End Violence Against Women International (EVAWI)

Crime Scene Processing and Recovery of Physical Evidence from Sexual Assault Scenes

Special Agent Lauren Ware, MFS

With contributions by Sergeant Joanne Archambault (Ret.)

September 2017

This module is part of EVAWI's OnLine Training Institute (OLTI), which is available at no cost, and includes review exercises, practical applications, and an end-of-course test. Participants can download a personalized certificate of completion to use for continuing education or other purposes. For more information, please see the EVAWI website.

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Electronic Access

The publication may be downloaded from End Violence Against Women International's Resource Library.

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Authors

Lauren Ware is the Chief of the Forensics and Special Investigative Skills Branch at the Federal Law Enforcement Training Center (FLETC) in Glynco, Georgia. In this position, Ms. Ware leads a staff of forensic instructors who are responsible for researching, designing and delivering the most current, relevant, and accurate forensics and specialized investigative techniques available to federal law enforcement officers. Ms. Ware served a total of 15 years as a special agent with the Air Force Office of Special Investigations (AFOSI), with ten as an active duty officer and five in a reserve capacity. Her formal education includes a bachelor's degree in Anthropology awarded from the University of Hawaii, and a master's degree in Forensic Sciences, with a concentration in crime scene investigation, from George Washington University.

Sgt. Joanne Archambault (Retired, San Diego Police Department) is the Founder and Chief Executive Officer of End Violence Against Women International (EVAWI). Sgt. Archambault worked for the San Diego Police Department for almost 23 years, in a wide variety of assignments. She first worked as an officer in Patrol and then as a Detective in Gangs, Child Abuse, and Crimes Against Persons. As a Sergeant, she had assignments in Internal Affairs, the Office of Equal Employment Opportunity, and Sex Crimes. During the last ten years of her service, Sgt. Archambault supervised the Sex Crimes Unit, which had 13 detectives and was responsible for investigating approximately 1,000 felony sexual assaults within the City of San Diego each year.

Throughout her career, Sgt. Archambault has worked tirelessly to improve criminal justice and community responses to sexual assault, authoring and co-authoring hundreds of reports, articles, chapters, and developing training materials of various kinds. She also served for five years as co-editor of the *Sexual Assault Report*, a bimonthly publication of the Civic Research Institute, and she has provided training for tens of thousands of practitioners, policymakers and others – across the country and around the world. These efforts have been instrumental in creating system-level change, with recommendations for best practice and policy initiatives.

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- Jennifer Y. Levy-Peck, PhD, Training and Development Specialist, EVAWI, Yelm, WA
- Kimberly A. Lonsway, PhD, Director of Research, EVAWI, San Luis Obispo, CA
- Ted McDonald, Former Detective, Glynn County Police Department, Brunswick, GA
- Lieutenant Andrea Munford, Michigan State University Police Department, East Lansing, MI
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The crime scene photographs in this module were taken by Ted McDonald and Lauren Ware. These photographs were not taken at a natural crime scene; a mock sexual assault crime scene was created to illustrate the training objectives in this module. Lauren Ware, Ted McDonald, Carlita Scott and Kim Kelly also appear in these photographs and assisted in the processing and evidence collection necessary to obtain these photographs.

Special thanks to Evident for their generous donation of all the crime scene processing and evidence collection materials depicted in the photographs throughout this module. These valuable tools can be found online at https://www.shopevident.com.

Objectives

At the end of this training module, the learner will be better able to:

1. Apply the scientific method and competing hypotheses to sexual assault crime scene processing.

2. Understand the characteristics and value of physical evidence.

3. Identify and describe the various roles and associated duties needed to successfully process the sexual assault crime scene.

4. Employ standard crime scene processing procedures, to include:

    a. Documentation through notes, sketches, and photographs
    b. Application of methodical and thorough scene search techniques
    c. Identification and prioritization of physical evidence
    d. Proper handling, seizure, and packaging of physical evidence

5. Identify the major categories of evidence potentially found at sexual assault crime scenes; perform proper development, preservation, and packaging; and evaluate the evidentiary value of each of the following:

    a. Footwear impression evidence
    b. Friction ridge (fingerprint) evidence
    c. Trace evidence (hairs, fibers, soil, paint, glass, tool marks)
    d. Biological evidence
    e. Documents as evidence
    f. Digital evidence
    g. Drug evidence

6. Consider the uniquely challenging characteristics of the sexual assault crime scene and identify potential strategies to overcome those challenges.

7. Recognize the importance of scientific crime scene processing to prevent gender bias in sexual assault investigation and prosecution.

Introduction

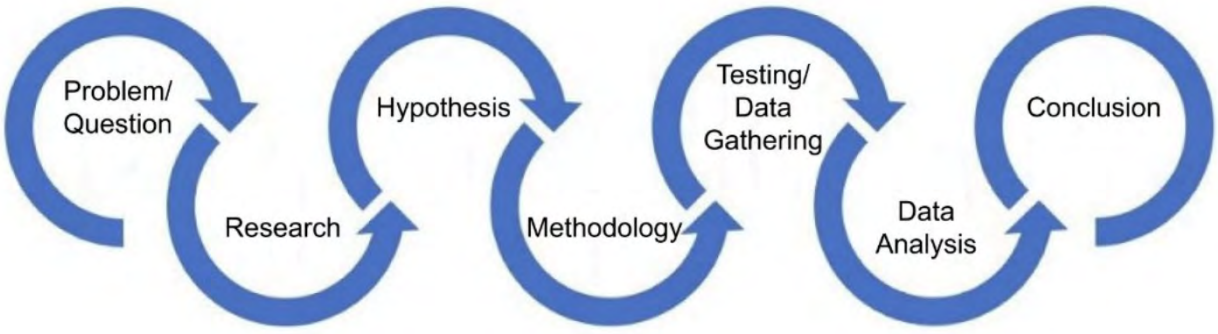
Crime scene processing is a systematic, meticulous, and scientific process that law enforcement investigators should employ in every major criminal investigation. This process is used to document and preserve a location where criminal activity is known or suspected to have occurred; it facilitates the location and recovery of physical evidence to help prove the elements of an offense; it generates information that helps outline individual investigative steps and an overall investigative plan; and it facilitates the identification of participants, such as witnesses and suspects. It is essentially the foundation on which the entire investigation is built. Like any foundation, its quality, stability, and integrity are critical to the future success of the structure built on it.

The Scientific Method in Crime Scene Processing

Ironically, the setting for this structured, scientific, and orderly process (the crime scene) is one of the most chaotic, unpredictable, and variable environments we strive to understand. Every reported crime is different, every scene is unique, every component may be an important variable, and all of this affects the investigator's ability to apply the science of crime scene investigation to the scene itself. Investigators must therefore balance the theory behind these processes with logic, reasoning, and the reality of resources available, to determine how closely they can adhere to the best practices of crime scene investigation. Luckily, these best practices are rooted in a natural thought process any reasonable individual can employ: **The scientific method.**

Whether we are conscious of it or not, the process of investigation, and indeed every rational decision-making process, follows the scientific method. Our minds may cycle through this process almost instantaneously, but if we slow down and analyze our thoughts, we can that see that our decisions (or at least our logical ones) are made in a very predictable and scientific manner.

The steps involved in the scientific process are as follows:



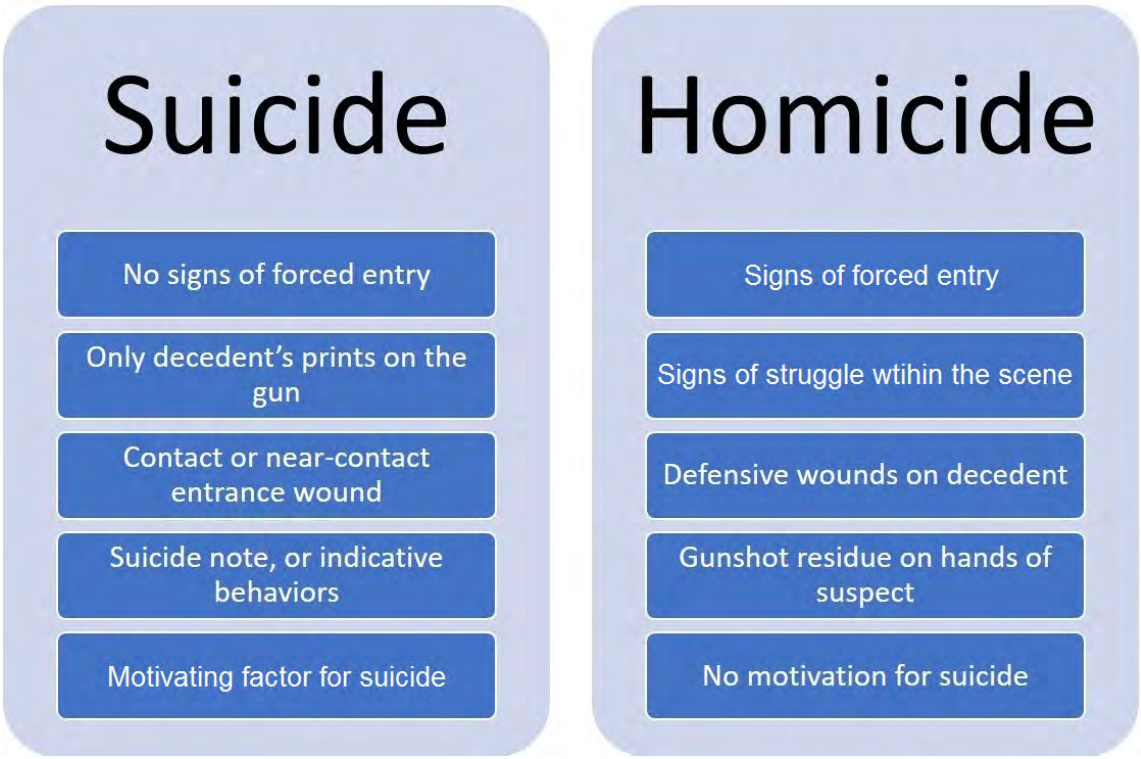
To illustrate, let's use an example most of us can relate to. We identify the need to buy a new car; this is our problem. If we want to be smart about our decision, we will conduct some research to identify our needs, determine the amount of money we have available to spend, and evaluate what we want in the car of our choice. We will likely formulate a hypothesis that two or three particular cars might best meet our needs. Then we might conduct an experiment to gather relevant data. To accomplish this, we formulate a plan, or methodology, to gather this data. This plan ensures we collect and compare comparable and relevant data for each of the subjects we are considering.

As we follow our plan, we might test drive two different vehicles. We might also compare fuel efficiency, the cost of insurance, and perhaps the vehicles' track record of recalls, longevity, and reliability. When we are done gathering our data, we then analyze the information to see what it might tell us. We examine which of the two choices is best supported by the data. When we are satisfied that the data clearly supports the purchase of one vehicle over the other, we're typically ready to make our purchase. While we may not consciously recognize that we have employed this process, we follow some version of it every time we need to make a sound decision. It is natural, and it is reliable, and for this reason, it makes sense to use it at crime scenes.

Use of Competing Hypotheses

The application of the scientific method to crime scene processing involves one additional twist: The inclusion of dueling or **competing hypotheses.** This is important to the integrity of the investigation for several reasons. First, it helps to prevent bias, by combating our inclination to form a conclusion too early in the investigative process. It also increases the probability that the investigator will identify and recover all available evidence, not just that which supports obvious assumptions. Finally, the use of competing hypotheses also helps to address possible defenses that might be raised by the suspect(s) during the investigation or at trial.

An example of competing hypotheses may be a death scene. When we enter the scene, we might see the decedent with a single gunshot wound to the head, the apparent weapon by his side. We might immediately formulate two competing hypotheses; either the individual shot himself, or someone else fired the fatal shot. As we begin to process the scene, we consciously seek what we would expect to be true for each hypothesis to be accurate. In this way, we ensure that we collect not only the evidence that supports our initial assumptions, but also the evidence that challenges them. At the end of this process, we will have a collection of evidence that either proves or disproves each hypothesis. Returning to our gunshot victim, we might make a mental list of things we could expect to see in the case of a suicide or a homicide:



All this relevant evidence, as well as the absence of evidence, is captured in the scientific approach to crime scene processing. At its conclusion, the evidence may support or refute the hypotheses proposed. As with many scientific questions, the end of the process does not always result in a final conclusion; often additional questions arise and must then be cycled through the same process. This is normally where the rest of the investigation picks up. But soundly processing the original impermanent and perishable scene, will make those additional investigative steps possible, by ensuring that they begin with the right set of questions.

Application of the Scientific Method to Prevent Gender Bias

In December 2015, the US. Department of Justice published new Guidance on *Identifying and Preventing Gender Bias in Law Enforcement Response to Sexual Assault and Domestic Violence.* As Attorney General Loretta Lynch stated, the *Guidance* is designed to "help state, local, and tribal authorities more fairly and effectively address reports of domestic violence and sexual assault" (US. Department of Justice, 2015b, para. 2). Or, as the *Guidance* itself states:

> *Gender bias, whether explicit or implicit, conscious or unconscious, may include police officers misclassifying or underreporting sexual assault or domestic violence cases, or inappropriately concluding that sexual assault*

> *cases are unfounded; failing to test sexual assault kits; [and] interrogating rather than interviewing victims and witnesses … In the sexual assault and domestic violence context, if gender bias influences the initial response to, or investigation of the alleged crime, it may compromise law enforcement's ability to ascertain the facts, determine whether the incident is a crime, and develop a case that supports effective prosecution and holds the perpetrator accountable* (US Department of Justice, 2015a, p.3).

One way in which gender bias can influence a law enforcement investigation is by facilitating a human tendency described as **confirmation bias.** Confirmation bias refers to the phenomenon where individuals "tend to seek evidence that confirms pre-existing ideas and avoids or discredits evidence challenging these ideas" (Lonsway, Archambault & Berkowitz, 2017, p. 43). This is not just a problem within the criminal justice system, it is a natural human tendency. However, it can create particular problems when it influences the criminal justice process. An investigator who is not mindful of his or her biases may consider statements made by a sexual assault victim as unreliable, simply because it does not fit the investigator's expectation of the offense. As a result, that investigator may enter the crime scene and (unconsciously) miss the evidence that corroborates the victim's statements, and perhaps even seek out evidence that challenges them. Needless to say, this can create a miscarriage of justice, with tragic consequences for victims, suspects, and the public as a whole.

One of the best ways to reduce the influence of confirmation bias in a law enforcement investigation is with thorough crime scene processing, which applies the scientific method and pursues competing hypotheses. Considering the many challenges associated with sexual assault investigations and prosecutions, it is critical to note that this does not mean that the victim's statement is immediately accepted as true (or dismissed as false), or that the suspect's statement is immediately accepted as true (or dismissed as false). While the interview of each person should begin from an orientation of "Start by Believing," a scientific approach with competing hypotheses can help prevent an investigator's actions from showing favor to one person over another (either knowingly or unknowingly), based on gender stereotypes or misunderstandings about the real dynamics of sexual assault crimes. This will also help prepare the investigator and prosecutor to address defense arguments if the case goes to trial.

Consider this hypothetical courtroom exchange between an investigator and a defense attorney:

Attorney*:* *Tell me Investigator Smith, did you find evidence of anyone else in the victim's bedroom besides my client?*

Investigator*:* *The fingerprints recovered from the victim's nightstand only matched the defendant's fingerprints.*

Attorney*:* *But my client has already admitted that he was invited into the victim's bedroom where he and the victim engaged in consensual sexual intercourse. Did it ever occur to you that after my client left the victim's house, another intruder forced his way into her home and inflicted the injuries the victim later presented with at the hospital?*

Investigator*:* *We did not find any other fingerprints on the nightstand that would indicate another individual was in that room.*

Attorney*:* *What about the window to the victim's bedroom? She lives on the first floor of that apartment building and that window opens up to a vacant, unlit lot; anyone could access it! Did you examine that window to verify that it was not tampered with? Did you process it for fingerprints, tool marks, or trace evidence?*

Investigator*:* *No, we did not.*

Attorney*:* *I see, so you deliberately chose to focus only on evidence that might implicate my client and failed to process relevant areas of a crime scene that would have produced other suspects. Now, we will never know who actually assaulted the victim, because you failed to find and recover all the evidence available at the scene.*

In this exchange, the defense attorney introduced the possibility of evidence that may or may not have ever existed. This might seem like a long shot, but it could be all that is needed to create reasonable doubt in the mind of a juror. Thorough crime scene processing by a responsible investigator, utilizing a scientific approach, ensures that evidence is collected to help determine the truth, exclude suspects when appropriate, and later counter any attempts to undermine the investigation and prosecution.

Now imagine how a juror might react differently to the same defense argument, when the investigator can testify like this:

Attorney*:* *Tell me, Investigator Smith, did you find evidence of anyone else in the victim's bedroom besides my client?*

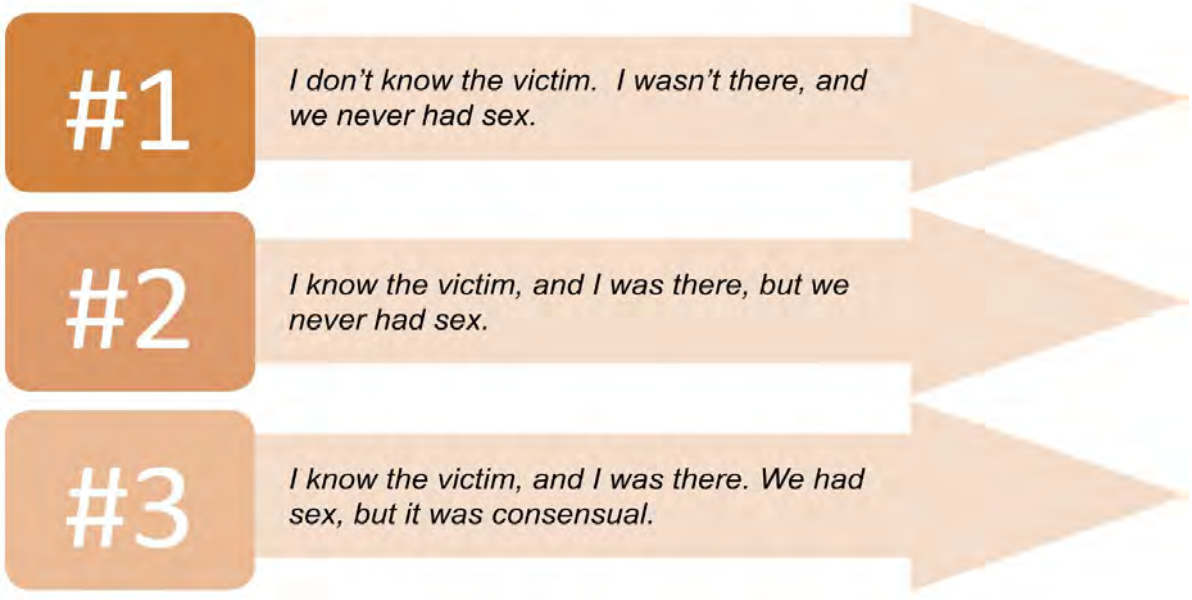
Investigator*:* *We examined all interior and exterior surfaces of the windows and doors to the apartment for signs of forced entry and the existence of latent fingerprint impressions. There were none, other than those belonging to the victim and the defendant. We detected no footwear impressions in the dirt below the windows and no indicators that the windows had been forced open. All*

windows were verified to be locked from the inside at the time investigators arrived.

At this point, the defense attorney has no other recourse than to try to challenge some other aspect of the investigation, because the crime scene processing was thorough and scientifically sound.

Competing Hypotheses and Possible Defenses

Many hypotheses for a sexual assault scene will tend to mirror **possible defenses** for the suspect or defendant. Generally, investigators can anticipate three likely defenses:



The value of any particular item of evidence will vary, based on which of the three defenses is raised. For example, if a suspect denies ever being present in the victim's home, and investigators recover evidence that proves this statement to be false, then that evidence might become more significant than other evidence. However, if the suspect acknowledges being present in the victim's home, but states that the sex was consensual, evidence of the suspect's presence in the home will not be as valuable. Instead, investigators must focus on recovering evidence that helps to establish the element of force or fear (e.g., bindings, injuries, blood, pulled hair). Of course, suspects often switch their defense from initially denying any contact with the victim, to a statement that the victim consented, when confronted with evidence such as fingerprints or DNA.

