Chapter 2.3: The Evidence Collection and the Evidence Team

Learning Goals and Objectives

The identification, collection, handling and storage of evidence from a crime scene is vital to its use in investigations and courtrooms. Key considerations you should understand from this section include:

- What are the proper steps for processing a crime scene;
- Who are possible members of an evidence team and what are their roles;
- How is evidence properly collected, recorded and stored;
- What is meant by "chain of custody".

Processing the Crime Scene

Now that we understand the legal underpinnings of *when* evidence can be collected, it is now important to consider the skilled work of processing a crime scene – the *how* of evidence collection. The actions of investigators in the field often have profound effects on the later course of a criminal case. Crime scene processing involves the proper identification and handling of physical materials associated with criminal actions, including collecting information from witnesses. Failure to do the process correctly will often result in the loss of potentially key forensic information.

Figure 2.3.1. Crime scene processing (www.georgia.gov/00/channel_modifieddate/0,2096,67862954_88103910,00.html).

At the heart of crime scene investigation is the careful observation and proper handling of all potential evidence. Skill, experience, care and patience all combine to yield the maximum amount of information possible from the evidence at hand.

The proper processing of crime scenes follows certain basic and logical practices and procedures. With training and care, the sequence of steps needed to do this correctly are logical and relatively straightforward. These steps usually include:

- Securing and isolating the scene;
- Recording the scene;
- Searching and collecting evidence;
- Packaging, transporting and storing evidence.

Some Definitions

First Responder: the initial police, fire or similar officer to arrive at a crime or emergency scene.
Boundary: the border surrounding potential physical evidence.
Chain of Custody: the thread that keeps track of the history of a piece of evidence so that its location and handling are documented from the point of its discovery through storage and analysis.
Reference sample: a sample collected from a verified source (such as a fingerprint taken from a suspect).

Secure and Isolate the Scene: The processing of any crime scene typically begins by securing, controlling, and isolating the scene of any crime. The idea is to first ensure that the scene is safe from all potential threats to responders, victims and the

public, such as criminal actions and physical harm, and that any necessary medical assistance has been rendered. The highest priority must be to ensure the safety of any potential victims and responders themselves. First responders should, from practice, consider the crime to be ongoing from the moment when they first arrive until it is determined to be otherwise. First responders must remain alert, attentive, and observant – recording any person or vehicle leaving the scene and noting anything from the ordinary. Actually, processing begins at the moment of first arrival and attention should be paid to the bystanders – "watch the watchers", perpetrators may blend into the crowd as observers of their own criminal actions and potential witnesses may be noted. Responders need to be alert for any potentially dangerous situations that might arise, such as a gas leak, poisonous substances, explosive materials, or potential chemical, biological or radiological threats. The first responders may be required to arrest suspects and conduct a preliminary sweep search to make sure that no hidden threats remain, such as criminal accomplices or other victims.

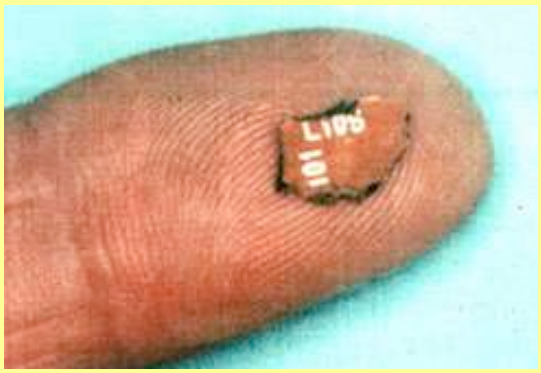
Figure 2.3.2. First responders must evaluate and act to secure any potential crime scene, eliminate potential treats, and provide emergency medical assistance (photo: http://tucsoncitizen.com/tucson-progressive/2010/12/22/senators-who-fought-against-911-first-responders-healthcare-cant-use-911-in-stump-speeches/)

Providing emergency medical treatment has priority over preserving evidence, although usually both ends can be achieved through a little care and cooperation between police and emergency medical technicians. First responders should assist medical personnel in avoiding evidence and document the movement of people or physical items by the EMTs. Once proper medical aid has been given and any victims transported off of the site, the EMF personnel should not clean up the mess they leave behind – they need to leave it as it is to avoid further contamination of the scene.

