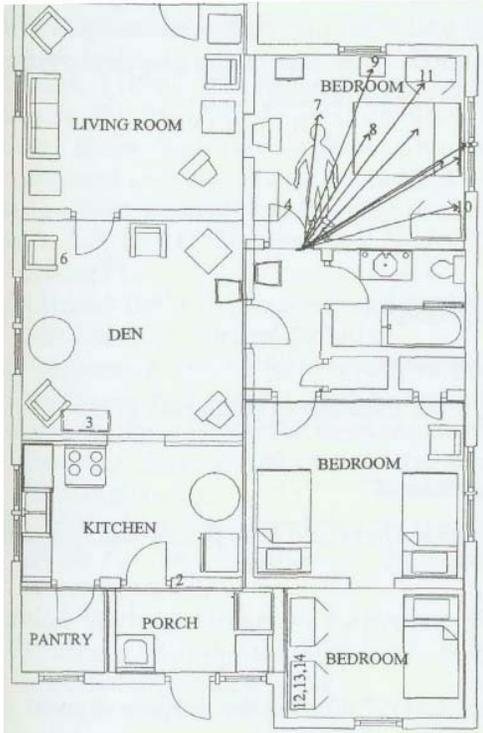


Figure 8.14 Crime scene sketch with legend.

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Marked Trajectories

Figure 8.16 Sketch of approximate trajectory pathways.

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 shape of the tears were determined by the investigators to be consistent with a glancing blast of shotgun pellets and not with a full blast or discharge from a shotgun muzzle. Once again, the physical evidence and its documentation at the crime scene were used to disprove the eyewitness' statement.

The proper documentation of the crime scene allowed the investigators to disprove the lone eyewitness' account of a homicidal act. Her account of the shooting and the implication of the suspect were not substantiated by the physical evidence and, in fact, led investigators to conclude that her account was not even possible.



Figure 8.18 Bloodstains on hallway rugs.



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Figure 8.17 Arterial gush found on wall near door inside bedroom.

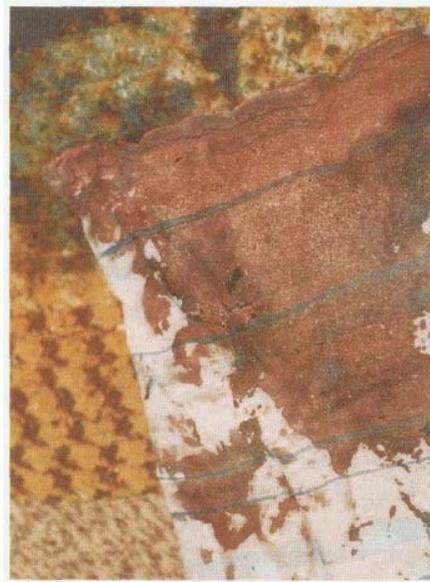
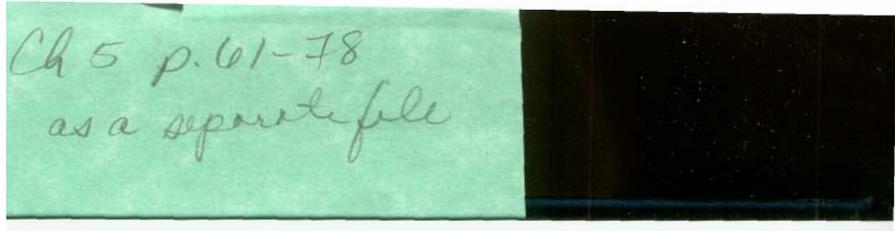


Figure 8.19 Pillowcase showing tears caused by a glancing blast of shotgun pellets.



Conclusion

Scientific crime scene investigation is the best methodology to ensure that an investigation

is properly conducted and justice is served. Use of this methodology will prevent the abrupt end of an incomplete investigation and allow for the best use of the physical evidence found at crime scenes.

Questions

1. What are the basic steps of scientific crime scene investigation?
2. List and describe the definitions or classifications of crime scenes.
3. What are the eight types of information that can be obtained from the examination of the physical evidence found at crime scenes?
4. What are the four components **of crime scene management**?
5. What are the five crime scene investigation models? Describe them and give the advantages and disadvantages of each.
6. Discuss the duties of the first responder at a crime scene.
7. What is the multilevel approach to crime scene security?
8. What are the components or tasks of crime scene documentation? What is the purpose of each?
9. What is the basic process used for photographing crime scenes? Discuss each step.
10. What are the two basic types of crime scene sketches? What are the two types of perspectives used in sketches?

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