On the other hand, some suspects will confess to the offense when confronted with physical evidence that demonstrates the impossibility, or implausibility, of their original

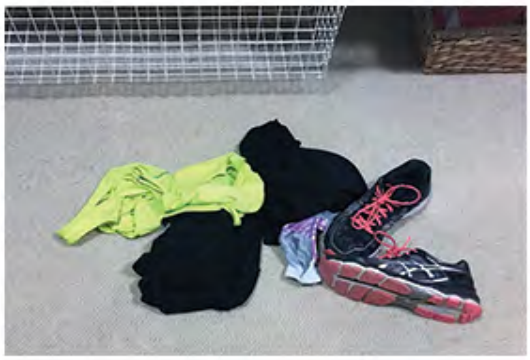
explanation. For this reason, investigators must process the scene and collect evidence in anticipation of any of these three possible defenses or competing hypotheses.

Crime Scene Processing vs. Evidence Recovery

The prospect of applying this thorough process to every reported crime may seem daunting. Therefore, it is important to differentiate crime scene processing versus evidence recovery. The simplest litmus test is the question of **context**: Does the information offered by a particular item of evidence depend, in any way, upon the precise location of that item?

To illustrate, imagine a scenario where a female victim is sexually assaulted by a male friend while visiting his home. After the sexual assault, she returns home, to shower and change clothes, before going to the hospital for a medical forensic exam. The investigator will clearly need to make sure the clothing is recovered from the victim's home, but the question is whether that "scene" needs to be processed? In this case, the answer is probably no.

The information sought from the victim's clothing might include the presence of the suspect's semen or DNA, and any visible damage sustained during the forcible removal of her clothing. As such, the value of the evidence is in no way dependent upon the location from which it is recovered. In this instance, it is perfectly acceptable to simply recover the items without processing the victim's home, bedroom, or closet.



When the value of evidence is not dependent on the context in which it is found, it may be suitable to simply recover the evidence. While photographing the item is encouraged, there is no need to document spatial relationships.

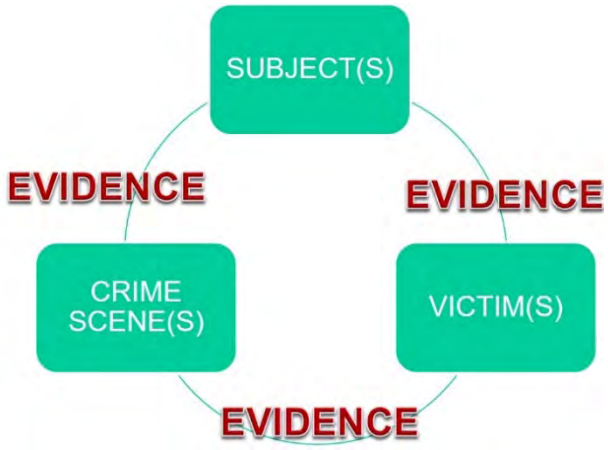
If we change some of the circumstances in this example, however, the answer to the question of whether or not to process the scene might change. Suppose the suspect kept the victim's underwear, but he discarded it in the trashcan behind his house. Now, the location of the victim's underwear is extremely relevant, along with potential DNA and maybe even other items that might be found in the trashcan (e.g., condom, tissues). The context in which the underwear is found gives these items meaning and evidentiary value. In this instance, it is best to fully document and process the trashcan and surrounding area.

It is important to thoroughly document all crime scene processing efforts because the specific value of evidence is often determined by the location and the context in which it is found.

Characteristics and Value of Physical Evidence

Physical evidence can be any tangible thing that helps to ascertain the truth of a matter of fact under investigation. It is generally perceptible to the senses, even though it may require analysis and interpretation to aid in the understanding of its significance. To be of legal value, the evidence must be **relevant** to the question at hand, it must be **probative** in that it helps to answer an unknown, and its **original context** must be preserved. When this is achieved, physical evidence can be very powerful and versatile. It can help to include or exclude suspects and exonerate the innocent. It can also prove or disprove elements of the offense. It can even help to identify and locate suspects, witnesses, and victims of crime. As so eloquently stated by Paul L. Kirk:

> *Evidence does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are. It is factual evidence. Physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent. Only human failure to find it, study and understand it, can diminish its value.*



Physical evidence can be used to link victims, witnesses, suspects, and crime scenes.

Locard's Exchange Principle

The **Exchange Principle** made famous by Edmond Locard in the early 20th century asserts that whenever two surfaces come into contact with one another, there is a partial transfer of material from one to the other. When an assailant steps on the victim's carpet, for example, soil may be deposited that has been clinging to the shoe treads; this soil might have come to be in that tread when the suspect stepped outside the home, or at a place of employment, before traveling to the victim's home.

Then as the assailant deposits soil on the victim's carpet, carpet fibers, pet hairs, or any number of trace items from the floor will also be picked up and taken out with the suspect when leaving. In this instance, a dual opportunity has been created for investigators to recover physical evidence to establish the suspect's presence in the victim's room. Investigators might recover the soil from the suspect's shoe tread and match it back to a location frequented by the suspect. They may also recover the suspect's shoes and find fibers or hairs that might be traced back to the victim's carpet. While this may seem like common sense, this governing principle of **"every contact leaves a trace,"** provides the foundation for the analysis of physical evidence and the need to preserve the context of that evidence; namely, the crime scene processing procedures we follow today.

Because every contact leaves a trace, we can say with great certainty that there is physical evidence at every crime scene. Only human error, or the lack of appropriate tools, would explain leaving a scene empty-handed. If we take the time to look for evidence with the appropriate tools, we can usually recover it.

Class vs. Individual Characteristics

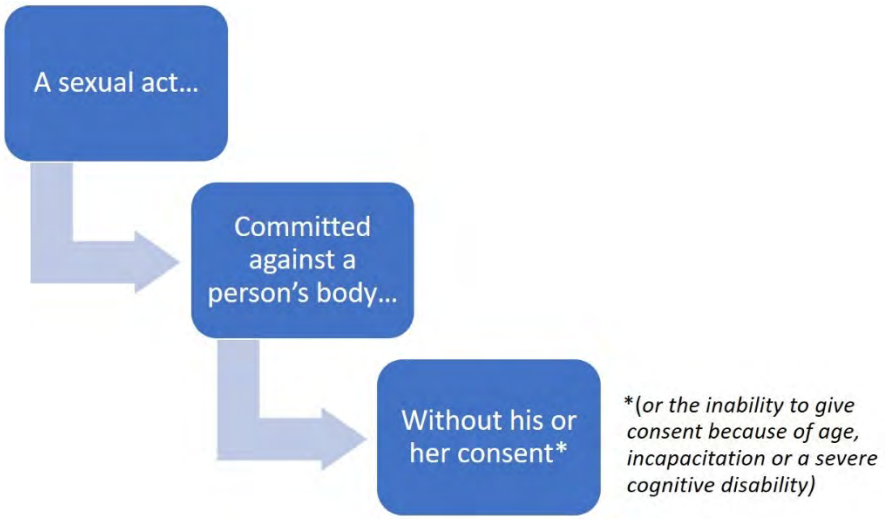
Some key concepts are needed to understand the analysis and interpretation of physical evidence. First, **class characteristics** can be used to group like objects into a shared category. This could be an impression made by a particular brand (or class) of running shoe, or a tire track created by a certain type of tire. Sometimes, the best information we can expect from an item is the general class of the evidence. While this is not overly discriminating, and it cannot identify the item to the exclusion of all others, it might still contribute to the investigation as circumstantial evidence.

On the other hand, **individual characteristics** can be used to group objects into a category that can be distinguished from all other objects, based on specific and identifying features. In other words, they can identify an item to a reasonable degree of scientific certainty. To illustrate, there might be evidence that isolates one particular running shoe, by documenting wear defects and patterns that make that shoe unique and matching those features to a footwear impression left at a crime scene.

A three-dimensional cast of a footwear impression is collected at the scene for future comparison to similar footwear that will be deliberately searched for, and potentially recovered during the investigation.

Supporting Elements of the Offense

While there are many types of sexual offenses, a sexual assault can generally be defined by meeting the following **legal elements:**



Regardless of the specific criminal offense, the elements of proof the investigator must support with physical evidence are abstract, and they do not manifest in a sexual assault crime scene as obviously as some other crimes. For example, sexual contact can leave physical evidence, but the sexual act is often not in dispute. Rather, the investigator must recover evidence that helps establish the absence of consent. But what does a lack of consent look like? How does an absence of consent manifest in a

scene? Absent defensive injuries on a victim, or physical damage showing forced entry, what evidence might establish the elements needed to prove a forcible sexual assault? This is one of our greatest challenges when processing a sexual assault crime scene, and it is generally dependent upon the specific circumstances of each unique case.

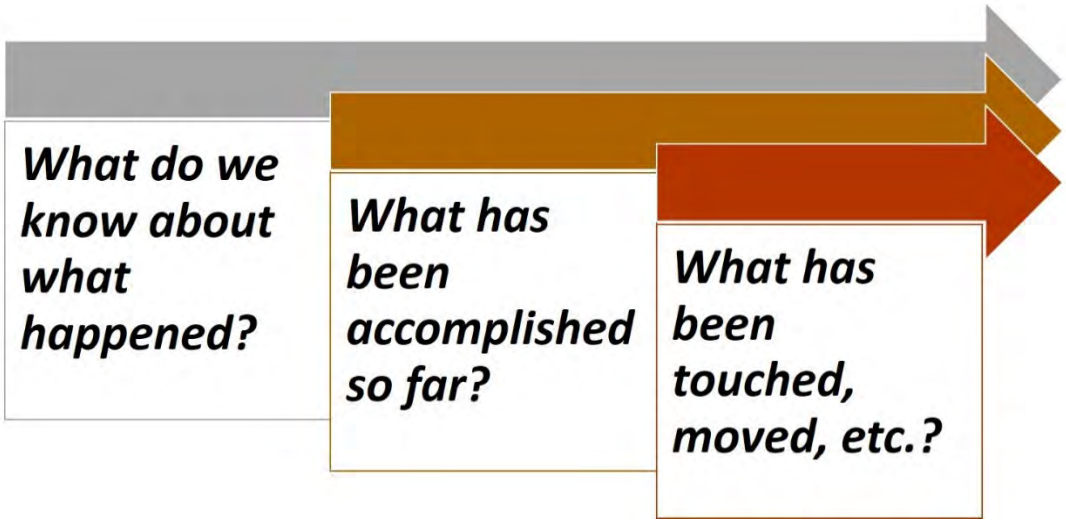
As another example, if a male victim reports that the suspect incapacitated him with excessive amounts of alcohol, then investigators must search for receipts that show repeated purchases of alcoholic beverages for the victim. Or, if a victim reports that her clothing was removed while she was unconscious, then investigators must examine the clothing for damage that may have occurred while they were being removed. Finally, if a victim reports that the suspect raped her in a vehicle by pulling the release handle that allows the seat back to recline, then investigators must swab that handle for touch DNA. The challenge for the investigator is to consider the unique and abstract components of each offense and hypothesize how those individual components might have manifested in tangible form within the crime scene. However, it is this kind of physical evidence that is often most challenging to identify and locate when investigating a sexual assault.

Generally, sexual assault scenes don't include the elusive "smoking gun." Sometimes, despite our best efforts, we are left with two versions of a story, and the only choice we have is to build a circumstantial case. Investigators must recover the evidence available and allow it to support or refute each person's account of what happened. At the end of the day, the version that is better supported by evidence, however circumstantial, stands the best chance of being believed. This means it is critically important to apply the competing hypotheses model and let the evidence speak for itself.

Preliminary Crime Scene Steps and Team Roles

This section will address processing procedures for a crime scene when law enforcement has received timely notification. In other words, the sexual assault was reported shortly after it was committed.

Upon initial notification, the investigator must make sure the crime scene is secured as soon as possible. Investigators are not usually the first responders, so the first investigator to arrive should take the time to gather all available information to adequately prepare for the processing efforts. Because the scene is normally transferred from one law enforcement official to another, a thorough debriefing of what has been accomplished thus far should occur before the scene is turned over. Some perhaps obvious, but nonetheless critical questions, may include:



Based on this statement, where should investigators search for evidence? What opportunities are there for physical evidence? What should an investigator expect to find at this scene?

While circumstances may dictate otherwise, it is usually best to know the victim's account *prior* to processing the sexual assault crime scene. Without an understanding of what happened according to the victim, investigators can make incorrect assumptions about where or how the sexual assault occurred, and what is or is not important. For example, all too often, investigators are quick to collect the victim's bedding, assuming the assault occurred on a bed, only to find out the assault actually occurred on the couch, etc.

Consider this statement, which provides a great deal of detail about the crime scene:

> *On February 25th, at approximately 5:00 a.m., I left my house at 41 Lakes Drive, to go for a 7-mile run. I do this run every Saturday, and I listen to music on my iPod. I take the same route, and normally I cross the bridge on Hwy 17 that is currently under construction. For the past three weeks, I have gone around the bridge by cutting through Mallard Point neighborhood. I have run through this neighborhood several times and have never seen anyone there. There are only two houses built so far, and I don't think anyone lives in them yet.*
>
> *The rest of the paved streets are lined with vacant lots. This morning, when I ran through the neighborhood, I ran around the closed gate and down the street, intending to make a left turn at the palm tree. It was still dark, but there was a streetlight that provided enough light for me to see where I was going. I tripped over something and fell to the ground. Somebody started helping me up and as soon as I realized there was another person with me, I felt*

something hard and heavy hit the right side of my head. I was dragged backwards through a metal gate and up some stairs and through some doors. I tried to grab the door, but he pulled me inside. He threw me down, face first, onto a soft surface. I later saw it was a sleeping bag on a lounge chair. I remember hearing ripping paper and then an angry voice telling me not to make a sound or he would kill me. His breath smelled like alcohol and vomit. My ears were ringing, my head was pounding, and I felt dizzy.

I didn't really know what was going on. I know he pulled my shorts down and had sex with me. My arms were under my body and he pushed all his weight down on my back so I could barely breathe. When he finished, he whispered in my ear that I should lie there and not get up, or turn around, or he would kill me. I felt him get up off me, and I heard him move around the room. I have no idea what he was doing. I don't know how long he stayed. After a while, I realized it was completely silent. I was scared to turn around in case he was standing there quietly to test me. I thought he would kill me if I turned around. Eventually, I turned my head and looked around, but I didn't see him. I pulled my shorts back up and ran out the door and back through the neighborhood to get home. When I got to my house, I called the police.

Based on the victim's statement, it may not be immediately apparent that there is evidence available at the scene to support all elements of the offense. For example, one could expect to find physical evidence indicating that the suspect and victims were present at the scene, and that sexual penetration took place. However, what obvious opportunities are there for recovering evidence of force or a lack of consent? This question is precisely why thorough crime scene processing must be conducted by individuals with an investigative mindset. The recovery of a torn earbud belonging to the victim, forcibly pulled hair, or the victim's blood on a rock at the scene would all support the victim's account that the sexual act was forcible and perpetrated against her will.

This earbud was recovered outside the scene. While this evidence does not prove the victim was sexually assaulted, the fact that it appears to have been forcibly removed is circumstantial evidence that helps corroborate the victim's statement.

Arrival at the Crime Scene

Some of the first questions that must be asked by the lead investigator are critical to ensuring that proper resources are available to process the scene. These questions should be addressed by interviewing the first responders and conducting an initial walk-through of the scene. These questions include:

- Is this truly the scene where the crime took place? If so, is it the sole scene or azre there secondary scenes to consider?
- Is the scene secure? Have all victims/witnesses/suspects/bystanders been removed?
- What authority do we need/have to conduct a search?
- How many scenes are we dealing with? (The participants' bodies should be considered crime scenes as well)
- Do we have enough personnel and resources?
- Are there any experts that should be consulted (e.g., digital or computer forensic experts)?
- What kind of equipment is needed? Anything outside the ordinary?
- Is there any perishable evidence that needs to be addressed immediately?
- Which path of travel can investigators take that will be least disruptive to any potential evidence?
- Should the scene be cordoned off? What entry control measures are needed?
- Where should necessary equipment or a trash collection point be located?

The discovery of digital evidence may warrant consulting with a specialist in electronic evidence to ensure the item is collected and preserved correctly.

Crime scene investigators must arrange a staging area, not only to store equipment and evidence collection materials, but also to provide and store necessities like water for investigators and a trash collection point.

Crime scene processing tools and evidence collection materials should be maintained at a separate location outside the crime scene, but accessible to investigators.

Roles and Responsibilities

Once these questions are adequately addressed, it is important to ensure that everyone clearly understands their roles and responsibilities. There are numerous roles that need to be filled when processing a scene. However, limitations on personnel and resources generally mean that investigators will fill more than one role. Fortunately, the application of these roles occurs in a systematic and predictable manner, so investigators can often accomplish the duties and requirements of one before moving on to the next. These roles and their general responsibilities are described below.

Lead Investigator: This individual is responsible for formulating the overall plan, making key decisions, and note-taking. Note-taking includes recording the names of all people present, crime scene indicators, lead development, etc. The lead investigator often performs the initial walk-through of the crime scene to identify the circumstances the team will be managing during the processing efforts that follow. At this point, the team leader notes any perishable evidence, processing and packaging requirements,

special assistance or equipment needed, and the least destructive pathway in and out of the crime scene. Notes may be taken during this walk-through, and they should include crime scene indicators which may not persist. This might include scents or odors in the air, lighting and temperature conditions, and the liquid or dry state of fluids.

The lead investigator may perform an initial visual examination of the scene and use this information to brief other investigators, formulate a processing plan, and identify equipment and any specialists or additional resources needed.

Photographer: Photographs should depict the scene and the items of evidence that are recovered, as they are found.

Whenever possible, the photographer should have an accompanying investigator to keep a contemporaneous photo log. This helps ensure that each photograph is recorded and minimizes the chance of missing a needed exposure.

Sketch and Measurement Team: This team obtains and records measurements and produces a visual representation of the scene. A rough sketch might be completed on scene, but the sketch should document all needed spatial information. The goal is to provide, in a single view, a graphic illustration of spatial relationships between items of evidence within the scene.

The sketch and measurement team should include at least two people, and ideally three, if space allows. This will produce more accurate measurements and more efficient documentation, because one investigator can sketch and record measurements, while the other two obtain and call out measurements.

Search and Evidence Collection Team: The number and type of individuals involved in searching and collecting evidence will vary depending on the nature of the scene and the resources available. This team ensures a methodical process is employed to recover as much physical evidence as possible.

The search and evidence collection team works together to identify evidence at a crime scene. This approach is methodical and redundant, ensuring that at least two sets of eyes examine every location when searching for evidence.

On-Scene Evidence Custodian: This role varies per agency policy. In general, the on-scene custodian assumes custody and maintains chain of custody for recovered evidence, ensures that evidence is described and annotated on a recovery log, and verifies that the evidence is properly packaged.

The on-scene evidence custodian should be consulted to help determine the most appropriate manner to preserve, collect, and package evidence. This team member also performs a quality control check before receiving the evidence, ensuring that serial numbers are accurate, descriptions are sufficient, etc.

Standard Processing Procedures

Crime scene investigation is rooted in the forensic sciences and, as a science, it must follow a methodical process and provide sufficient documentation to allow others to replicate the process and results. In other words, crime scene documentation should be completed in essentially the same way, every time.

Crime scene documentation consists of written notes, sketches, and photographs. The importance of this documentation cannot be overstated, because it preserves the context of the physical evidence. As discussed previously, an item's context may ultimately determine its evidentiary value. Additionally, thorough documentation ensures that a record exists for items or information that may not be considered significant at the time of scene processing. It is impossible to know at this early stage in an investigation what may or may not be relevant to the case. Instead, subsequent investigative steps may reveal the significance of an item or feature of the scene that investigators were not aware of initially. If proper documentation has been achieved, that feature may have been captured in a note, sketch, or photograph, and may therefore provide critical information that helps resolve the case.