Figure 2.3.3. Establishing a secure boundary around the potential crime scene (http://yourfreenews.org/Illinois_Uni_Shooting.html).

Once the scene is determined to be safe, the role of the first responders then shifts to preserving the scene and its evidence in as pristine a state as possible. This usually requires establishing a perimeter large enough to encompass the entire scene and excluding all unauthorized people from the scene, such as bystanders, neighbors, press, and even unnecessary responders and police officials. This is sometimes rather difficult to

The Lockerbie Bombing Crime Scene



On December 21st of 1988, Pan Am Flight 103, on its way between London and New York, exploded over the small Scottish town of Lockerbie, killing all 259 people aboard. including 35 Syracuse University students. Additionally, 11 residents on the ground in the town of Lockerbie also died. More than 10,000 pieces of evidence were ultimately found, collected and preserved during the investigation. The crime scene itself stretched over 845 sq. miles of Scotland and was intensely scrutinized. Amazingly, a key piece of evidence linking the bomb with suspects from Libya was a very small transistor chip (picture at right) from the radio containing the bomb. This evidence was critical in the conviction of Abdul al-Megrahi of the bombing.

[Photos: airliner wreckage: www.dailymail.co.uk/news/article-556732/Lockerbie-bomber-stay-Scottish-jail-says-U-S.html. Evidence chip: www.rhahninc.com//]

achieve because crimes often bring emotional responses from people who want to see what has happened, including from other police, fire and EMT personnel. Unfortunately, the more serious the crime, the greater the likelihood of nonessential personnel wanting to gain access to the scene. Only those who have a real need to be at the scene should be allowed to cross the boundary. Suspects, victims, witnesses, medical personnel, and bystanders need to be separated and isolated for later questioning.

Once the scene is secure, medical attention given, and persons at the scene controlled, a lead investigator must be designated who then defines a crime scene boundary that is determined by the location, extent, and nature of the crime. Usually, larger boundaries are first established that can later be reduced in size as necessary since expanding the boundary later can be very difficult. This is often accomplished by starting at the point where the crime is know to have occurred and then extending outward. Physical barriers, such as the famous "police line" tape need to be established and the entry of all people and materials

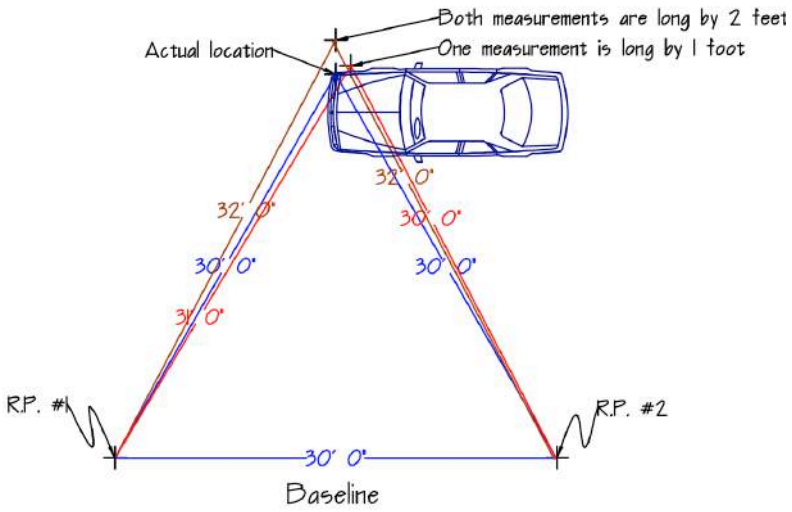


Figure 2.3.4. Triangulation uses the distance of an object from two fixed reference points (labeled RF in the figure) to accurately determine its position in a crime scene (www.authentegrity.com/files/Crime_Scene_Diagramming.pdf).

in and out of the scene carefully limited and documented.

Record the Crime Scene: The next key phase involves the complete and careful documentation of the crime scene. This can be an extensive process and is dictated by the size and nature of the scene itself. Investigators need to document the location, condition, and appearance of persons and items within the crime scene. This may include recording the weather conditions, locations of objects within the scene, identification of personal items, and conditions of items (e.g., the television was warm, the oven was on, or the room smelled of natural gas) as well as interviews from witnesses.

Several methods have been developed to accurately and quickly locate physical items within the crime scene. These include:

- *Triangulation*: In this process, two fixed points in the crime scene are selected (e.g., the corner of a building, fire hydrant, or telephone pole). Distance measurements (or angles) between an object in the crime scene and the two fixed reference points then serve to fix the position of the object accurately (Figure 2.3.4).
- *Azimuthal Locating*: This process uses a compass arrangement, such as used by surveyors, to locate the evidence by measuring angles and distances to a known geographic point.
- *Coordinate Mapping*: This

Figure 2.3.5. A "total station" device used in mapping a crime scene (http://crashdynamics.com/?page=usedEquipment).

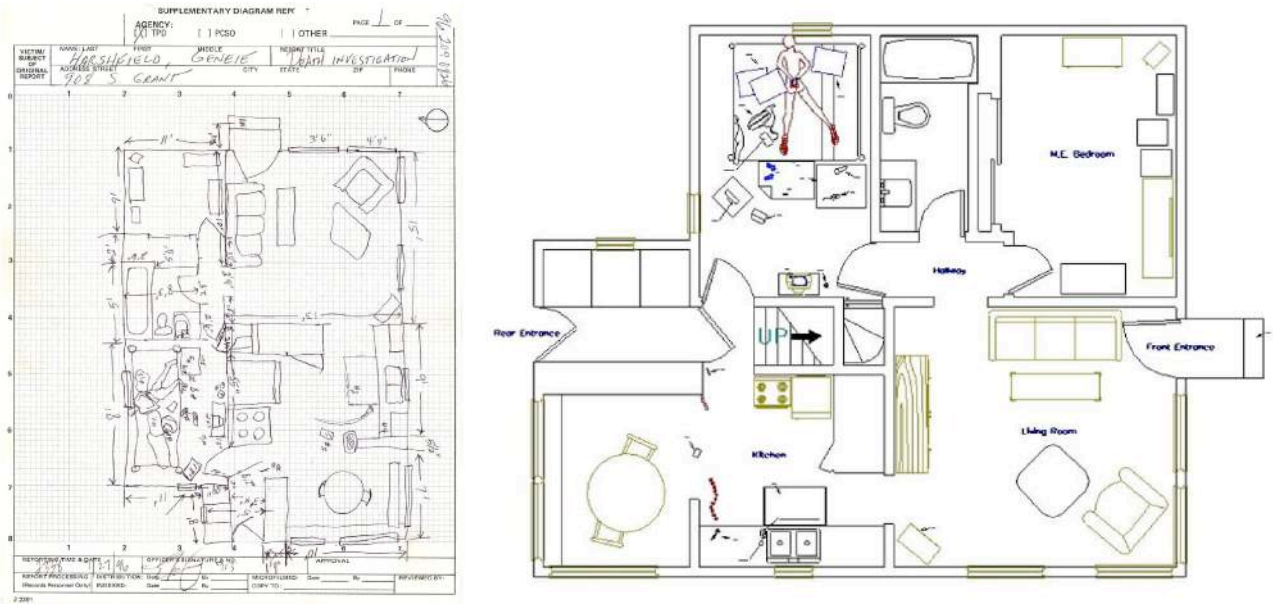


Figure 2.3.6. Rough drawing (right) and finished map (right) or a crime scene made from on-site measurements and observations (www.authentegrity.com/files/Crime_Scene_Diagramming.pdf).

technique divides the crime scene into a grid of small squares, much like a checkerboard. The contents of each square can then be searched, mapped, and placed within the context of the entire array of squares.