Written Notes

Notes taken at a crime scene are used to create a contemporaneous record of all actions taken. These notes are used to write the scene narrative for the crime report or the follow-up investigation. They also support other forms of documentation (e.g., photographs, sketches) and serve to remind the investigator of what has and has not yet been accomplished. Importantly, these notes may be the only record of any negative results of processing efforts. In other words, if something is *not found* at the crime scene, this can sometimes be a significant finding. This would be the case if the victim describes that the suspect used a condom, or tissues to clean up, but no condom or tissues are found at the scene. When a crime scene report is ultimately produced, the information contained in the investigator's notes will provide the details needed to document their attempts to locate evidence while processing the scene.

According to Ross Gardner (2012), all narrative descriptions of a crime scene should share three general attributes:

a. The narrative should be detailed. All pertinent details observed at the crime scene should be documented.
b. The narrative must be accurate. In other words, it should match the true conditions of the scene.
c. The narrative must be understandable, so others can make sense of it.

Gardner recommends breaking the narrative into several sections, including: an introduction, a discussion of characteristics of the scene (meaning day-to-day features of the scene, such as the type of building or natural barriers), the conditions of the scene (referring to relevant conditions to the incident at hand, such as lights being on or off, or doors, and windows locked or unlocked), notes about environmental conditions, factors pertinent to entry and exit, scene documentation efforts, collection of physical evidence, the search for latent fingerprints, and any other examinations at the scene. Whichever approach the investigator chooses to follow, it is best to take notes in anticipation of the final crime scene narrative product; if the information is needed for the report, a prompt to collect the information at the scene should be available. Many agencies and departments design a note-taking form that guides the investigator in collecting all relevant information while on scene.

Example of a Narrative Produced from Crime Scene Notes

On February 25th, Investigators K. Kelly, T. Steele, M. McScott, and L. Whitmore responded to and processed the scene of a rape reported to have occurred in the clubhouse of Mallard Point residential community. Investigators arrived at 7:45 a.m. and released the scene at 5:55 p.m., that evening. The weather upon arrival was approximately 57 degrees and there were no reports of rain during the prior evening.

The crime scene was located in an uninhabited, partially developed, and gated neighborhood off of Highway 17, called Mallard Point. The gate was functional, but only opened upon entering a code; however, pedestrians could conceivably access the neighborhood on either side of the gate on foot. The area flanking either side of the gate was heavily wooded and would obscure the view from Highway 17.

Mallard Point neighborhood consisted of two developed lots and 22 additional lots which did not have structures built at the time of this examination. Upon entering the neighborhood, the road came to a T-intersection; the left turn headed north and the right headed south. Both directions terminated at cul-de-sacs. One residential home was built on either side of the main road, Mallard Point Way. Neither home was occupied or furnished and exterior examination of both homes revealed no signs of forced entry.

On the east side of the T-intersection was the clubhouse and private pool for residents of the neighborhood. The clubhouse was situated between the outdoor pool to the north and a parking lot to the south. The clubhouse and pool were surrounded by a 5-foot wrought-iron fence which surrounded the west, north, and east sides; an electronic gate was located on the south end of the fence.

The parking lot was located outside the fence enclosure on the southernmost side. The electronic lock on the gate was not functional at the time of this examination. The pool was surrounded by six feet of concrete patio, which was then surrounded by a 3-foot landscaped area containing shrubs and pine straw on the west, north, and east sides. The clubhouse exterior had four columns on its north side which supported a covered patio area; individuals must step up two stairs to access the patio. The north wall of the clubhouse consisted of glass windows and glass double doors which opened outwards into the patio area. The left door was open upon investigators' arrival at the scene.

The clubhouse was accessible through the glass double doors on the north side of the building, as well as two double doors on the west wall of the building. The doors on the west wall were locked during the time of this examination and exhibited no signs of forced entry. The left door on the north wall of the building was unlocked and open at the time of scene processing efforts. This door exhibited no signs of forced entry. On either side of the double doors on the north wall were two sets of windows; all windows were locked from the inside at the time of this examination. The east wall of the clubhouse consisted of three windows; all windows were locked from the inside at the time of this examination. The southern wall had a corded, nonfunctioning telephone mounted approximately five feet from the ground. An empty water dispenser sat against the southern wall to the right of the phone. The middle of the southern wall contained a locked door to a broom closet; subsequent entry into the closet revealed nothing of value to the investigation. To the east and west of this closet were single bathrooms, each containing a functioning toilet and sink, and one small trash can devoid of content. Lights were off upon investigator arrival at the scene, but a check of all light switches, following attempts to develop latent prints, revealed all lights were functioning. A prescription pill bottle with no label was found on the sink of the bathroom to the east. The bottle contained 14 pills with varying shapes and markings. The pills were removed and packaged separately as evidence. The pill bottle was superglue fumed to preserve latent prints.

Upon entering the clubhouse, a utility mat was located on the floor directly inside. Investigators collected surface debris using tape lifts, and seized the mat. A search of the floor with oblique white light revealed no visible footwear impressions, however a blind dusting with dual contrast powder revealed the presence of a two-dimensional impression. The impression was collected using a gelatin lift. To the east, there was a reclining patio chair with a partially opened sleeping bag on top. A cellular phone was retrieved from the top of the sleeping bag; it was determined to be powered off and was subsequently placed in a Faraday bag and seized as evidence. Several strands of light-colored hair were found in the zipper of the sleeping bag and a torn portion of wrapper was found in the folds of the sleeping bag. Both

were packed in pharmaceutical folds and seized as evidence. An examination of the sleeping bag using an Orion-Lite 455nm blue light and orange filter goggles revealed the presence of a fluorescing stain on the inner surface of the sleeping bag. The stain was field tested using Acid Phosphatase Reagent and produced a presumptive positive for the possible presence of semen. The sleeping bag was collected as evidence. Near the head of the chair, on the floor was a 12-pack cardboard box of Sam Adams beer with six remaining bottles inside. Outside the box, on the floor beside the patio recliner was one empty bottle. The empty bottle was superglue fumed to preserve latent fingerprint evidence prior to collection. Between the patio chair and the eastern-most wall were two fully reclined patio chairs stacked on top of one another. In the northeast corner of the room was a trash can which was completely empty, a child's plastic patio chair, and a stack of six patio arm chairs. Examination of the chairs revealed they were covered in dust and did not appear to have been disturbed. In the southeastern corner of the clubhouse, three flattened cardboard boxes were stacked and fanned out; under the top-most cardboard box was a partially visible pair of pruning shears. These shears were superglue fumed to preserve latent prints and seized as evidence. Examination of the cardboard revealed a suspected footwear impression, which was photographed prior to collection. Near the cardboard boxes was a pool skimmer in two pieces lying parallel with the southernmost wall. Examination of the skimmer revealed nothing pertinent to the investigation. To the immediate west of the north wall's double doors were four Sam Adams bottle caps. All caps were superglue fumed prior to collection. In the corner of the northwest wall, investigators recovered an empty Sam Adams beer bottle, which was fumed prior to collection.

An external search of the clubhouse grounds was done via line search and produced four items of evidence. A three-dimensional footwear impression was located between the parking lot and the southern wall of the clubhouse. A rock was located near the short asphalt path between the parking lot and the gate to the clubhouse pool. The rock exhibited a reddish-brown substance and what appeared to be light-colored hair adhered to its surface. The reddish-brown substance was tested using Phenothalein Blood Test Reagent and produced a presumptive positive for the presence of blood. A headphone ear bud was located in the grass on the northern lawn bordering the entrance to the parking lot. A bike lock, which appeared to have been cut, was recovered from the shrubbery on the west side of the clubhouse patio. Further examination of the fence line surrounding the clubhouse pool revealed no signs of disturbance or surreptitious entry. Exterior examination of windows using Small Particle Reagent produced no latent fingerprint impressions. A search of the parking lot produced no information pertinent to the investigation.

Investigators documented the scene with a rough sketch that captured spatial characteristics and relationships between items in the scene. Photographs were also taken of the overall crime scene and individual items of evidence recovered during scene processing efforts. All photographs were documented on a photography log. The following items were recovered from the scene and seized as evidence:

1. *Sam Adams beer bottle from northwest corner of clubhouse*
2. *Four (4) Sam Adams bottle caps, fumed*
3. *Red-handled pruning shears, fumed*
4. *Sam Adams beer bottle from west side of reclining patio chair*
5. *Light-colored hairs from zipper of sleeping bag*
6. *Cellular phone, Samsung, Serial #SG255T18*
7. *Floor mat, 7a-trace lifts of surface of floor mat*
8. *Partial wrapper, fumed*
9. *Prescription pill bottle, originally containing fourteen (14) pills, 9a-14 pills*
10. *Sleeping bag with suspected biological stain*
11. *Three (3) latent prints from exterior glass surface of north wall glass door*
12. *One (1) latent print from exterior door trim of north wall glass door*
13. *Footwear impression, gel lifted*
14. *Blue bike lock, cut, fumed*
15. *Rock with reddish-brown stain and hairs*
16. *Ear bud*
17. *Three-dimensional footwear impression, cast*

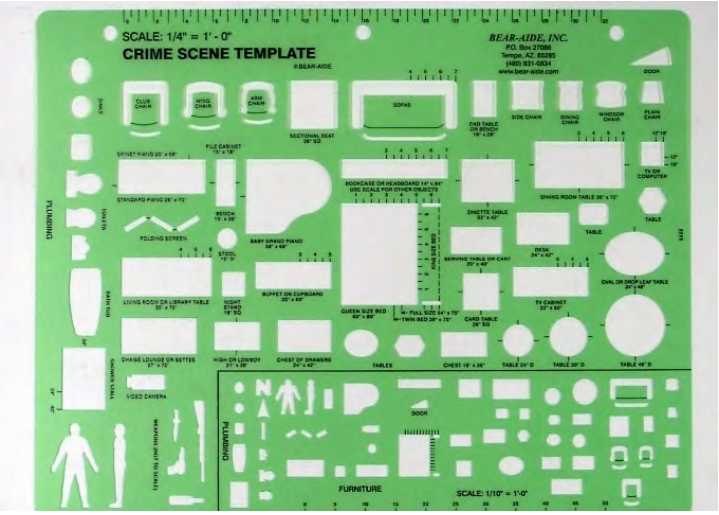
Crime Scene Sketch and Diagram

The crime scene sketch is often only associated with violent death scenes, but it can play a critical role in understanding the dynamics of a scene with contradictory accounts. Sometimes, a spatial representation of the scene can help support or refute statements by simply demonstrating an impossibility or implausibility in one person's story. The diagram or sketch may also help victims, suspects, and witnesses provide more detailed information about their movement throughout the scene during later interviews.

Even if the circumstances do not warrant a sketch with full measurements, a hand-drawn sketch that lays out the basic walls, furniture items, and associated evidence can be of tremendous assistance during later attempts at reconstruction. Consider the following illustration:

> *A woman walks home on a military base, in a very intoxicated state. As she walks, she is approached by two males who befriend her and lead her to their dormitory room where they sexually assault her. Afterward, the victim could remember very little about the assault, but she was able to describe the arrangement of furniture in the dormitory, which was unusual and suggested the subjects had rearranged the furniture upon occupancy. The victim helped investigators produce a diagram of the furniture, which was then disseminated to dorm inspectors who ultimately identified the room in question, and eventually located the two suspects.*

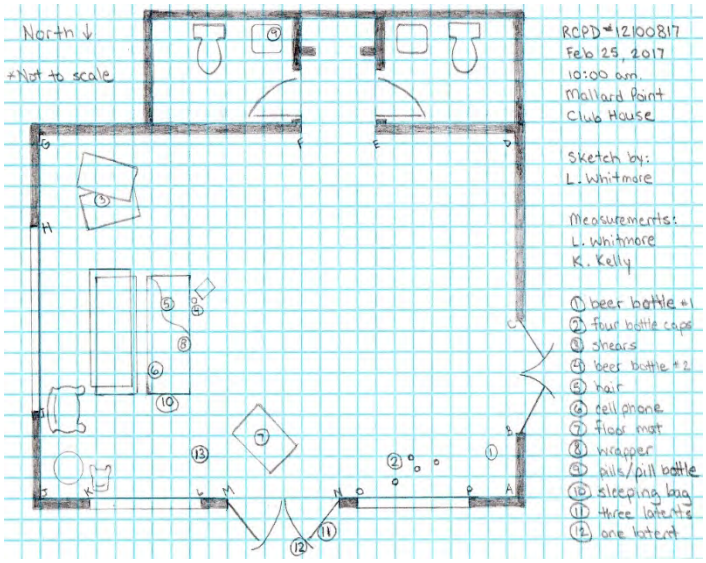
When a decision is made to complete a sketch, several drafts may be produced. The sketch accomplished at the scene tends to be "rough," meaning it is typically drawn by hand without the use of a straight-edge or templates. At that point, the most important priority for the investigator is to obtain relevant measurements while the scene is still preserved. Once items of evidence are seized and removed from the scene, the opportunity to provide context may be lost.



Templates may be used while at the scene for rough sketches, and to produce more detailed final sketches.

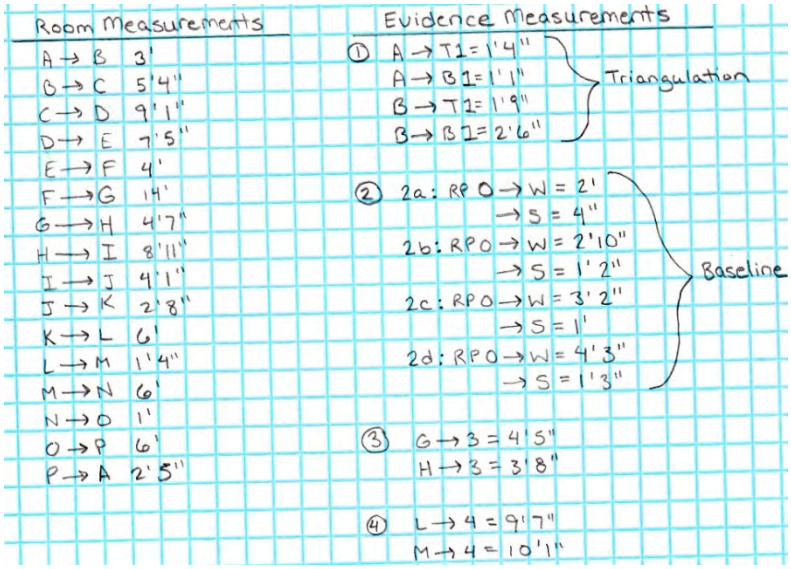
Later, a more detailed and exact **diagram** can be produced. This is sometimes prepared for court presentation or for inclusion in the investigator's final report. On these occasions, a more professionally accomplished hand-drawn sketch, or computer-assisted diagram will be used. Recommendations for best practice include noting the date and time the sketch was completed, recording the name of the person who completed the sketch, documenting the location of the scene, adding an arrow to orient

the viewer to north, clarifying whether the sketch is drawn to scale or not, and including a key or legend.



The rough sketch produced at a crime scene helps to establish an overall spatial relationship one can visualize in a single, bird's-eye view. When evidence is found on a vertical surface, that surface can be laid flat and included in the sketch.

Consider listing the measurements between reference points and their distances to items of evidence on a separate sheet of paper. This helps keep the sketch clear and understandable while also avoiding any confusion about which measurement applies to a given item.



The sketching process typically begins with a layout of the **basic perimeter** of the relevant area, whether it is a single room, multiple rooms, or an entire home in larger scenes. Walls, doors, and other permanent structural components are drawn first, to provide a setting to place relevant items. Furniture is included in the sketch, according to its relevance. Relevance may be determined by sheer size. For instance, a bed, large table, or couch are critical items in a room that affect the spatial relationship between other smaller objects. As such, these are normally included in the sketch. Relevance might also be determined by evaluating whether that item of furniture played a role in the crime. A small table might not be included in the sketch on its own, but the discovery of evidence on that table would make its location important. All relevant furniture should

be “fixed” into the scene with measurements from a permanent structural element such as a door, a wall, or a corner of a room. These permanent features are also known as **reference points,** and they may be labeled for future reference.

Normally, reference points are annotated with alphabetic characters rather than numbers. This is to avoid confusion between the number of items of evidence, and the points of reference marked on a sketch. On the other hand, items of evidence are generally listed numerically, rather than alphabetically, because scenes often have more than 26 items of evidence. However, scenes rarely require more than 26 reference points, so alphabetical labeling works for this purpose.

Once a scene and its important components are fixed within the scene sketch, the items of evidence are placed according to measurements from their location to the nearest logical reference points. There are two basic measurement techniques used: Baseline coordinate and triangulation.

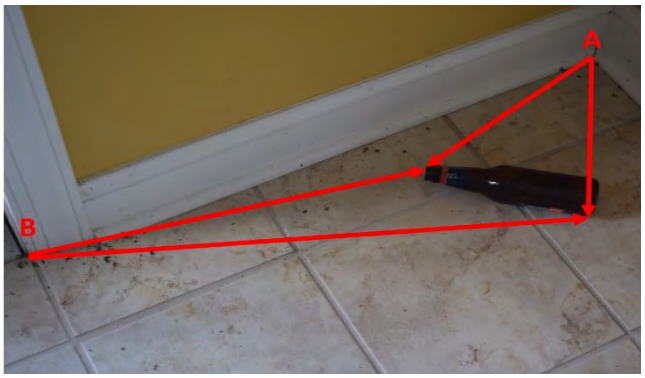
A **baseline coordinate** takes advantage of scene components that lend themselves to a 90-degree or X, Y- axis system of measurement. The item of evidence is measured by its spatial relationship along these two perpendicular lines.

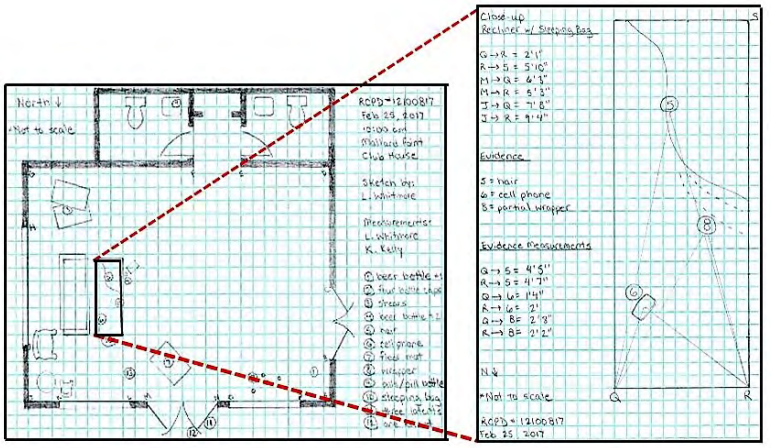
Multiple like-items, recovered from a common location near a perpendicular surface, are appropriate for baseline coordinate measurements.

Triangulation uses measurements from two fixed points (e.g., structural components such as doorjambs) to the item of evidence. For regularly and irregularly shaped objects

for which directionality does not matter (e.g., pools of blood, discarded sweatshirt), measurements are taken from the reference point to the center mass of the item. For linear objects for which directionality matters (those whose ends are significant, like firearms, knives, pipes, etc.), their position can be triangulated from the fixed features to both ends of the item.

Triangulation is considered a more precise method of measurement and involves collecting measurements between two fixed points and their individual distances to an item of evidence.





When multiple items of evidence are located in a small area, it is recommended that an additional close-up sketch of that area be completed. The spatial relationship of the items found on the recliner noted in this sketch would not be clearly understood, if they were only depicted on the overall sketch.

When evidence is found on top of a piece of furniture, each item can be measured in relation to the relevant furniture, once the piece of furniture is fixed into the scene by measuring its relationship to true structural fixed features. In this case, the recliner is fixed by triangulating its position in relation to reference points M and J.

Crime Scene Photography

Perhaps the most crucial component of documentation is the crime scene photograph. Because the equipment used varies by agency, the emphasis here is on photography

composition rather than operating equipment. There are, however, some standard camera equipment items and accessories an investigator should ideally use to properly document a crime scene. Most scenes can be sufficiently photographed with an 18-105 mm lens for all overall, midrange, and close-up photographs, and a 60 mm lens for close-up photographs of small items of evidence. A tripod, flash cable, detachable flash body, and infrared (IR) remote are also accessories that are necessary to successfully capture complicated or challenging photographs.