- *Electronic Methods*: With the advantages of laser and GPS technology, a number of sophisticated methods are now being employed to map an entire crime scene, such as the total station (Figure 2.3.5).

The measurements from the crime scene and the identity of the items are typically used to construct a detailed "map" of the scene, beginning with a rough sketch prepared while at the crime scene that includes the field measurements. Typically, the data in the rough sketch are then used to generate a detailed finished map using computed assisted design (CAD) techniques (Figure 2.3.6). Both 2-dimensional and 3-dimensional renderings are available using this technology and are often quite helpful in the courtroom to give juries a detailed picture of the crime scene (Figure 2.3.7)

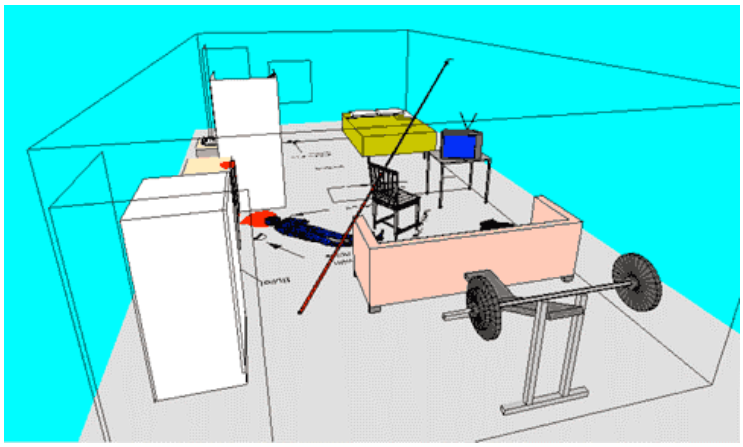


Figure 2.3.7. Computer-assisted design software used to generate a detailed 3-dimensional map of a crime scene (iwitnessphoto.com)

Crime scenes are also usually documented using photography (Figure 2.3.8). Photographs of evidence and the crime scene form a permanent record of often ephemeral and short-lived types of evidence. Photographs of fingerprints, footprints, bodies, injuries, bloodstains, tire marks, and many other forms of evidence are often the only record that lasts long enough to be useful in court. Usually, photographers are among the first into a crime scene in order to photograph it in as pristine a state as possible. Photographers typically take both overview (wide angle) photographs to place the item within the context of the entire scene as well as close-up photos to show the detail of the item.

Figure 2.3.8. Crime scene photography to document the condition and location of pieces of evidence (www.co.clackamas.or.us/sheriff/cid.htm).

Search for Evidence: Once the site is "mapped" and recorded, the painstaking task of searching for relevant evidence begins. The investigator in charge usually determines the type, extent, and location of the searches that need to take place. A number of systematic search patterns have been developed that allow for the complete coverage of a search area without missing any areas, such as shown in Figure 2.3.9. These same search patterns can be used effectively for most sized crime scenes of any size, from relatively small areas, such as inside a single room of a house, to very large areas, such as square miles of outside terrain. The goal, of course, is

not to miss or damage any potential evidence and to properly record and collect anything relevant to the case that might be found. The difficulty, of course, is to distinguish between "background"

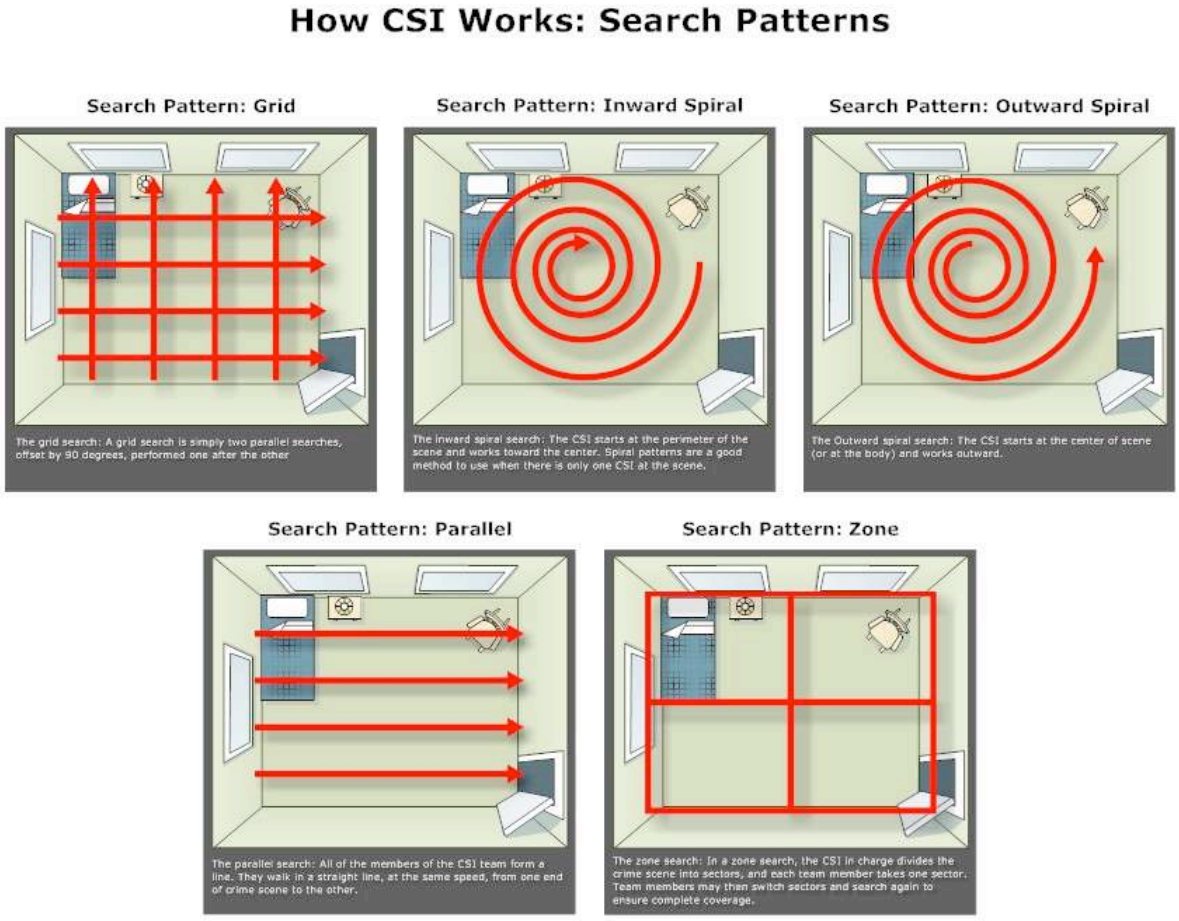


Figure 2.3.9. Types of searching patterns for the complete coverage of an area when searching for evidence (www.smartdraw.com/examples/view/crime+scene+investigation+search+patterns/).

environmental items (e.g., items present before the crime occurred or irrelevant to the events) and those that are indeed important. The ability to make these distinctions usually comes from field experience but it is often better to collect too much than run the risk of missing an important piece of evidence (see the inset box on the Lockerbie bombing).

Figure 2.3.10. Typical evidence collection and packaging kit (store.sirchie.com/Evidence-Packaging-Kit-

Police agencies typically develop rather extensive protocols for properly searching areas and what to do once a piece of evidence has been located to guide the work at the scene.

Collection and Preservation of Evidence: Once a piece of evidence is discovered, photographed in place, and located on the site map, it must be properly collected and preserved. The sample must be correctly packaged for transportation to the lab such that contamination

does not occur and that it is protected from as much damage and degradation as possible.