Regardless of the type of equipment used, there are some basic principles and best practices that Edward Robinson (2016) refers to as the "Cardinal Rules."

Rule #1: Fill the frame. If something is important enough to photograph, fill the frame with it.

This applies when the subject of the photograph is the entire overall scene, and when the subject is one item of evidence within it. In these situations, the photographer must make a conscious decision about what is included in the photograph, so it tells one story. The photographs taken at a scene are the lens by which the jury might come to understand the dynamics of the crime. Evidence within the scene is meaningful, but these items may be surrounded by meaningless objects which can be confusing when a person is trying to understand an event they didn't witness. These visual depictions of the scene should therefore be clarifying, and they should focus the viewer on what is important and what that item's relationship is to other aspects of the scene. If unnecessary items are visible in the background or foreground, consider zooming in or photographing from alternate vantage points, to eliminate these extraneous items from the field of view.

Rule #2: Maximize depth of field (or the area of sharp focus surrounding an object).

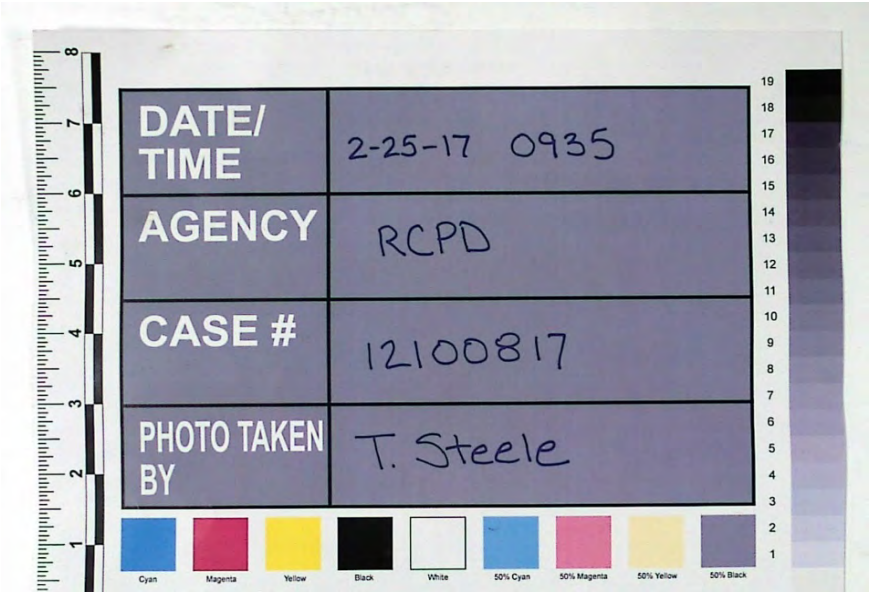
If Rule #1 is observed, then it is safe to say that all items appearing in a crime scene photograph are important to the story being told in that image. However, it is equally important to ensure that all items appear in focus, whenever possible. This prevents others from speculating about what forensic evidence might have been obscured in the blurred area of a photograph, or to call into question the competence of the photographer (who apparently cannot even focus his or her camera). Again, if it is important enough to photograph, it is important enough to ensure that it appears in focus. In general, depth of field can be achieved by using smaller aperture settings.

Rule #3: Keep the film plane (or digital sensor) parallel to the subject being photographed.

The crime scene photograph is supposed to be a fair and accurate representation of the scene as the investigator found it. This means any photograph taken within the scene should represent the reality of spatial relationships and object size. When the human

eye observes an object from an angle, one portion of the object is perceived as closer and larger, than the portion of the object that is further away. This effect is even further exaggerated by the camera lens, so any photograph taken from this vantage point will no longer fairly represent the object. When the photographer positions him or herself (and consequently, the camera's lens or sensor) parallel to the subject of the photograph, the resulting image tends to be a much more accurate depiction of reality.

It is best to make sure the first photograph taken at a scene contains a **photo identifier.** This typically includes the incident number or case number if it is available, the date and time, the photographer's identity, and sometimes a color scale and/or gray scale, in case future color adjustments become necessary. This first photograph, and every photograph that follows it, must then be annotated on a **photo log.** Even improperly exposed, or "bad" photographs, should never be deleted. In this age of digital photography, investigators are fortunate to be able to review each photograph they take immediately to determine whether it is sufficient or not. With this convenience comes a digital record of each image captured and its sequence. Deleted photographs will still be detectable in the metadata of the photographs, and while an investigator can hope to convince a jury that the images deleted were just terrible photographs, a good defense attorney will argue that the photographs constituted exculpatory evidence and were subsequently destroyed. To avoid this line of questioning, it is best to refrain from deleting images and simply retake as many photographs as needed to get it right.



A photo identifier can be used to capture lighting conditions, and to document identifying information about the case. This identifier includes a photo log on one side.

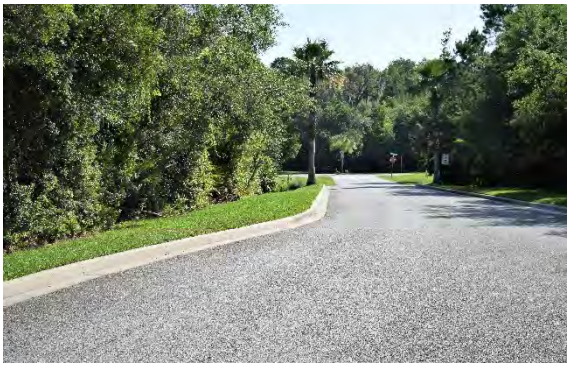
Establishing Overall Exterior Photographs

Overall exterior photographs are designed to establish the exterior setting of the crime scene. Depending on the extent of the scene, this may be a single-family home, an apartment building, a hotel, or even a neighborhood street, etc. The goal is to illustrate the relationship between the exterior of the crime scene, and the general surrounding

areas. Depending on the circumstances of the reported crime, it may be relevant to photograph cross streets, points of egress, natural landmarks, and obstructions. When photographing these areas, it is best to capture as much of the subject in one photograph as possible.

When it is not possible to capture the setting in one photograph, **overlapping photographs** may be taken. The photographer should assume a position perpendicular to the surface being photographed, at a midway point between the two ends, which will appear in the photograph.

Street signs and entrance points help establish the overall setting of the crime scene.



These photographs illustrate the approach from the neighborhood gates to the clubhouse where the sexual assault occurred. The photographs also provide possible insight about the perspectives of individuals involved in the incident, including any witnesses.



A segmented view of the surrounding areas immediately south of the clubhouse.



A segmented view of the surrounding areas immediately north of the clubhouse.


These photographs depict the gate and its spatial relationship to the access point the victim used to enter the neighborhood.

Exterior overall photograph of the south wall of the clubhouse.

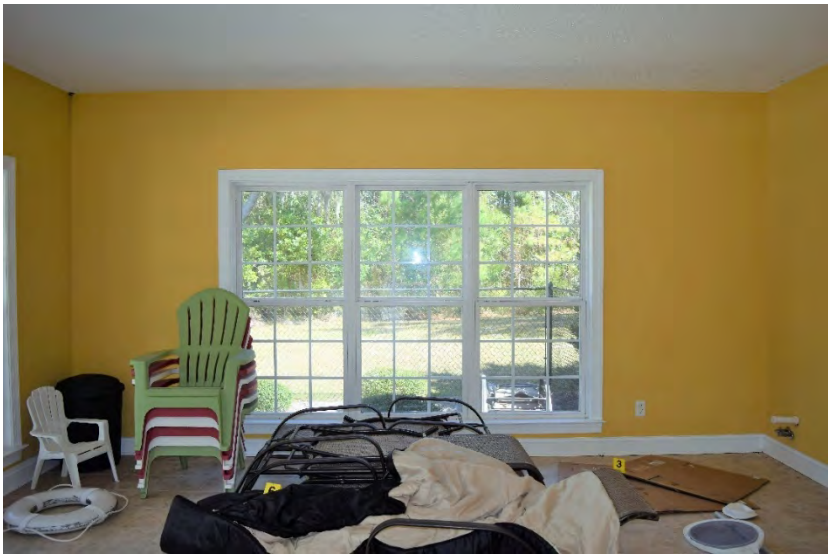
Exterior overall photograph of the west wall of the clubhouse.

Exterior overall photograph of the east wall of the clubhouse.

Exterior overall photograph of the north wall of the clubhouse.

Overall Interior Photographs

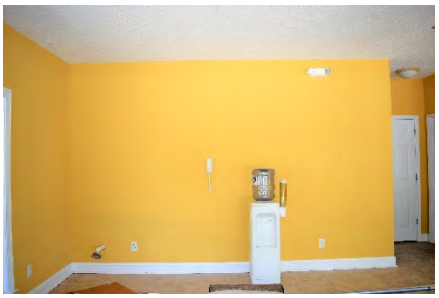
Once exterior overall photographs are taken, interior overall photographs should be taken. These photographs provide the framework and context for spatial relationships between items of evidence and the scene itself. The procedures described above also apply to this set of photographs. The photographer should attempt to capture an entire wall surface in one photograph, or take multiple overlapping photographs of each wall from a position parallel and perpendicular to that surface. Photographs should also be taken from a normal standing position with the camera held at eye level. These photographs should demonstrate what a person would see if they were physically present at the scene. As such, this is not the time for artistic photographs taken from low angles.

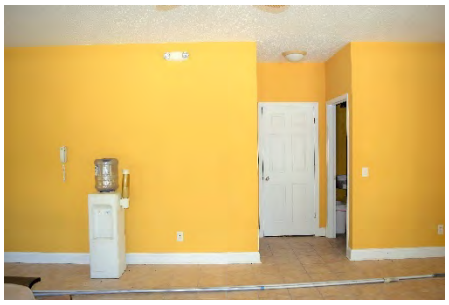


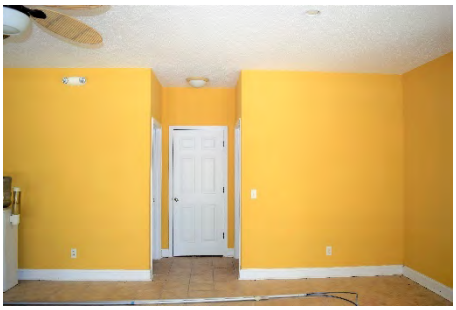
Interior overall photograph of the east wall of the clubhouse.

Interior overall photograph of the north wall of the clubhouse.

Interior overall photograph of the west wall of the clubhouse.







Interior overall overlapping photographs of the south wall of the clubhouse.

The floors and ceilings inside a crime scene structure may also be photographed. Typically, ceilings do not contain evidence, unless a particularly violent crime was committed. However, it is always important to document how the ceiling was found, to counter any argument that there could have been exculpatory evidence that was missed but the investigator failed to look.

While the floor will eventually be photographed in subsequent images of any evidence that is identified, investigators might want to photograph as much of the entire floor in one image as possible. In this case, multiple overlapping photographs may be taken, or investigators may mount the camera on a monopod and raise it in the air, keeping the film plane or camera lens perpendicular to the floor. If an investigator doesn't have access to a monopod, a collapsed tripod will work essentially the same way. By using a remote flash, or a timed exposure, an elevated 90-degree image can capture a bird's-eye image of a crime scene floor. As robotics and technology continue to advance and become more affordable, law enforcement agencies have even begun using drones to photograph large scenes in a single image.

Midrange Photographs

Midrange photographs help to establish the spatial relationship between an item of evidence and a fixed feature within the room. As you may recall from the previous section on sketching, a fixed feature is a structural element, not likely to change with time. This is important because investigators must be able to re-create the scene, and place these items back into their original positions if needed.

Whenever possible, the photographer should stand at the midway point between the fixed feature and the item of evidence. This produces the most accurate visual depiction of the spatial relationship between these objects.

The process for composing quality midrange photographs will parallel that for overall photographs. The photographer should imagine a straight line between the item of

evidence and the fixed feature, then stand at a midpoint perpendicular to that line, evenly splitting the distance between the evidence and the fixed feature.

At this point, the photographer should zoom in on these two objects, eliminating as much irrelevant detail as possible. Once the photograph is taken, the evidence should reside in one extreme end of the exposure while the fixed feature resides in the opposite extreme end. When this is achieved, the photographer can be reasonably assured that an accurate spatial relationship between the items has been captured.

Close-Up Photographs

Close-up photographs are also sometimes referred to as identifying photographs. At this stage, the goal is to capture identifying detail about a particular item of evidence rather than the spatial relationship. For this reason, it is once again imperative that the frame is filled with only what is important, minimizing the background. There are typically at least two, and sometimes three, close-up photographs that should be taken for each item of evidence. The first is a close-up of the item **as it is found**; this means the item is photographed in its original position. The next close-up normally includes **a scale,** which is used to deduce measurements from the photograph, in case the item is not physically present in the future (e.g., a stain is swabbed and consumed during testing, or a latent print is unsuccessfully lifted).

Bottle cap photographed in place, initially without a scale. Remember to fill as much of the frame with the main subject of the photograph as possible.

Bottle cap photographed in place, with a scale.

A third close-up is used when the original location where an object is found is **visually obstructed**, and therefore impossible to effectively photograph. This procedure also applies when that item is lifted, or manipulated following all required documentation, revealing an additional point of interest on the opposing surface or plane of the item.

For example, consider a condom wrapper found wedged in the folds of a sheet. It should be photographed in place first, and then again after the wrapper is removed, to document the brand and perhaps a lot number. This information may be very useful during the course of the investigation.

It is also best to not place an item back on the surface from which it was taken because this could create questions of cross-contamination, in addition to possible confusion about the item's true original location. Therefore, it is best to photograph the item in its "alternate" state on a different background than where it was originally found. This **alternate background** is ideally one the investigator brings to the scene and not something from the scene. For example, investigators can use a brown paper evidence bag. If this background is used each and every time for these "altered" shots, the investigator can easily remember and explain the different backgrounds.

This partial wrapper was located within the folds of a sleeping bag, making it impossible to effectively photograph in place. It is therefore photographed on an alternate background.

Despite their best efforts, investigators sometimes do not realize the evidentiary value of an item until it is moved or manipulated. When this occurs, it is best to immediately note where the item was found, and place it on an alternative background to be photographed. Never place the item back into the scene, as this could cause confusion about how the item was originally found and call into question whether other objects were replaced into the scene prior to photographic documentation.

This rock was not immediately recognized as evidence; however, upon turning it over, investigators discovered possible blood and hair. This is consistent with the victim's statement that she was struck in the head with a hard object. At this point, the rock is NOT placed back into the scene. Instead, it is placed on an alternate background to document its newly discovered evidentiary value.

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Photographic Lighting Considerations

Photography is sometimes artistically described as "painting with light." Indeed, light is required to create a photographic image, and as such, it is often the root of common photographic problems. The flash embedded in a typical camera system delivers light suitable for the average room, defined as a 10 X 12-foot room with white walls and an 8-foot ceiling. These parameters ensure that an adequate amount of reflected light will reach the camera's sensor when that flash fires. Any room that is smaller, larger, taller, darker, or more reflective, will probably require adjustments to the flash settings.

Same interior overall photograph of northern wall – first without, and then with, a flash.

Another consideration is whether an **external flash** should be mounted on the camera or connected using a flash cable. The reality is the flash will probably need to be mounted during some parts of the crime scene documentation efforts, and detached during others. For instance, when taking overall photographs of a room, the flash may serve its purpose mounted to the camera body. However, if an item of evidence is found under a bed or table, it will be necessary to disconnect the flash from the camera body, and control the direction of the flash using a flash cable. This way, the light is focused only on the desired area – in this case, under the bed or table.

The investigator may also use the flash and flash cable to overcome challenges when photographing **highly reflective surfaces**. If a surface reflects direct flash back at the camera and creates a "hot spot" in the exposure, the flash cable allows the investigator to direct light away from the object being photographed and "bounce" the light off an adjacent surface. This serves to illuminate the object being photographed without including a bright spot of reflected light in the image.

Items located in shadow can be visualized in photographs by detaching the flash from the camera body, and connecting it using a flash cable. This allows the photographer to direct the light where needed.

Alternate Light Sources

Because biological fluids are so often associated with sexual assault crime scenes, no search should be conducted without the use of an alternate light source.

Light engages in four different behaviors: Reflection, absorption, transmission, and fluorescence. The colors and objects seen by the unaided human eye are the result of different wavelengths of light being **absorbed** into a given surface. The color of light being **reflected** off that surface becomes the color we perceive. However, some materials actually convert the light, rather than simply absorbing and reflecting it. In this process, energy is emitted from the surface, and manifests in the form of **fluorescence**.

Light from the ultraviolet (UV) and blue spectrum cause certain biological fluids, like semen, urine, and saliva, to fluoresce. That fluorescence from a blue light is made more visible by examining the surface through an orange filter. (Most 455 nm blue lights come with orange filter goggles.) When violet lights are used, a yellow filter is appropriate. It is important to remember that any evidence made visible by the alternate light source and its filter must have similar conditions to successfully photograph that fluorescence. Therefore, an orange filter must be placed over the camera lens when photographing a stain fluorescing in blue light. Additionally, the camera must be attached to a shooting platform such as a tripod. This allows the camera to avoid the blur that might result if the camera is held by hand.

Many law enforcement agencies have a blue or ultraviolet light available, but not all alternate light source units are created equally. Blue or ultraviolet lights that do not emit a strong, bright beam, may be ineffective in helping to identify evidence. If an agency chooses to invest in a light source kit, the general rule is, “Brighter is better.” Quality lights are critical for the sexual assault crime scene, where fluorescing body fluids are almost always sought. There are also additional items of evidence such as hairs, fibers, and other trace items that are more easily located when using these alternate wavelengths of light. These lights either bring out fluorescent properties of the evidence, or eliminate distracting backgrounds that would otherwise obscure difficult to detect trace items. In other words, using a filter increases an investigator’s ability to see more subtle reactions to the alternate light source.

The color wheel can be used to determine the appropriate filter for the light being used. In most cases, the color directly opposite the color of light is the best filter. In other words, violet goes with yellow, blue goes with orange, and green goes with red.

An easy way to remember which filter is used with which light, is to recall the color wheel most of us first learned about in grade school. The most appropriate filter will be the color on the opposite side of the wheel from the color being utilized as an alternate light source.

For more information on this topic, including suggested camera settings, please see Robinson's book on Crime Scene Photography (2016).

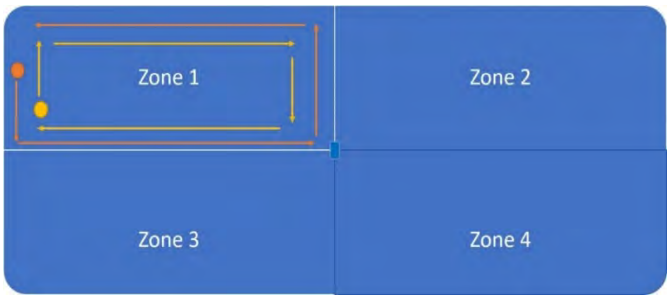
Crime Scene Searches

Crime scene searches may be accomplished in several ways, but regardless of the approach taken, the search must be methodical. It is best to use more than one individual if possible, simply because evidence is less likely to be missed when there are two sets of eyes.

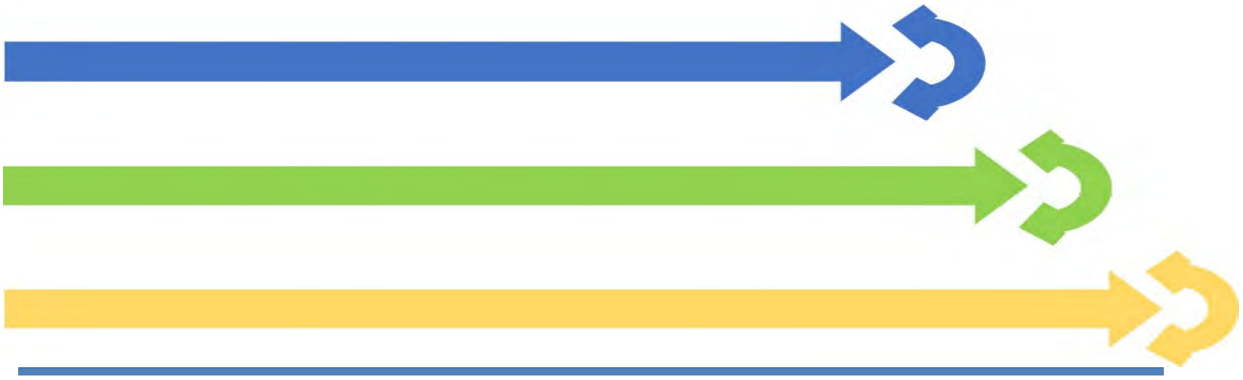
The search methodology will depend on the type of environment where the scene is located. For example, a bedroom is searched differently than a vehicle, and both are searched differently than an open field. In addition, there are typically at least two searches conducted at each scene; the first is the initial, non-invasive search that takes place during the team leader's walk-through to assess the scene.