Different types of evidence require differing methods of packaging and storage based upon the characteristics of the evidence itself. For example, volatile materials, liquids and powdered controlled substances usually need to be packaged in air-tight containers while moist biological evidence should be placed in a container that would facilitate its drying, such as a cardboard box or paper bag with the goal of allowing those items to dry under as close to natural conditions as possible. Once again, extensive protocols have been developed on how best to package, preserve and store important pieces of evidence. A sample of these methods is given in Table 2.3.1.

Table 2.3.1. Selected Examples of Packaging for Different Types of Evidence*

Type of Evidence/Sample	Identification	Preservation	Wrapping and Packing
Blood and Body Fluids (forensic biology)	On outside of box, paper packet, or envelope: Type of specimens, dates secured, CSI or investigator's initials, case name and number, and where sample was taken from.	Keep dry.	Tops, ends and all folds sealed. Never package in plastic. Always use paper.
Stained clothing or fabric	Type of specimens, date obtained, CSI or investigator's initials, case name and number, and owner of garment.	If wet when found, dry under natural conditions. USE NO EXCESSIVE HEAT TO DRY.	Each article wrapped separately and identified on outside of package. Place in cardboard box or paper bags, packed to prevent shifting of contents. Always use paper bags, never use plastic bags or containers that do not allow air flow
Bullets (projectiles, not cartridges)	Seal in container and mark container - not projectile. Place CSI or investigator's initials, date, case name and number on container.	None	Package to prevent shifting
Powders, Tablets and Capsules	Label or tag on outside of container. Show type of material, date obtained, CSI or investigator's initials, case name and number.	None	Seal with tape to prevent any loss.
Hair	Label or tag on outside of container. Show type of material, date obtained, CSI or investigator's initials, case name and number.	None	Druggist fold. sealed edges and openings with Scotch tape or adhesive tape.
Soil	Label or tag on outside of container. Show type of material, date obtained, CSI or investigator's initials, case name and number.	None	Paper bags, seal to prevent loss.
Toolmarks	On packaging or on a tag attached to or on opposite end from where toolmarks appear, CSI or investigator's initials, case name and number.	Cover ends bearing toolmarks with bag and wrap with paper. Never use tape on cut ends.	After marks have been protected, place in strong box and pack to prevent shifting.
Glass Fragments	Label or tag on outside of container. Show type of material, date obtained, CSI or investigator's initials, case name and number.	Avoid chipping.	Wrap each piece separately. Pack in strong box to prevent shifting and breakage. Identify contents.

*Excerpted directly from "Evidence Packaging Procedures", Illinois State Police, Division of Forensic Services and Identification Bureau of Forensic Sciences
(www.imprimus.net/PDF%20Files/Downloadable%20Files%20Page/ISP%20Evidence%20Packaging%20Guidelines.pdf)

A critical piece of the process of collecting and documenting evidence is referred to as the **Chain of Custody.** The chain of custody (CoC) for a piece of evidence documents its chronological control from the time that it is first discovered until it is needed in court. It provides details of every transfer of the evidence, including what is done to the sample (e.g., analysis, storage, etc.), where it is located, when these transfers happen, and who transfers and controls the evidence, to form a

continuous and *provable* record of every moment of the evidence's existence after it's collected. The key idea is to prove that a particular piece of evidence was found at a crime scene and related to the crime without the possibility of it being fraudulently planted or tampered with when it is presented in court as evidence. A typical chain of custody form is shown in Figure 2.3.11.

Evidence with breaks in its chain of custody record is highly unlikely to be useful in court since it authenticity can readily be challenged. The evidence must be stored in a secure, locked location and never out of an identifiable person's control (e.g., never left on a lab bench unattended or transferred an unnecessary number of times). The chain of custody should also contain all the information regarding the piece of evidence's history: where and when it was collected, how it was packaged and stored, a physical description of the item along with any identifying numbers.

International Police Department
Property Sign-Out Sheet

Case Number

Item #	Description of Property - one item only						
OUT					IN		
Date and Time Out	Property Rec'd by print name/id#	Signature	Released by	Reason or Destination (Court, DA, Lab, RTO, etc.)	Property Returned by	Date and Time Property In	Property Officer's Signature

Figure 2.3.11. A portion of a typical chain of custody for a single piece of evidence that records it history beginning when it is found (evidencelog.org/1994-04/chain-of-custody-keeping-track.shtml).

Evidence Packaging Goals

- Prevent any change in the item after collection;
- Prevent any possible cross-contamination with other samples;
- Preserves the sample as intact as possible;
- Maintains safe environment;
- Ensures proper identification and chain of custody information for the item.

A chain of custody might not be required for some pieces of evidence – evidence that is so unique that it could not originate any place other than that indicated. For example, an object with a serial number recorded at the crime scene or a vehicle with license plate (and internal serial numbers) may not require a chain of custody process and form.

Evidence Teams

A number of trained personnel are often needed to properly process a crime scene. The specific types of expertise required mostly depends upon the nature of the crime and crime scene itself, although a number of jobs are common to most scenes. Each person on the team has a well-defined set of tasks and responsibilities such that no duplication of effort exists to cause confusion. A crime scene-processing unit needs to be a well-organized, logic-based operation. A typical crime scene investigative team will usually include:

- **Team Leader**: The team leader assumes control and directs the access to the site. They are responsible for the overall operation of the search and recovery of evidence including determining the

Figure 2.3.12. Personal safety and prevention of contamination are important when searching for and recovering evidence (www.shutterstock.com no. 31561285).

site boundaries, the search method, assignment of personnel to various tasks, coordination with all the groups involved with investigating the crime and processing the scene (e.g., medical examiners, police responders, investigators, fire personnel, evidence technicians, and various specialists). Since the processing of a crime scene may change as new evidence is found, the team leader must continuously reevaluate the ongoing work and make appropriate changes accordingly. Finally, when the work is completed, they are responsible for releasing the site back to its owners (or for public use).

- **Photographer**: The photographer's primary responsibility is to document the site both before the processing begins and as evidence is collected. This requires both wide-view photographs of large portions of the scene and close-up photographs to show detail. It is important to record some known scale marker, such as a meter stick, coin, or size-grid, in each photograph to provide size information. When a piece of evidence is found, including fingerprints and impressions, it must be photographed before it's collected. Each photograph must be recorded in a log so that it can be placed into the context of the entire scene and entered as part of the evidence. The photographer should also inconspicuously photograph any bystanders or people watching the events – occasionally this will lead to potential suspects and witnesses.
- **Sketch/Map Preparer**: A detailed map of the scene must be prepared using site measurements and evidence location techniques described already. Typically, a rough sketch is first prepared showing the dimensions, orientations, and locations of the evidence. This forms the basis of a finished drawing of the site, usually prepared later, often using computer-based techniques.
- **Evidence Recovery and Recorder Personnel**: These technicians search, locate, collect and package evidence for transportation to the lab. Each piece of evidence found must be first logged and photographed before collection. The technicians then record a description of the piece of evidence and carefully label the item before it is properly packaged. These technicians also begin the chain of custody record of the item as they hand it over for delivery to the evidence recorder for transportation. Technicians must be keenly aware of any possible hazards associated with the evidence (e.g., biohazard or dangerous chemicals) and exercise proper techniques for the safe collection of the material.
- **Specialists**: For more complex crime scenes, various experts might be required to

Figure 2.3.12. Crime scenes may require specialized methods for processing, such a underwater, mountain, or other difficult terrain sites. (www.guidrynews.com/story.aspx?id=1000029303).