The lead investigator will first note any areas of interest and obvious evidence during this initial walk-through. The second, more invasive search involves manipulation of the scene: Drawers are opened, papers overturned, and bedding moved. For this reason, this search must take place after the initial scene documentation has occurred. To preserve the scene's original context, items should only be moved after photographs have been taken and measurements obtained.

The two main search methodologies used in these cases include overlapping zone searches and line searches, depending on the characteristics of the scene.



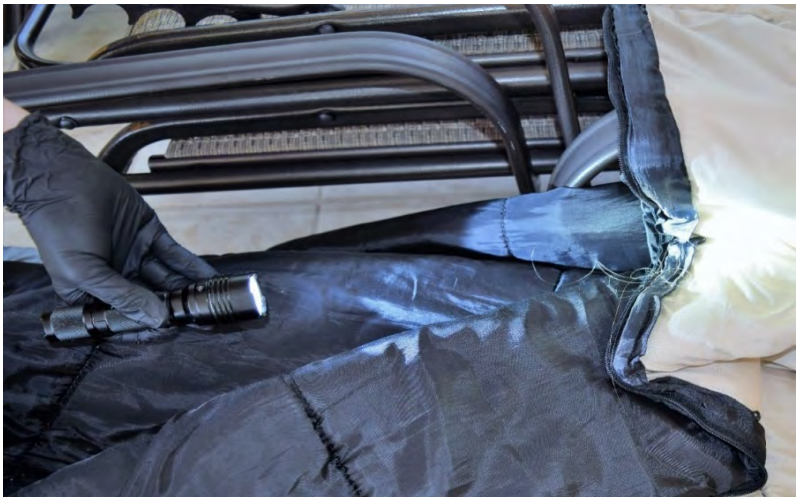
In a zone search, areas of logical division are designated and searched separately. Rooms within a house, or seats in a vehicle, are well-suited for zone searches. It is best practice for at least two people to work each zone, methodically traveling in opposite directions. This process ensures that two sets of eyes sweep every part of the zone, which increases the chance that any evidence will be located.



A line search is effective for large areas, especially outdoors where evidence may be scattered. Investigators should stand approximately arm's length apart and move in one direction, sweeping their line of vision a full 180 degrees in front of them, in search of evidence. When an item is located, all movement stops, while the evidence is marked and communicated to the team leader. When ready, the team continues in the same direction.

Regardless of whether a zone or line search is conducted, it is always a good idea to start with a larger search area, rather than a smaller one, because it is much easier to reduce a scene than to expand it. In addition to the search of an indoor scene, the exterior of the building or vehicle should also be searched. Investigators should be mindful of trash cans, dumpsters, and even public establishments nearby. If information provided at this early stage in the investigation suggests that any items have been removed from the scene (e.g., the victim's purse, clothing, condoms), the immediate area surrounding the scene should be searched in an effort to recover those items.

During the interior scene search, a methodical approach should be taken. For example, one investigator might start low and work high, moving clockwise, while another investigator starts high, and works low, moving counterclockwise. The search should not be conducted from a standing position only. Small objects roll and are kicked; liquids fly upwards and land underneath furniture; and trace hairs, fibers, soil, or glass on the floor will not be visible from a standing adult's vantage point. It is therefore best to conduct the search with an **oblique flashlight**. This involves holding a white light at a 45-degree angle from the surface of all areas searched. This technique helps make trace evidence visible that might not be immediately detectable by the search team.



The use of oblique lighting during search efforts helps investigators locate trace evidence.

As items of interest are located during the search, the lead investigator should be immediately notified, so a determination can be made about the priority of collection, and to ensure that at least one person on-scene is receiving all the relevant information coming in from various sources. This procedure also helps to identify items of investigative interest, and increases the probability that any possible connection to other items will be identified.

During a methodical search, team members communicate with one another as discoveries are made. The search comes to a halt as the item is identified with a marker, or flag, and the discovery is communicated to the team leader. The team leader needs this information to make informed decisions about the priority of processing and collection.

Determining Whether an Item is Evidence

Whether an object found at a scene constitutes an item of evidence is not always an obvious or easy determination. However, there is a science-based decision-making process that should be utilized for this purpose. By considering competing hypotheses about the nature and chronology of the crime, this lays the foundation for making the determination, because it forces investigators to think about what the evidence could potentially demonstrate. For example, knowing the elements of proof, and the victim's initial account of what happened, will help the investigator understand what must be proved or disproved. Potential evidence can then be evaluated, while considering the type of information that might be learned through subsequent analysis.

This also helps the investigator to formulate the best way for processing and packaging evidence. For example, if the DNA from a speck of blood is needed to establish an element of proof, or to corroborate an important component of the victim's or suspect's statement, then the investigator can package and preserve that speck of blood in a way that protects the DNA contained in it (e.g., by collecting a scraping or swab of the bloodstain). However, if the pattern of the bloodstain is most critical to the case, then the speck of blood may be better preserved in a different way (e.g., preserving the blood's location by seizing the surface itself).

The other thought process that should be employed when processing a crime scene is to place oneself in the mind – and shoes – of the people involved. Based on the information available at the time, the investigator should consider where the assailant might have stepped, what objects might have been touched, and how the suspect might have interacted with the scene, in order to commit the sexual assault as reported. Similarly, the investigator needs to consider how the victim might have responded, including their physical location and movements, as well as what the victim might have seen or heard. These questions, and the exploration of their answers, will help identify evidence to advance the investigation. This includes excluding suspects when identity is in question, establishing probable cause once a suspect is identified, and corroborating aspects of statements made by the victim, suspect(s), or any witnesses.

Prioritizing Evidence Collection

When prioritizing evidence for collection, it is always best to begin with whatever is **perishable.** This determination can be made by applying the following criteria: If the progression of time threatens to destroy, degrade, or disperse the evidence, and therefore its value to the investigation, it is a perishable item.

However, this decision is not always item-specific, because sometimes the location of otherwise resilient evidence makes it perishable. An example of this may be an expended cartridge casing. In and of itself, this is not an especially delicate or perishable item; however, if that casing is found in the main entryway of the only path in

and out of the scene, its location makes it inherently vulnerable and therefore a priority. Similarly, blood evidence may at first glance seem automatically perishable, but if the blood evidence is high on a wall not easily accessed or threatened, it may become a lower priority for collection than other items at the scene.

To practice making this determination, please consider the following items, and prioritize them for evidence collection, based on their inherent perishable qualities and the vulnerability of the location where they are found.

- A clear, viscous liquid, suspected to be lubricant, found on a nightstand near the victim's bed.
- A footwear impression made in the dust on top of an outdoor patio table, which sits underneath the victim's bedroom window, when the window shows signs of forced entry.
- Prescription pills found on the floor, in the hallway leading to the victim's bedroom where a suspected drug-facilitated sexual assault occurred.
- A bloodstain swipe on the headboard of the victim's bed.

Among these four items of evidence, the footwear impression on the patio table presents the greatest vulnerability and should be considered the most perishable. Both its location and the nature of the evidence itself are inherently vulnerable. A small breeze, or physical disruption by an unobservant team member, could easily erase that evidence at any moment. It should therefore be the first priority for collection.
The prescription pills on the hallway floor present the next most vulnerable item of evidence. Although the pills themselves are not perishable, their location in the main thoroughfare will subject them to the risk of being inadvertently stepped on or kicked, thus ruining the context of their discovery. If these pills offer a possible explanation for a victim's altered state of consciousness (and therefore the inability to provide consent), then the collection of the pills is critical and should be a priority as well.

The suspected lubricant would be the next most perishable item in this scene. Because it is clear and in liquid form, it is inherently vulnerable to destruction. However, its location on a nightstand table removes it from immediate threat of trampling by investigators, making it less "perishable" than the pills in the hallway.

The final item is the bloodstain transfer on the victim's headboard. This is no doubt valuable evidence, and since blood is biological evidence, it is considered somewhat perishable. However, the location is removed from the areas frequented by investigators, and it probably cannot be collected without disrupting the bedding below. This item's location is therefore relatively safe, and this reduces its perishability at the scene. It should probably be prioritized for collection after the bedding.

Cross-Contamination

With modern advances in forensic technology, we now have an unprecedented ability to detect and recover even the most fragile, microscopic, and unlikely piece of evidence. Yet this is a bit of a "double-edged sword," because it also means that items of evidence are increasingly vulnerable to cross-contamination. Just as a suspect might deposit recoverable hairs, fibers, soil, and DNA at a crime scene, so too can investigators, if they do not take precautions before entering the scene.

In fact, a good defense attorney will probably focus on that possibility, by arguing that evidence of their client's presence was brought into the scene – not by the suspect – but by investigators who did not take precautions to prevent cross-contamination. This is especially true when the same investigator processes the crime scene and also interviews the suspect, searches a relevant car, or accompanies the victim to the hospital for a medical forensic exam.

This same concern applies to SANEs and other health care providers who conduct a forensic examination of both the victim and suspect(s) in the same case. This might happen because of a shortage of SANEs, or other resources for conducting these exams. If best practices are not followed in this situation, it is easy for the forensic examiner to contaminate evidence – and even easier for the defense to raise this possibility and question the legitimacy of the findings.

To combat this defense, investigators and examiners who find themselves pulling "double duty" should be extremely careful to prevent the possible transfer of evidence from one location to another. This can include showering and/or changing clothes, when transitioning from one scene to another, or between exams of the victim and suspect. Also, equipment should be decontaminated in between procedures.

Most crime scene equipment and supplies will be transported from case to case, and scene to scene, and they must inevitably be set down in or near the scene to be used during processing. In addition, many of the contents are reusable (e.g., evidence placards, clipboards, measuring tapes). Therefore, it is best to sterilize any reusable items and containers in between scenes using a 10% bleach solution. This will also help defend against the argument that foreign materials may have been transported to the scene by crime scene personnel.

Gloves should be changed each time an item of evidence is touched, minimizing the potential for the transfer of trace evidence from one item to another.

Personal protective equipment (PPE) should also be worn by investigators and forensic examiners while collecting evidence, and it should be changed frequently, as needed. PPE not only serves to protect investigators from meeting with potentially hazardous or dangerous materials, but it also helps prevent them from leaving traces of their own presence at the scene. Gloves and shoe coverings are two standard items of PPE, and it is recommended that they be used at every crime scene.

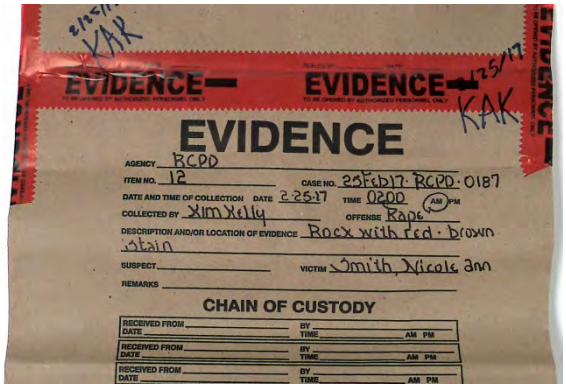
Some investigators routinely wear two pairs of gloves to ensure they remain protected every time the outermost, contaminated glove is removed and exchanged for a new one. Shoe coverings should always be changed upon entering and exiting the scene, and gloves should be changed every time an item of evidence has been touched. Once again, this practice helps ensure that investigators are not responsible for transferring and contaminating evidence from one location to the next.

Investigators should consider wearing personal protective equipment during their initial processing efforts, and during the search for trace evidence. For the remainder of processing activities, gloves and shoe coverings may be sufficient.

Evidence Chain of Custody

For evidence to be admissible in court, a chain of custody must be maintained. This includes documenting who found the evidence, where and how it was found, and how it was preserved and secured, after it was recovered from the scene. For example, the investigator must be able to testify that the stained shirt presented at trial is in fact the same shirt he or she recovered from the suspect's home, perhaps a year or more earlier. The procedures for how this is done will often depend on agency policy, but they typically involve either marking on the evidence itself, or placing the evidence in a container that is then sealed with evidence tape, initialed and dated by the person sealing it, and documented on the chain of custody form or evidence control document.

Prior to marking directly on evidence, investigators should check with their crime laboratory, to determine if this is the recommended practice. For many laboratories, it is now considered to be a less desirable practice, since it may unintentionally destroy evidence such as DNA. Again, this will vary by agency policy and crime lab preferences.



Evidence packages should be sealed with tape, dated, and initialed by the collecting investigator.

Documentation, Processing, and Packaging of Evidence

As discussed in the previous section on perishability, items that are found on the floor, particularly in the line of traffic, will automatically be more vulnerable to destruction than those found on raised surfaces. Therefore, investigators should typically recover evidence from the floor first. Even in scenes where an unidentified intruder is not suspected, it is a good idea to search the floor from a low vantage point, with oblique lighting, to determine if evidence may be present before stepping into the scene.

Footwear Impressions

Footwear impressions may be either two-or three-dimensional. **Two-dimensional prints** are made when footwear meets with a contaminated surface (e.g., dust) or when the footwear is covered in some other contaminant and deposits an impression on another surface (e.g., a greasy impression left on a tile floor). **Three-dimensional prints** are made in material such as snow, dirt, mud, or a shallow puddle. As the term implies, they have three-dimensional volume in a substrate, rather than a two-dimensional impression on a surface. Typically, two-dimensional impressions are found inside the crime scene, and three-dimensional impressions outside.

To locate footwear impressions, the investigator should employ critical thinking and hypothesize where a person might have stepped during their interactions at a scene. Probable points of entry and exit, and other obvious pathways of travel are reasonable locations to search for footwear impressions. Indoor surfaces may include tile, wood, or linoleum floors, while outdoor surfaces might include decks, planter boxes, or patio furniture. Consideration should also be given to objects with raised surfaces, such as tables, bookcases, counter tops, and windowsills, because these items may have been stepped on when the suspect entered or exited the scene.

Once a possible location is identified, a footwear impression may be visualized using oblique lighting, and then enhanced with the investigator's consideration of contrast, shadow, and patterns. Sometimes, a "blind lift" of a promising area will result in the discovery of a previously unidentified two-dimensional footwear impression.

Two-Dimensional Impressions

When a footwear impression is found, two types of photographs should be taken before anything is manipulated or seized. **"As-found" photographs** are just that – pictures taken of the impressions exactly as they are found at the scene. **Comparison-quality photographs** are close-up pictures taken for an expert to examine later, to compare the "unknown" (e.g., footwear impression in the photograph) with a "known" object suspected of producing that evidence (e.g., footwear collected from the suspect). These

photographs must be adequately lit, properly exposed, in-focus, and include a scale on the same plane. This makes the examination and comparison possible.

Porous Surfaces: Processing and Packaging

Impressions on porous surfaces (i.e., surfaces that absorb moisture) are typically processed with **chemical treatment**. For example, a piece of cardboard or paper that was stepped on during the assault, might have absorbed contaminants from the assailant's shoes during drying.

Depending on the investigator's resources and agency policy, however, chemical treatments might only be available at the crime laboratory. If this is the case, the object must be seized in its entirety and sent to the laboratory for processing. The object should be packaged in a way that does not restrict airflow, or expose the surface of the object to excessive contact. A shallow box or manila envelope works well to ensure the laboratory has an opportunity to develop the impression.

If chemical enhancement is permitted and available, investigators should consider using Ninhydrin fuming for any impressions made in sweat, oil, or other fatty acids. **Ninhydrin** reacts with the oils in the contaminate, but it may take several hours to develop. The resulting visualization is impermanent and will fade over time, so it must be photographed immediately following treatment. If chemical processing is not permitted, or available for investigators, the crime laboratory can use these techniques.

A possible footwear impression left on the surface of a collapsed cardboard box. This contaminate can be chemically treated by a forensic laboratory to better visualize any details in the impression.

Two-dimensional impressions consisting of dirt, mud, or soil may be enhanced by chemicals that react with any iron in the contaminate. Footwear impressions made in blood may similarly be enhanced with chemicals. These procedures are not typically done at the scene, but instead are appropriate procedures to request of the laboratory.

Many chemical development techniques have accompanying safety concerns for those not properly trained. Additionally, some of these chemical solutions run the risk of re-moistening the impression to the extent that it "runs" and obliterates detail. As a result, an impression should only be chemically enhanced when absolutely necessary by individuals well trained to do so.

The general rule is that evidence should be collected and processed using the least destructive or altering method possible. For investigators working in agencies that do not permit or equip them to use these chemicals, it is still important to know the range of laboratory examinations available, in order to recognize the full scope of potential information that can be learned from crime scene evidence.

Nonporous Surfaces

Nonporous surfaces (i.e., those that do not absorb water) will retain footwear impressions differently, so the manner of processing them will also be different. For example, wet-origin footwear impressions left on a smooth, nonporous surface may be processed using standard fingerprint powders. They may even be subjected to cyanoacrylate (superglue) fuming, a process that will be described later. When impressions are developed using fingerprint powders, they may be lifted using traditional tape, if the surface is completely smooth. In the case of textured surfaces, gelatin lifters and silicone lifters are much more useful.

Gelatin lifters consist of a vinyl or cloth backing, with a gelatin adhesive and clear plastic covering. The lifter is applied to the impression, and because of its pliable nature, it can be rolled and pressed to eliminate air bubbles. It can also reach down into the lower areas of the textured surface, to lift out parts of the powdered impression not resting on the uppermost surface of the texture. Depending on the preferences of the servicing laboratory, the protective plastic covering can either be replaced over the lifted impression for protection, or left off. If the plastic is not replaced, the gelatin lifter should be secured in a shallow box, to avoid objects meeting with the surface and potentially altering the lifted impression.

Gelatin lifters should be stored in a temperature-controlled environment before being utilized at a scene, and after a successful lift of a two-dimensional impression. When exposed to excess heat, the gelatin matrix can melt.

ReproCAST, Mikrosil or Accutrans are **silicone-based products** that can be applied over a processed impression and allowed to dry. Within minutes, a silicone rubber product is lifted from the surface, containing the powdered impression in its matrix.

Gelatin lifters work well to lift powdered impressions, and those left in dust. The resulting lift is visualized using oblique lighting during photography.

Two-dimensional footwear impressions are frequently found on surfaces covered in dust. Whether a dusty surface is stepped on, or a clean surface is stamped with the dirty tread of a shoe, a gelatin lifter is very effective. Additionally, an **electrostatic dust print lifter** may be used to lift the impression. There are also devices that will deliver a high voltage static charge to a Mylar film, to draw dust particles up and onto the film. Individual Mylar sheets can even generate sufficient static electricity to draw particles up without an external source of electricity.

Electrostatic dust print lifters use static electricity to draw particles up and onto Mylar film. Much like dust prints lifted with gelatin lifters, oblique light helps visualize the lift.

In both instances, the Mylar film should be placed over the area containing the impression, and any air bubbles should be gently smoothed out. When the Mylar film is lifted, it will contain the dust print. However, it is important to recognize that the only force holding those particles to the film is the static charge itself. Therefore, the dust print must be photographed to preserve the evidence. The best way to photograph the impression is to relocate to a dark room, mount the camera on a tripod, set the camera to at least a 10-second exposure, and pan the entire length of the impression using a white, low-angled oblique light. Once the lift is photographed, it can be taped to the bottom of a shallow cardboard box for transport and storage.

Three-Dimensional Impressions

Three-dimensional footwear impressions are usually found outdoors, in places of suspected entry, exit, or movement such as a struggle. They may be found in the soft mud of a planter box, dirt patches in a lawn, or a stretch of sand near a body of water. They can also be found in snow, or even in a patch of wet cement from a driveway or sidewalk. Like two-dimensional footwear impressions, oblique lighting can help investigators locate these impressions.

Three-dimensional footwear impression located outside. The impression is thoroughly photographed prior to casting.

Once a three-dimensional impression has been located, its collection should be a priority, because both the location (outdoors, on the ground) and the material (snow, mud, shallow puddle) are likely to be inherently vulnerable. As always, comparison-quality photographs should be taken of the impression prior to any efforts to cast it.

As with other types of crime scene photographs, three-dimensional footwear impressions require a series of additional photographs to capture all available identifying detail. First, the camera should be mounted on a tripod directly over the impression. The camera must be parallel with the ground, because even the slightest tilt of the camera can exaggerate and distort potentially identifying features of the impression. The impression should also be shielded from any imposing light, so the photographer can control the source and direction of the light used in the photograph.

The impression is then photographed at least nine times, with the flash connected to the camera using a flash cable and held at an oblique angle from each of the three openings of the tripod. This ensures that details caught in the shadow of one position will be illuminated and captured in the next. Once this is accomplished, a scale should be added to the exposure, but outside the impression. It is best to dig down to the lowest point of the impression and place the scale there, because this ensures the most accuracy in subsequent measurements. The same series of three photographs (from each side of the tripod), should then be taken again with the scale present.

Three-dimensional footwear impression located outside. The impression is first photographed with light from varying directions to ensure details obscured in shadows are captured in subsequent exposures.

Following photographic documentation, impressions made in dirt, sand, or mud may be casted using **dental stone.** The application of a "fixer" (even hair spray) can strengthen the impression and make it more resilient to the casting material.

Once it is determined that a casting lift is possible, it is best to surround the impression with a sturdy wooden or metallic barrier, to contain the casting material and avoid having it spread too thin. It is also helpful to place a flat, sturdy object, such as a metallic ruler, just outside the impression but extending beyond the border of the barrier. This allows investigators to apply some leverage when prying the dried cast from the surface.

Next, the casting material is prepared by mixing the appropriate amount of water with the stone powder. The ratio varies according to the manufacturer, but it normally results in a consistency like pancake batter. The prepared mixture begins to solidify as soon as it is mixed, so it should be applied as soon as possible. Investigators should also consider allowing the casting material to hit an intermediary surface before flowing onto the impression, to help avoid disturbing the original impression.

While the stone is allowed to dry, the investigator should document his or her name on a note card, along with the date, time, and the orientation of the impression. This note card can then be placed onto the top surface of the casting material. Alternatively, the information can be etched into the drying material, as long as investigators exercise caution in the location and depth of the etching to ensure the impression is not compromised.

It is important to follow the manufacturer's directions when mixing casting material to ensure proper consistency and solidifying of the cast. Improper mixing, or a delayed application of the material, could obliterate details of the impression.

Some investigators opt to wait for the impression to dry before writing directly on the cast with permanent marker. The note card method, however, ensures that the required information is recorded and incorporated within the cast.

When the impression is lifted, investigators should refrain from cleaning the cast to inspect the quality of the lift. This is because the soil adhering to the lift may contain additional evidence that must be preserved. The soil can later be removed and examined by a criminalist in the laboratory. The lifted cast should then be placed securely in a shallow cardboard box before sending it to the laboratory. Plastic containers should not be used.

Lifted casts should be placed securely in a sturdy cardboard box, and packaged appropriately for transport or shipping to avoid breakage. Soil may be left on the cast for potential soil analysis.

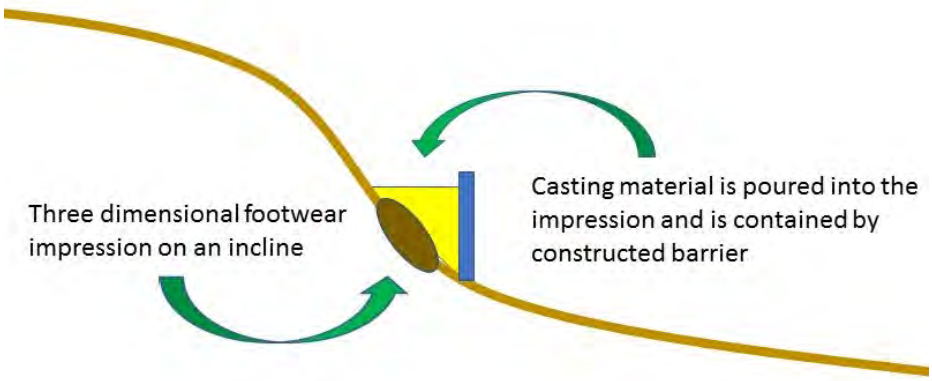
Challenging Circumstances

Impressions made in the snow present unique challenges because the material is already subject to degradation with the slightest application of heat. Most casting material produces an exothermic reaction when mixed with water; that is, it releases heat. However, there are some steps that can be taken to help minimize the impact on snow. First, the application of a **snow print wax** can provide a protective barrier between the casting material and the snow beneath it. The wax also comes in various colors, which helps to create contrast and shadows when photographing an impression.

The casting material can be mixed with very cold water to bring the temperature closer to that of the snow, which helps minimize melting.

Other challenging scenarios involve footwear impressions in a shallow puddle, or those that have been rained on. In some cases, investigators might be able to carefully remove the excess water from a puddle, as long as they do not disturb the impression itself. Another option is to use slightly less water than usual in the casting mixture, and allow it to absorb the water from the puddle as the stone solidifies. Finally, successful casts have been made by pouring the casting material directly into the puddle, and then allowing the material to absorb the standing water as it dries. In any of these scenarios, it is recommended that a test impression be made nearby, so the various techniques can be practiced before applying them to the actual item of evidence.

Another challenge involves footwear impressions found on a hill or incline. In this instance, traditional casting procedures will not work because the material may run down the incline. To address this problem, investigators can build a strong base at the low side of the footwear impression; a surrounding mold must be used, and the mold must reach above the highest point on the horizontal plane of the impression. Once accomplished, the casting material can be carefully poured into the mold, starting with the lowest end, and working up toward the steepest end of the impression.



Sometimes, an impression is not clearly two- or three-dimensional. An example of this would be a footwear impression made on a smooth surface by heavily depositing a resilient contaminate, such as mud. Such an impression is not fully three-dimensional, but it also isn't two-dimensional. In these cases, dental stone can be used to cast and lift the impression contaminate from the surface on which it is found. If an investigator is unsure if the dental stone will separate from the surface, it is a good idea to conduct a test of the process, in a safe area away from the evidence. It is also imperative that the impression is photographed before any lifting technique is applied.

A flat stick or ruler may be placed inside the casting frame, but outside the impression, to make it easier to lift the solidified cast.

Friction Ridge (Fingerprint) Evidence

Despite the advances in forensic technology, friction ridge (or fingerprint) evidence is still one of the most powerful forms of physical evidence that can be recovered from a crime scene. Unfortunately, its value is sometimes overlooked, because of the more recent focus on DNA. However, friction ridge evidence is actually the most discriminating form of physical evidence, surpassing even nuclear DNA. And unlike DNA, it is very difficult to convincingly argue that a fingerprint was transferred to a scene by a third party. In other words, the recovery of a fingerprint impression is indisputable proof that the owner of that fingerprint came into physical contact with the surface from which it was recovered. At a sexual assault scene, this means that every print recovered offers the potential for information about who was present, what objects were touched, and perhaps even the sequence of events (if, for instance, the fingerprint was made in the victim's blood or the suspect's semen).

Friction ridges are found on the anterior surface of the hands (as well as the bottoms of our feet), and they consist of varying patterns of loops, whorls, arches, ridge endings, bifurcations, and trifurcations. These fingerprint patterns are unique to every individual, including identical twins who share nuclear DNA. These patterns are formed during the fourth month of gestation, and they do not change throughout an individual's lifetime. Even accidental or deliberate deep-skin injury will not completely destroy their value, but will instead make them even more unique.

The types of friction ridge evidence recovered from scenes generally fall into one of four categories:

- **Latent prints** are typically invisible to the naked eye, and are made with a contaminate such as sweat or oil, when an individual's finger meets with a surface or substrate.

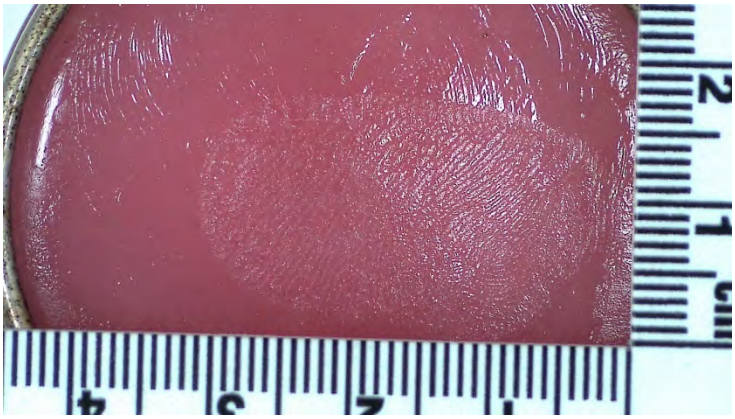
- **Patent prints** are visible to the naked eye, because the impression is made in a contaminate that can be visualized (e.g., blood, ink, paint).

- A **plastic print** is a three-dimensional impression produced when the finger is pressed into some malleable material such as clay, putty, soap, or food product.

- Finally, **etched prints** are produced when the acids from the fingers are transferred to a metallic surface that subsequently corrodes, leaving behind the impression of the print's friction ridge.

In each of these instances, recovered fingerprints that exhibit sufficient unique friction ridge detail can be used to identify or exclude a suspect, during the course of a law enforcement investigation.

A three-dimensional fingerprint impression found in lubricant. Often, the photographed print becomes the best evidence. This lubricant can be placed in a freezer to solidify prior to casting efforts.



Factors Affecting Fingerprint Evidence

When we interact with our environment, we are constantly touching objects. However, there are several factors that determine whether a person does or does not deposit a fingerprint that is of value for identification. First and foremost, is the individual. If a person has dry and cracked hands, or doesn't produce sufficient sweat and oil in the fingertips or from other parts of the body frequently touched by the fingers, they may not leave behind quality impressions. Likewise, the nature of a contaminate can increase or decrease the chances of leaving an impression behind. While individuals might not produce sufficient natural oils, if they first touch some other material like grease, oil, lubricant, or lotion, numerous prints could be found.

It is also important to consider the way in which the print was deposited, because objects that are contacted fleetingly, or with substantial motion, will have less deposited material than those contacted more slowly and with more even pressure. Consider the difference between the acts of turning a door knob and lifting a can of soda; a smeared print is more likely to be found on the door knob, while more intact prints would be expected from the surface of the soda can.

The nature of a substrate, or surface touched, can also determine the likelihood of retaining prints. A substrate's porosity (or lack of porosity) will play a role in determining

what kind of prints, if any, will remain on its surface – as will its texture (whether it is smooth or textured), whether it is wet or dry, and whether it is clean or dirty.

Just as these factors affect the deposit of a fingerprint impression, they also dictate the processing and recovery of that impression. In other words, once investigators determine that an object was likely touched, and this contact might be relevant to the investigation, they should ascertain whether the print is already visible (patent) or invisible (latent). Sometimes, even latent prints can be visualized with oblique white light. The investigator must also consider whether the print is on a surface that is porous (paper or cardboard for example) or nonporous (glass, plastic, or metallic), and whether it is smooth or textured.

Even the color of the substrate should be considered. Since the goal when processing the substrate is to create contrast, black powder on a black background will not be effective, because it will not make the print any more visible than it would be in its latent state. Additionally, any surface that can potentially be fumed with superglue (cyanoacrylate), should be fumed before applying other processing efforts.

Appendix A includes a Decision Tree with the various processing options for friction ridge evidence found at a sexual assault scene. This Decision Tree is also available as a freestanding document, so you can print it out for easy reference.

Superglue Fuming to Increase the Identification of Latent Prints

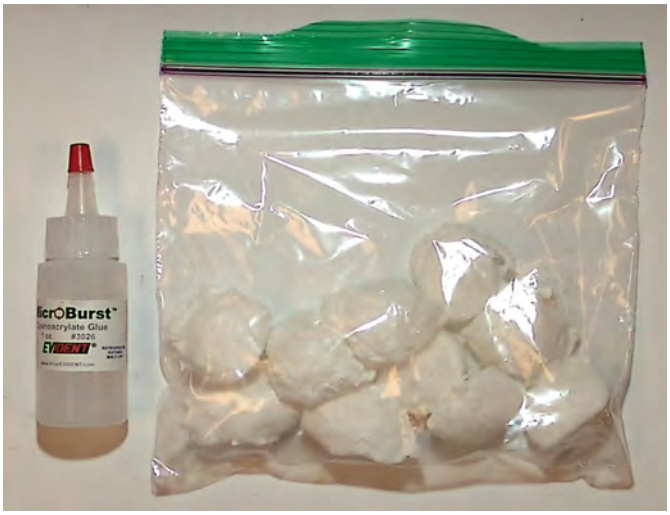
At this point, it has now become standard practice for many law enforcement agencies to use superglue (cyanoacrylate) fuming for nonporous objects containing possible latent prints. In the early 1980's, the US Army Criminal Investigation Laboratory-Europe (USACIL-Europe) speculated that latent prints were often destroyed during the process of packaging and shipping evidence (Perkins & Thomas, 1991). To better preserve these prints, and maximize the persistence of evidence between crime scenes and the laboratory, USACIL-Europe mandated superglue fuming for all nonporous items prior to shipment.[1] Today, investigators with the US Department of Defense (DoD) are advised to fume any nonporous surface that may contain latent friction ridge evidence.
After enacting this policy, USACIL-Europe documented a 200% increase in the number of latent prints recovered from fumed objects, compared to non-fumed items. Furthermore, there were 400% more identifications made from items that were superglue fumed than those that were not. This study demonstrated such a dramatic improvement in the quantity and quality of prints recovered from nonporous objects, that the practice continues to be a mandatory processing step for all DoD criminal investigative organizations.

[1] Items that might undergo serological or drug chemistry analysis were excluded from this mandate. However, subsequent studies have determined that superglue fuming in no way hinders serological or drug analysis.

The fuming process traditionally consists of placing the object suspected of containing latent prints into a chamber, and then placing a few drops of superglue on a dish or a piece of aluminum foil, which is then subjected to some form of heat generation, such as a hotplate. The heat causes the glue to vaporize, and then polymerize to the contaminate of the latent print, consequently building a somewhat permanent residue upon the print's friction ridge detail. While effective, this process was often cumbersome to utilize at scenes because the chamber has to be transported and assembled, and the external heat source typically required access to electricity, which is not always available at crime scenes.

Superglue fuming nonporous items of evidence significantly increases the probability of recovering usable latent prints. A test print card should be monitored frequently to avoid over-fuming.

Today, crime scene investigators have a more portable option; they can use baking soda-laden cotton balls, and temporary or disposable chambers, to superglue fume objects at the crime scene. This technique involves dissolving one part baking soda with two parts water. When the mixture is ready, cotton balls are submerged in the solution and set out on a clean surface to dry (butcher paper works well as a drying surface). Once the cotton balls are completely dry, they may be stored in a plastic bag in a crime scene supply kit until needed.



Baking soda-laden cotton balls do not require an external heat source to turn liquid superglue into vapors. This is critical for processing outdoor scenes when electricity is unavailable.

When fuming is required on scene, one of these previously prepared cotton balls is retrieved and placed in the same container as the item of evidence.[2] Next, the investigator must place a **"test print"** into the chamber for monitoring purposes, because it is possible to over-fume a print. To prevent this, the investigator will place a known fingerprint onto a dark surface (black fingerprint backing cards work well). This test print will then be placed in the chamber along with the item of evidence. This way, the investigator can periodically check the progress of the fuming effort on the test print, without handling the evidence. When the test print appears sufficiently processed, the evidence may be considered processed as well.

As noted, one of the primary advantages of the cotton ball technique is that it does not require an external heat source. Instead, as soon as the superglue touches the baking soda-filled cotton ball, the glue vaporizes almost immediately. While most prints are typically well fumed within 10-15 minutes, investigators should periodically check the test print, because the specific timing will depend on factors such as the heat and humidity of the surrounding area, and the size of the object being fumed, and the volume of the chamber. Once the fuming process is complete, the fumed print may be packaged and sent directly to the crime laboratory for additional processing. Laboratories will typically apply a dye stain to the fumed print to enhance visualization. However, any of these processing techniques may be applied, depending on agency and laboratory policy.

[2] Disposable "pop-up" fuming tents are available that can be stored compactly and thrown away after use. They work very well at even the most remote crime scene. However, any container that can contain vapors may be used, including plastic toolboxes, large plastic coffee containers, fish tanks, or improvised chambers fashioned from PVC pipe and plastic sheeting.

Smooth, Nonporous Surfaces

Surfaces that are smooth (lacking in texture) and nonporous (nonabsorbent) are some of the easiest surfaces to process for latent prints. This includes glass, plastic, aluminum, lacquered wood, and painted surfaces, all of which are typically suitable for latent print processing. As mentioned in the previous section, these surfaces should first be considered for superglue fuming. Surfaces or objects that are not conducive to fuming can be processed with powders on scene.

Investigators should process any relevant surfaces likely to have been touched. This requires an understanding of the dynamics of the crime as it occurred within the scene, as well as an understanding of the specific elements of the offense to be proved.

Investigators can choose any number of print processing powders, taking care to choose a powder that contrasts in color with both the surface on which the print is found and the backing card the lifted print will be placed on. As a rule, when it comes to powders, less is best. A little powder goes a long way, and just as one can over-fume a print, investigators can use too much powder, which might obscure important identifying ridge detail. Rather than dipping a brush in the powder container, it is best to use the lid, since it holds more than enough powder.

Traditional black powder is still in use, but there is also a **dual-contrast powder** available that can be visualized on both dark and light surfaces, making it a more versatile option.

Fluorescent powders are used to provide contrast for dark or distracting colored substrates. These powders fluoresce under blue or ultraviolet light sources, which helps create additional contrast between the print and the surface on which it is found. When using these powders, soft, light brushes are best, because they carry and deposit a fine amount of powder with minimal contact.

Magnetic powder is also widely used at crime scenes, and it offers several advantages over traditional powders and brushes. With this technique, the “brush” is a magnetic

wand that attracts magnetized powder particles to adhere to the end of the wand. The particles then form the "brush," which is lightly dusted over the area suspected of containing latent prints. Only the powder meets with the surface, which helps to avoid smearing the print. Another advantage is that if too much magnetic powder is deposited on the print, the wand may be cleared of magnetic powder and then, by hovering over the powdered area, it will attract and remove excess powder from the print.

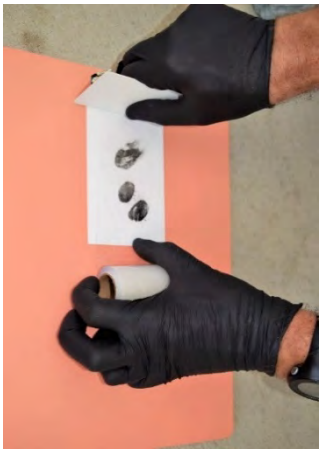
There are, however, several limitations to consider when using magnetic powder. The first involves vertical surfaces, such as walls, panes of glass, and mirrors. Because magnetic powder is subject to gravity, the powder will move to the bottom-most surface of the wand when it is angled, potentially leaving a bare metal wand. If investigators are not careful, they may end up physically disrupting the print on a vertical surface.

Magnetic powder makes up the "brush," but it is subject to gravity, so particles will hang from the metal applicator, potentially leaving very little magnetic powder to contact the desired surface.

Investigators must also consider the magnetic properties of the substrate to be processed. Naturally, a magnetic surface will interfere with magnetic processing tools. Therefore, an alternate processing technique will need to be used for magnetized surfaces, such as metallic filing cabinets, refrigerators, and metal fixtures.

Once a print is sufficiently processed, it should be re-photographed, with and without a scale. Then when the investigator is ready to lift the print, there are several options to choose from. Because these surfaces are smooth and nonporous, traditional **tape lifts** or **hinge lifters** will typically work well. Many fingerprint backing cards also contain an area on the opposite side of the card where investigators can sketch where the print was lifted from, and provide a written description of the location and the processing technique employed.