Figure 2.3.12. A variety of experts may be needed to properly and completely document and recover key evidence from a crime scene, such as a forensic anthropologist (John Williams and FS anthropologists on site: www.ncforensics.org/forensic_anthropology/forensic_anthropology.html).

deal with specialized evidence. These experts can include:

- Forensic anthropologist (Chapter 9)
- Medical examiner or medicolegal death investigator (Chapter 8)
- DNA technician (Chapter 5)
- Blood spatter experts (Chapter 6)
- Divers and special recovery experts
- Fingerprint/Impression evidence technician (Chapter 7)
- Canine units
- Entomologist (Chapter 10)
- Crime reconstruction engineer (Chapter 19)
- Forensic ecologist (Chapter 10)
- Toxicologist (Chapter 13)

Types of Crime Scenes

Generally, there are three broad types of crime scenes: outdoor scenes, indoor scenes and "conveyance" scenes.

An outdoor crime scene can range from a relatively small area to extend over many square miles of terrain. These scenes present some of the greatest challenges since their processing is most difficult to control adequately and may need to occur under a variety of difficult weather conditions – conditions that may very quickly degrade and eliminate vital forensic information. These scenes often must be processed as quickly as possible to avoid loss.

Indoor scenes are typically easier to control and less subject to environmental conditions. These scenes, of course, present their own set of challenges such as requiring technicians to work in confined areas with potential safety concerns.

Finally, "conveyance" scenes are defined as those involving some form of transportation: cars, planes, trucks, trains, boats, etc. Since vehicles move, it may be necessary to retrace the pathway of the vehicle to look for evidence ejected from the vehicle – a path often extending over many miles along a path of pursuit.

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GLOSSARY OF TERMS

Azimuthal Locating: This process uses a compass arrangement to locate the evidence by measuring angles and distances to a known geographic point.

Boundary: The border surrounding potential physical evidence.

Chain of Custody: The thread that keeps track of the history of a piece of evidence so that its location and handling are documented from the point of its discovery through storage and analysis.

Class characteristics: Features that place the piece of evidence within a particular group.

Comparison analysis: The technique of the association of a standard reference sample (sometimes called an *exemplar*) with a known origin to a sample of an unknown origin.

Coordinate Mapping: This technique divides the crime scene into a grid of small squares for searching.

Exclusionary Rule: Any evidence resulting from an illegal search cannot be used as direct evidence in court.

First Responder: The initial police, fire or similar officer to arrive at a crime or emergency scene.

Fourth Amendment to the US Constitution: The 4th Amendment to the US Constitution 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."

Fruit of the Poisonous Tree Doctrine: Any evidence found from an illegal search also cannot be used to find other evidence.

Identification analysis: Detailed description of the components or composition of an unknown sample.

Individual characteristics: Features that are of a unique and specific origin with a *very high degree of certainty*.

Mincy v. Arizona: This case limited the length of time that a warrantless search was justified on emergency conditions.

Michigan v. Tyler: This case limited the length of time that a warrantless search was justified on emergency conditions.

Plain view doctrine. Items in plain view do not fall under the 4th amendment's provisions since the person can have no real expectation of privacy in such circumstances and can be seized without a warrant.

Prejudical evidence: Evidence must not be unfairly prejudicial to be allowed in court. In some ways, all evidence against someone is prejudicial against them. But the evidence must not be unfairly prejudicial.

Probable cause: The common practice that requires the police to present to the judge objective facts or evidence that they will find what they are looking for during the search.

Probative evidence: Evidence that has the ability to prove or demonstrate something relevant to the case.

One-to-many matching: The process that involves matching key features found in an unknown sample with candidates from a very large pool of known possibilities.

One-to-one matching: The comparison a set of features observed in an unknown sample with either just one reference or among a very small number of "standard" possibilities.

Reference sample: A sample collected from a verified source (such as a fingerprint taken from a suspect).

Relevant evidence: Evidence having the ability to make the existence of any fact that is important to the case more probable or less probable (from FRE 401).

Search warrant: An order issued by a judge or magistrate that gives the officers the authority to conduct a search at a very specific place, time, and for a specific reason

Triangulation: The use of two fixed points in the crime scene to fix the position of the object accurately

Warrantless search: A search that occurs through well-established exceptions to the 4th amendment's requirement where a prior warrant is required.