It is important to remember that the precise location of a latent fingerprint impression will often be critical. For example, any number of latent prints may be recovered from a scene, and many of those could belong to the suspect; however, it may be far more meaningful to demonstrate that the print was recovered from the bedroom closet door, rather than the living room, if the suspect denies being in the victim's bedroom.



Powder-processed latent prints can be lifted with hinged lifters or strips of lifting tape. The use of a straight-edged surface, such as a plastic card or ruler, helps to ensure an even application of pressure during the lift and placement on a backing card. It can also minimize air bubbles.

Textured, Nonporous Surfaces

Textured, nonporous surfaces may include textured or patterned tile or linoleum, plastic or glass bottles or containers, or even painted surfaces where linear brush strokes are visible. These surfaces may be processed in the same way as smooth surfaces, but any developed prints should be lifted in a very different manner. When a print is processed on a textured surface, the powder will adhere to the area of the print deposited on the uppermost surface of the substrate, as well as the deepest, most recessed area. If traditional fingerprint tape is used to lift the powdered impression, it may only meet with the most raised surface of the substrate, and therefore produce an incomplete lift of the powdered impression. For this reason, it is necessary to choose a lifting technique that is capable of reaching down into the lowermost recesses of the surface, to extract all portions of the impression.

As in the previous section on two-dimensional footwear impressions, many of the same materials will be suitable for lifting processed fingerprint impressions from textured surfaces. Gelatin lifters are malleable and can be pressed down into the textured substrate to lift the complete impression. The same is true for products such as **DIFF-Lift** or **poly-tape**.

As previously noted, **ReproCAST, Mikrosil** and **Accutrans** are silicone-based casting materials that are very versatile for crime scene processing. When applied to a processed print on a textured surface, the initially liquefied silicone substance will effectively invade all portions of the textured substrate and, upon solidifying into its rubber-like cast, it will lift and hold the powdered impression in its matrix. All these products can do an excellent job of lifting and preserving a processed impression. However, silicone-based materials can cover and lift a powdered impression from smooth, curved surfaces more thoroughly than any other lifting technique.

Some silicone-based casting materials must be mixed manually; others can be purchased in self-mixing tubes that fit into extruder guns. When the trigger is squeezed, the device combines the silicone base with a catalyst hardener through a disposable tip.

Silicone cast of a powder-processed latent fingerprint impression. This durable casting material works well to lift powder-processed impressions from textured, uneven, or vertical surfaces. Once dry, the silicone cast should be placed in a pharmacist fold, or small envelope to protect against damage.

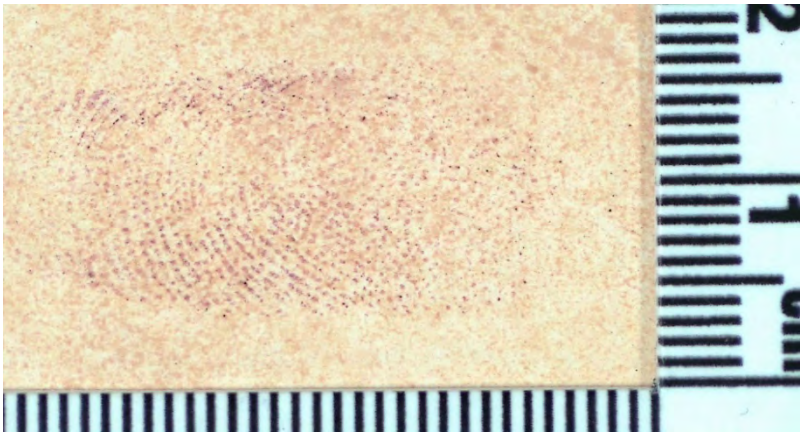
Porous Substrates

Porous substrates (capable of absorbing moisture) may be processed for latent fingerprint evidence, but typically only when using chemical development techniques. Examples include a piece of paper containing a written note, a receipt from a bar, or the cardboard container for a box of condoms.

Many of the same processes described for two-dimensional footwear impressions can also be used to process porous surfaces for latent fingerprints. However, investigators should always be familiar with agency and crime laboratory policies regarding chemical processing in the field. In many cases, investigators are directed to package the unprocessed evidence and send it to the laboratory for chemical processing. The forensics laboratory can do a much more effective job at processing porous surfaces, and the packaging, transportation or shipping will generally be non-destructive to prints on these surfaces. However, investigators seizing porous surfaces should avoid using

plastic containers. Instead, paper products such as envelopes, shallow boxes, or paper bags are best to use for preserving latent print evidence on a porous substrate.

When processing nonporous surfaces for latent prints, the laboratory will typically use Ninhydrin, as previously described. This substance vaporizes and reacts with the oils or amino acids in the print's contaminate, resulting in a color change of blue or purple.



Ninhydrin-fumed print on a porous paper surface. While not routinely used in the field, investigators should be aware of this option and consider submitting a laboratory service request for analysis when appropriate.

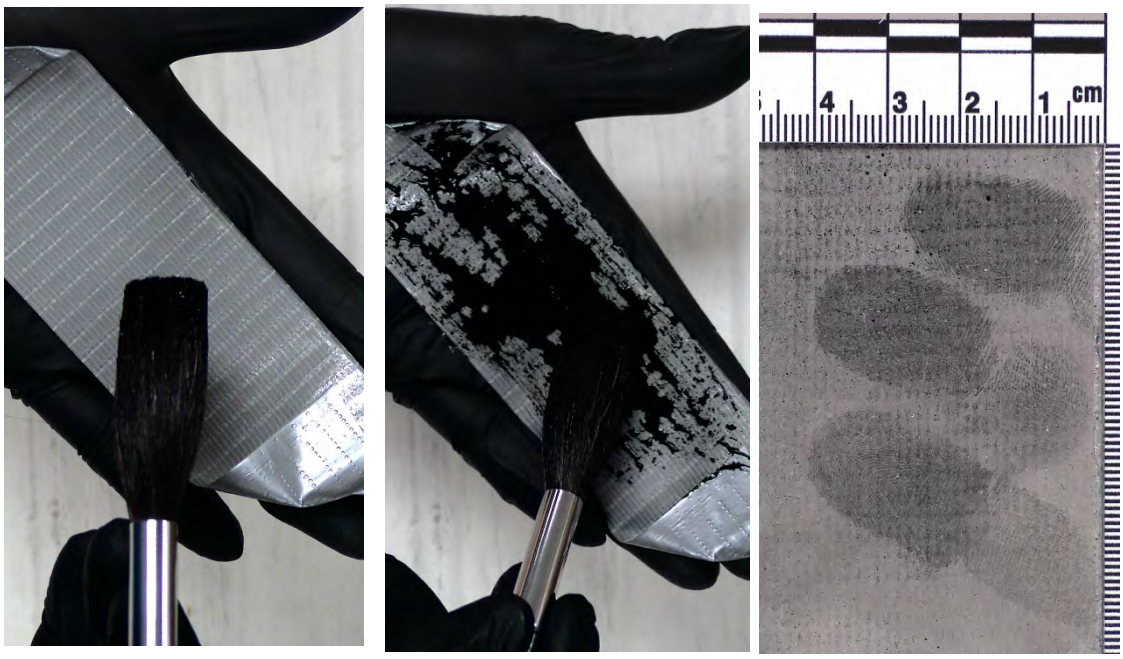
Difficult Surfaces and Circumstances

What constitutes a difficult surface or circumstance can vary from investigator to investigator, depending on their proficiency. However, there are a few universally difficult surfaces that crime scene investigators frequently encounter. Fortunately, there are processing techniques for these difficult surfaces that can be used effectively.

Surfaces that have an adhesive side to them (e.g., duct tape, electrical tape, envelopes, removable sticky notes) present a tremendous opportunity to recover latent fingerprints. The adhesive nature of the substrate makes contaminates adhere to their surface, but this also means that traditional powder methods will be ineffective. Instead, investigators can use a **sticky-side powder**, which, when mixed with a detergent and water-based solution, produces a thick processing material that can be painted (using a camel hair brush), onto the adhesive side of tape. This special powder will adhere to the contaminates in the print, but not the adhesive material. The excess processing material is then washed away with water and allowed to dry, revealing well developed latent prints. The sticky side of the tape should then be placed face-down onto a plastic transparency or document protector, and shipped to the laboratory for analysis.

Of course, investigators must be aware that submerging the material in water may destroy any other evidence potentially offered by that object (particularly on the non-sticky side of the tape). Therefore, investigators should employ the thought process described earlier to determine what probative information is most needed from any analysis. Crime laboratories will ensure that other, less destructive examinations are

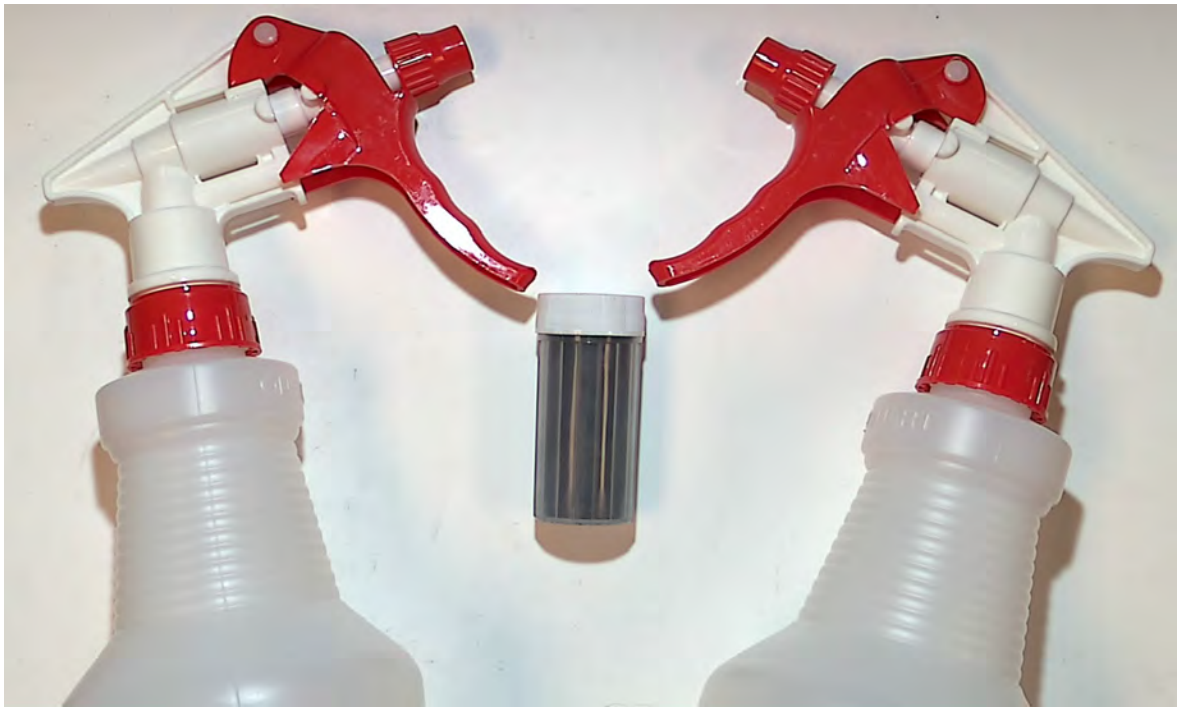
conducted prior to employing this method, so if there is any doubt, this analysis should be completed in a laboratory.



Sticky-side powder provides a simple process to develop prints on the adhesive side of tape. For investigators not equipped with this material, analysis should be requested from the crime laboratory. To package the tape for transportation or shipment, consider placing the sticky side down on a plastic transparency.

Traditionally, nonporous surfaces are easier to process for fingerprint evidence. When they are wet, however, these surfaces can be more challenging. This could include a vehicle covered in morning dew, or the exterior surface of a window that has been subject to rain. In such a situation, investigators may find themselves wondering how to process what would otherwise be considered an “easy” surface.

Contrary to what many believe, rain does not always wash away latent print evidence, nor is it always prudent to wait for the surface to dry. Instead, investigators may use **Small Particle Reagent**, a powder that is suspended in a detergent solution and sprayed using a spray bottle, onto the wet surface suspected of containing the prints.



Small Particle Reagent kits are very easy to use. One spray bottle is mixed with water and the detergent solution, and then sprayed generously over the surface area where latent prints are expected to be found. The second bottle contains only water, and it is applied to remove excess powder solution, revealing developed prints that can be lifted using traditional tape lifting techniques.

The detergent serves to displace the water, and allows the powder to adhere to any contaminates left in the fingerprint. Once the surface is dry, the processed print can be lifted just like any other print developed using traditional powder methods. Great success has also been achieved using this solution on dry surfaces covering a large area. For example, if a home has a large window and the victim reported seeing the suspect peering in through the window, investigators can spray the entire exterior surface of the window with Small Particle Reagent to develop any latent impressions that might have been left.

DNA evidence will be covered in a later section; however, it is worth noting that many agencies now consider it standard practice to swab a substrate after lifting a print for trace amounts of epithelial cells. This swab might be used to develop a DNA profile. While this will produce additional items of evidence, it is also considered best practice, because it provides a safety net for critical evidence. In the event that the lifted print is smudged, or results in a partial print with too few points of identification for a match to

be made, the swab taken from beneath that print can be sent for analysis and may contain enough DNA to identify the individual who deposited it.

Trace Evidence

Trace evidence refers to any physical evidence that is small in size, but not necessarily microscopic. It can include hairs, fibers, dirt, glass, pollen, cosmetics, paint – even dead insects. Except for trace DNA and fracture matches, however, most trace evidence can offer only limited analytical results, meaning it rarely produces an identifying match. Instead, laboratory reports on trace evidence will often state that the item in question "cannot be excluded from having a common origin as the known sample."

The exclusionary power of trace evidence can still be very helpful, however, because a forensic scientist might be able to conclude that the trace item examined *cannot be included* as having come from a common origin as the known sample. This means that hair, fibers, soil, or pollen recovered from the victim's residence can sometimes be determined as having been brought to the scene from another location.

Locating and collecting trace evidence requires deliberate and methodical search techniques. Because it can potentially be found anywhere, it makes sense to concentrate search efforts in the areas most likely to yield evidence. This includes points of entry or exit, any areas exhibiting signs of obvious struggle, and natural collection points such as seat cushions, carpet, shoe treads, and drain or lint traps.

Trace evidence may be visualized during a crime scene search by utilizing oblique white lighting, alternate light sources, and magnifying devices. "Blind lifts" may also be conducted, which involve lifting debris from an entire area suspected to be relevant in a crime scene. Once lifted, the debris can be examined for trace evidence. As with every item of physical evidence found at a scene, investigators should attempt to photograph the evidence in place, prior to removing it.

Tape Lifts for Trace Evidence

Tape lifts can be a particularly effective way of covering a large area of potential trace debris. This could include, for instance, an entryway into a residence, or a couch where the sexual assault took place. In this process, strips of lifting tape are applied to the area with just enough pressure to adhere to contaminates resting on the uppermost surface. The tape is then lifted off the surface and placed sticky-side down on a sheet of transparent plastic (like the kind used with overhead projectors), or on a clear document protector. The investigator will then document where the lifts were taken, before placing them in a breathable container such as a paper bag, envelope, or shallow box.

Trace lifts can be done in a "blind" search for evidence, or for deliberate collection. Some agencies may not routinely tape lift evidence they plan to seize; however, trace evidence is inherently fragile and often transient. If it is not collected when first discovered, there is no guarantee the evidence will still be present when it is examined at a laboratory.

Because it is often unrealistic to tape lift an entire carpeted room, investigators should narrow their search to those areas most likely to reveal relevant evidence. This could include areas of obvious struggle, suspected points of entry and exit, or other areas and surfaces brought to the attention of investigators through victim, suspect, and witness interviews.

Investigators may consider conducting a cursory examination of the lifts for superficial information that would aid in lead development. It is also important to remember that trace evidence must be compared to **a known sample** to have evidentiary value. Therefore, an on-scene examination may be helpful to focus an investigator's efforts when searching for the possible source of the contributed material. For example, if several green fibers are lifted when processing the entryway, investigators might search the suspect's home for anything that could have contributed the green fibers. When a warrant or consent is obtained to search the suspect's home, investigators might retrieve a green sweatshirt, a green bathroom mat, and a green blanket. These items can then be sent to the laboratory to compare to the green fibers found at the scene.

Close-up view of a green fiber recovered from the floor mat. Investigators can use an initial examination of trace lifts to generate a list of potential sources to search for during the investigation or when writing a search warrant.

Trace Hair

Unless hair has been forcibly pulled from a person's body, it will not typically contain sufficient tissue at the root for nuclear DNA analysis. **Mitochondrial DNA analysis** is still possible, but it is far less discriminating than nuclear DNA.

In the absence of the root, hair can still be examined for ethnicity (to some extent), body part of origin, artificial treatment such as hair dyes, and other damage due to heat or chemicals. It can even be used for species identification, to link a suspect to a scene based on pet hair. However, the crime laboratory will need known hairs to be submitted for comparison from all potential donors. At a minimum, this includes the suspect, the victim, and any other person who might reside at the house or visit frequently. Examiners can then make a determination for each source of comparison.

For example, the forensic scientist might make one of the following conclusions:

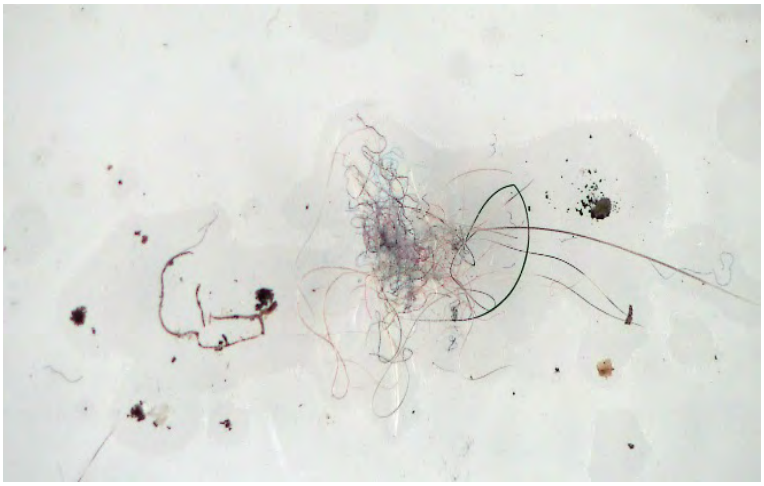
- The unknown sample can be positively excluded from a source of common origin. In other words, it did not come from the same source as the comparison sample.
- It is possible that the unknown sample came from a source of common origin (i.e., the same source as the comparison sample).
- There is insufficient information to determine whether the unknown sample could have come from a source of common origin (with the comparison sample).

Light-colored hair adhered to a dried reddish-brown substance suspected to be blood. The victim sustained a head wound after being struck with what was described as a heavy, hard object. Hairs obtained as reference standards from the victim can be microscopically compared to those recovered from the rock.

Trace Fiber

The analysis of fiber evidence can help investigators narrow down the number of potential items that could have contributed to the evidence found at the scene. Determining the type of material used in the fiber (e.g., cotton, wool, silk, nylon, rayon) can be useful to investigators when they seek to recover the contributing material from the suspect's or victim's property.

Unlike in television crime shows, however, initial analysis of a fiber cannot yield a definitive place of origin. The fiber examination can only compare the dye used in the fiber, the thickness of the fiber, and perhaps even fluorescent properties, if applicable. Again, this comparison will only establish that similarities do, or do not, exist between the recovered fiber and the known reference sample.



Close-up view of a cluster of fibers recovered from tape lifts taken from the suspect's jacket. Notice the presence of a green fiber similar to what was lifted from the floormat inside the clubhouse. These fibers can now be compared for similarities.

Trace Soil

Soil may be present at a sexual assault crime scene, but it is all-too-easily overlooked. Dirt debris from a suspect's vehicle tires may remain at the scene, for example, or mud from the suspect's shoes might have been tracked onto the victim's porch or into the house. The suspect can also carry soil away from the scene, including dirt and debris that may place that individual in the scene. Therefore, investigators may want to attempt to recover footwear suspected to have been worn during the assault.

Depending on the amount of material recovered, soil evidence can provide a tremendous amount of information. Pollen content, if in sufficient quantities, can be matched to a plant through DNA analysis. The mineral makeup of the soil components can also be determined, as well as the presence of any contaminants (such as motor oil). While not fully individualizing, this might constitute strong circumstantial evidence, linking the suspect with the location where it was recovered. When found in small amounts, investigators can seize the entire object, or soil can be removed using adhesive tape lifts, or by scraping the soil into a pharmacist's fold, box, or envelope.

It is important to recognize that even when soil appears dry, it is likely to retain moisture. Therefore, soil evidence should never be packaged in a container that doesn't breathe. Cutting off air flow produces mold, which can degrade or destroy evidence.

As with all trace evidence, comparison samples must be obtained to make a determination about where the soil came from. One strategy is to collect samples in jars or specimen collection cups, from six different spots in each area that could have contributed the recovered material. This may include the victim's home, the suspect's home, the victim's or suspect's place of employment, or even a spot on the side of the road where evidence was discarded.

Trace amounts of soil must be compared to suspected sources of that soil. Investigators should take samples of every potential source of the soil, including the victim's or suspect's home, the victim's or suspect's workplace, and other frequently or recently visited areas. These samples will then be used to eliminate or identify the source of the soil.

Trace Paint

Trace amounts of paint may be recovered from the scene of a sexual assault under a variety of circumstances. For example, paint from a window sill might chip off and adhere to the suspect's clothing, or be carried away in shoe treads, following a forced entry through that window. Or, dried paint on the suspect's clothing could fall off and remain on the victim's bedroom floor. Weapons or tools that are brought to the scene might also deposit small chips of paint, or transfer paint to another surface when force is applied. If there was a struggle during the assault, furniture or other painted objects may become damaged, resulting in chips of paint being carried out of the scene by the victim or suspect. In each of these scenarios, the recovery of a paint chip can be a very strong piece of evidence.

Sometimes, the individual paint chip can be **fracture-matched** back to its source, leading to a potential individualization. Alternatively, laboratory analysis can provide information about layering sequences and the chemical makeup of the paint itself.

In this example, the crime scene investigator notices white paint chipping off a column just outside the sexual assault scene. A small paint chip is then located in one of the suspect's shoes. The laboratory can examine both sources to determine if they are similar.

Because paint chips can potentially be fracture-matched to a source, it is imperative that they are collected and packaged carefully without disrupting or destroying their fragile edges. Whenever possible, investigators should collect paint chips using disposable tweezers and place them into a small box. Adhesive tape should never be used.
When paint has been transferred onto a surface, a scraping should also be made of the surface with the paint, as well as a nearby surface where no paint is identified. Scrapings should capture all of the layers of paint, down to the substrate material.

Trace Glass

Broken glass at a crime scene can be a rich source of information. For example, it might demonstrate forced entry through a door or window, or it might indicate that there was a struggle. When glass breaks, it may also scrape or cut the suspect, giving investigators an opportunity to retrieve trace DNA and blood evidence.[3]

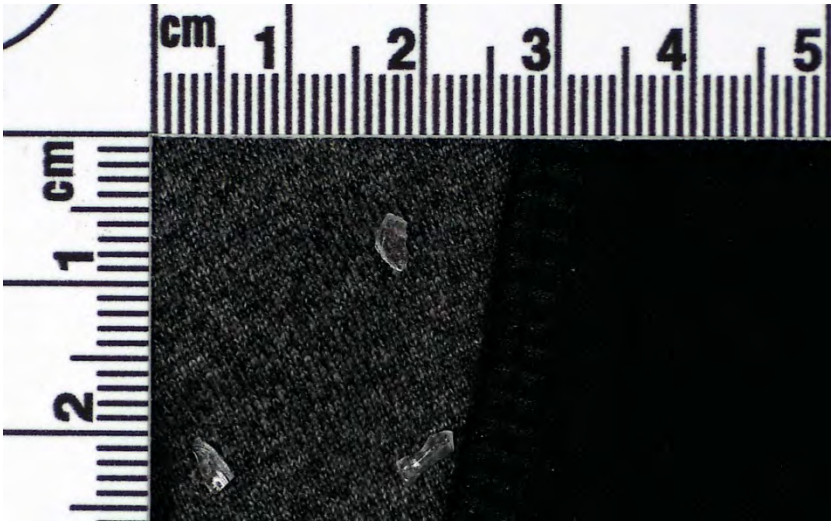
In addition, glass tends to be an ideal surface for developing and recovering latent friction ridge impressions and two-dimensional footwear impressions. Finally, when glass breaks, small and sometimes microscopic particles can fragment backward, leaving trace glass evidence in hair, on clothing, or in the tread of shoes. These small particles can then be recovered and compared to the source of the broken glass.

To search for trace evidence on the body or clothing of a suspect, a forensic examination should be conducted. EVAWI offers a template for an affidavit and search warrant to obtain a forensic examination of a suspect, as well as two examples of an affidavit and search warrant to obtain confirmation samples and other potential evidence (e.g., blood, buccal swab, fingerprints, hair) from an incarcerated person following a CODIS hit. These materials are provided with the training bulletin on Forensic Exams for the Sexual Assault Suspect, but they will need to be adapted for use based on the specific facts of each case and the laws in a jurisdiction.

Of course, glass and other types of trace evidence can transfer from the suspect to the victim, and vice versa. So, if the suspect is taken into custody shortly after a window or other glass object has been broken, it is important to process the suspect's body and clothing for any trace glass that might have been deposited.

As with victims, the suspect should remove each article of clothing while standing over a large sheet of butcher paper. The clothing should then be examined for any visible trace evidence. Once the visual examination is complete, the investigator should recover the clothing. The paper should also be retained and examined in the crime laboratory for any trace materials that may have fallen off the suspect while undressing.

[3] Research funded by the National Institute of Justice (NIJ) found that, when DNA was added to traditional property crime investigations, more than twice as many suspects were identified, arrested, and prosecuted. Blood evidence was more effective in solving property crimes than other biological evidence, particularly evidence from items handled or touched by the suspect. The research also found that evidence collected by forensic technicians was no more likely to result in a suspect being identified than evidence collected by patrol officers (Ritter, 2008).



Trace particles of glass may not be immediately visible, but they can adhere to clothing when a glass object is broken during the commission of a crime. This is fragile evidence and should be collected by tape lifting the exterior surface of the clothing.

Larger pieces of glass might also be fracture-matched to the original pane of glass. This means it is vitally important to recover glass evidence carefully, and package it securely, to avoid further breakage.

In general, glass particles from common locations can be packaged together. For example, a broken window might result in glass pieces being deposited both inside the room and outside the home. The pieces that are inside the room can be collected together, wrapped in paper, and placed in a rigid container such as a box. However, the fragments found outside will need to be packaged separately from those recovered inside. Comparison samples should also be recovered from the window pane, because those pieces still residing in the frame can be clearly documented as coming from the window. Glass pieces recovered from the ground could have come from any number of sources, so they cannot reliably serve as comparison samples.

Trace Tool Marks

Scenes involving forced entry may result in three-dimensional tool marks left on door and window frames. Sometimes, the section of damaged door or frame may be cut out completely and sent to the crime laboratory for analysis. This also preserves other potential trace evidence such as paint transfers, blood, or fibers. However, investigators may also choose to cast the impression using a silicone-based material, such as ReproCAST, Mikrosil or Accutrans. The use of oblique lighting will alert investigators to the presence of these small tool marks, because it will create shadows in the impression. This same technique should also be used to photograph the tool mark in its place. The tool mark impression, or its cast, can then be analyzed to narrow down the type of tool responsible for the impression, and to compare to a suspected tool that is later recovered.

If a suspected tool is recovered at or near the scene, investigators should not place the tool on or into the impression to compare it visually. This type of action could destroy the context of the impression, create cross-contamination issues, and potentially alter the original impression.


When it is not feasible to take the entire surface containing a suspected tool mark, a silicone cast of the impression can be used for later comparison to suspected tools.

Biological Evidence

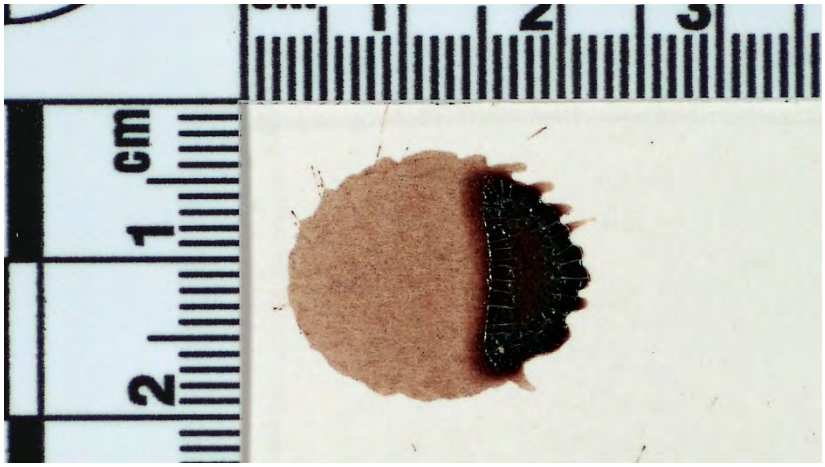
Biological evidence is often considered the most crucial type of evidence recovered during a sexual assault investigation. Blood, semen, and saliva are all forms of biological evidence that can help support the elements of proof for sexual assault offenses. In addition to their obvious associative value through DNA analysis, biological evidence can provide other crucial information to help corroborate or challenge statements obtained during an investigation.

For example, blood evidence can be examined by bloodstain experts who can extract a vast amount of information regarding the sequence of events (e.g., direction of travel, location of injured individuals). Semen evidence can conclusively identify a suspect and establish that a sexual act occurred, although the investigation will still have to establish the additional element of force, incapacity, or severe cognitive disability, depending on the circumstances.

Saliva evidence can identify the donor, but it may also support accounts of specific offender behaviors such as biting, sucking, or licking the victim –even clothing or other objects. Touching items, whether momentarily or for an extended period of time, can also result in the deposit of epithelial or skin cells, which can be processed for trace amounts of DNA. The key to biological evidence is identifying, collecting, and preserving sometimes trace amounts, without subjecting it to any potential cross-contamination.

Blood

Like any other evidence, blood evidence should be photographed with and without a scale, as well as after any enhancement efforts. Its location should also be fully documented through measurements, sketches, and handwritten notes. The context of blood evidence almost always matters; therefore, the location and spatial relationships should be sufficiently preserved through crime scene documentation.



Close-up photograph, with a scale, of a bloodstain exhibiting directionality. Following proper photography, this bloodstain can be collected using a sterile cotton swab and distilled water, or it can be scraped into a pharmacist fold with a sterile razor.

When blood evidence is found on a movable object, the investigator should document it as it was found. As long as the blood evidence is dry, the entire object should be seized and packaged in a paper container to ensure that it can breathe. Investigators should then take steps to ensure the evidence is securely packaged, so any friction that might occur when the evidence is shipped or transported to the crime laboratory will not damage or even remove the dried bloodstain.

Presumptive field tests can be useful at a scene when trying to determine the value of an item of evidence; however, all results should be confirmed by laboratory testing.

When blood is found on an object that cannot be transported (e.g., on a countertop, bathtub, tile floor), it must be documented and then recovered from that surface. If the blood is still wet (depending on the volume), it can either be allowed to dry prior to collection, or it can be swabbed, or saturated with sterile gauze, and then dried. Much depends on the nature of the bloodstain. If the bloodstain comprises a patterned impression, it must be preserved in that impression. However, if it is merely a smear or pooled collection of blood, its form may not need to be retained.

When blood is found in a dried state, it can be scraped into a porous container using a sterile razor blade. Appropriate containers include boxes or pharmaceutical folds. Dried blood may also be rehydrated by applying distilled water to a sterile cotton swab, and then swabbing the dried bloodstain. As always, the swab must be allowed to dry prior to packaging.

It is important that investigators avoid having multiple swabs come into contact with one another, and each individual swab must be clearly labeled, so it can be differentiated from any other swabs taken at the scene. Location information is particularly important. To illustrate, it would be much easier for the suspect to explain why the victim's blood was found in the kitchen than in the suspect's shower. Therefore, it is imperative that swabs taken from different locations are thoroughly documented to preserve their vital context.

Semen

Semen evidence is often recovered during a sexual assault investigation. It may be found on clothing, objects, condoms, and the victim's body. Because it may not be

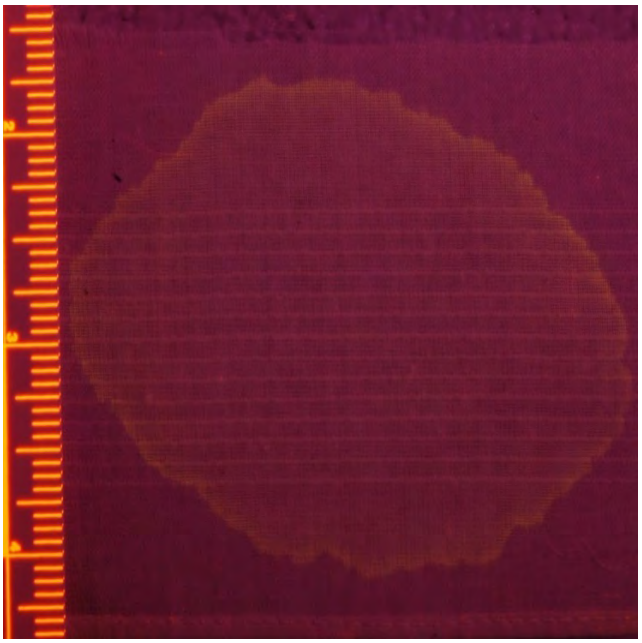
readily visible, investigators have several options to recover semen evidence. First, they may seize objects that are likely to contain this evidence. This includes clothing worn at the time of the assault, or put on immediately afterward. Similarly, bedding, cushions, or other movable surfaces on which the assault is reported to have occurred can be seized and examined by a laboratory for the presence of biological evidence.

Investigators can also utilize an alternate light source during their scene search to help identify biological evidence. Semen frequently fluoresces under ultraviolet and blue lights, so employing one of these alternate light sources during an on-scene search can help investigators sort through piles of clothing or masses of bedding. Ultraviolet lights, violet lights with yellow filter goggles, or blue lights with orange filter goggles, can be used during the search to help visualize the presence of semen. If a stain is located, it should be photographed using the same alternate light source. If the human eye required a filter to see the fluorescing stain, the camera will need the same to capture it clearly.

Depending on agency policy, investigators may utilize a field test (or **presumptive test**) for semen at a scene. The detection of acid phosphatase can serve as a strong indicator for the presence of semen; however, as with any presumptive test, the results should be verified by a laboratory. When a suspected semen stain is located, investigators should ensure that the stain is dry before seizing the evidence.

At one time, it was common practice to circle suspected semen stains prior to packaging; the idea was that this would immediately alert the crime laboratory to the area of interest. However, the continuation of this practice should be verified with the servicing crime laboratory, because the reality is, criminalists have far superior light sources than those available at a crime scene. They will generally have no problem identifying a stain that originally caught the eye of investigators. In fact, their examination and equipment will likely identify several other stains that investigators were unable to see at the scene. As a result, marking on evidence is typically unnecessary, and it can potentially destroy unseen evidence.

When suspected semen is found on an immovable object (e.g., chair, tile floor, bathtub), it should be removed from the surface. Once again, it should be photographed prior to processing, and this may involve the use of an alternate light source. If the stain is dry, it can be collected in a manner similar to blood evidence: It can either be scraped into a box, envelope, or pharmaceutical fold using a sterile blade, or it can be rehydrated with distilled water on a sterile cotton swab. If the semen evidence is wet, it can be swabbed directly and allowed to dry, before packaging the swab in a porous container. If the stain is found on carpet or a couch cushion, the preferred method of collection is to cut the stain out of the substrate material. As with all biological evidence, the substance must be allowed to dry prior to packaging in a paper or cardboard container.



Suspected semen stain under blue light and visualized through an orange filter.

Agencies should collaborate with forensic laboratories to determine whether it is advisable to mark or circle stains that are immediately visible in the field. It is important to remember that crime laboratories have much more powerful light sources than what is typically used at crime scenes. This could mean that a forensic scientist may detect a faint stain that might have been contaminated if marked in the field.

Condoms may be recovered from the scene of a reported sexual assault, and they can offer a tremendous amount of valuable information, provided they are properly collected and packaged. Trace amounts of a victim's DNA may be recovered from the exterior surface of a condom, as well as any lubricants that were used. The suspect's DNA may also be recovered from inside the condom, even if ejaculate is not present.

Condoms should always be allowed to dry, before packaging them in a porous container. When there is suspected semen inside the condom, it is imperative that the condom is allowed to fully dry. If a mass of wet biological material is packaged in a container that restricts airflow, that biological substance will mold and degrade, possibly destroying DNA evidence. If that volume of ejaculate remains inside the condom, it will take a very long time to dry; for this reason, the contents of the condom can be carefully removed to expedite the drying process and increase the probability of developing a DNA profile. This can be accomplished by inserting several swabs into the condom and allowing them to absorb the bulk of the substance. Once the swabs are saturated, they can be removed and separated and allowed to air dry much more quickly than if the contents remained in the restricted space of the condom's interior.

Recovered condom relocated to a brown paper bag to expedite drying prior to packaging.

Other Biological Evidence

Saliva, sweat, and urine are also forms of biological evidence that can yield DNA evidence and potentially corroborate either the victim's or suspect's account of events. These latent stains may fluoresce under ultraviolet or blue light, but typically they will not fluoresce as brightly as semen. Once again, any biological evidence must be dried before packaging, and it should be placed in a porous or breathable container. If biological evidence is found in a dried state on an immovable object, it is best collected using a sterile cotton swab and distilled water.

Swab of suspected biological fluid taken from tile floor. If the stain is dry, it can be lightly moistened using distilled water.

Any vomit found at a scene should be documented because it can help support victim, witness, or suspect statements. In addition, vomit can help to corroborate the element of incapacitation in a drug-, or alcohol-facilitated sexual assault.

The physical examination of vomit may even reveal the presence of undigested pills. If so, they should be removed from the vomit, allowed to dry, and retained as evidence. Investigators may also take a sample of the vomit in a specimen collection container for toxicology analysis. This sample should be placed in a freezer and transported to a laboratory as soon as possible.

Trace or Touch DNA

Due to advances in DNA technology, increasingly smaller amounts of cellular material can yield usable amounts of genetic information. This is often referred to as trace or "touch" DNA.

DNA and Sexual Assault Investigations

For more information on the topic of DNA and sexual assault investigations, EVAWI offers a comprehensive training module entitled, *Laboratory Analysis of Biological Evidence and the Role of DNA in Sexual Assault Investigations*. This module is

available as a downloadable document in our Resource Library. However, the interactive version of the training module in the OnLine Training Institute (OLTI) includes review exercises, practical applications, and an end-of-course test. After passing the test, participants can print a personalized certificate of completion.

As noted earlier, some agencies routinely swab under any lifted fingerprints in an attempt to recover trace or touch DNA. Others have a practice of swabbing nonporous surfaces that are suspected to have been touched or handled during the assault (e.g., light switches, door knobs). This, of course, should be done following attempts to process latent prints. Any object suspected to have come in contact with a person's mouth should also be swabbed or collected in its entirety. This can include beer bottles, cigarette butts, chewing gum, drinking glasses, and eating utensils.

Clothing and other accessories (e.g., jewelry) can also be processed for trace or touch DNA. Typically, criminalists will either swab or cut out small sections of the material from areas most likely to contain sweat, cells, and other biological contaminants. Suitable areas might be the armpit of a shirt or sweater, the waistband of a pair of pants, the inside surface of a baseball cap, and the crotch area of an undergarment. Ropes, cords, and other restraints used to limit a victim's movement might also yield DNA. In each of these instances, investigators should minimize the handling of objects that might contain trace or touch DNA, and package these objects separately in paper containers.

Packaging and Storage of Biological Evidence

Unlike trace evidence, biological evidence can potentially identify major participants in a crime, to the exclusion of all others. Unfortunately, this valuable form of evidence is also susceptible to degradation when exposed to high heat, ultraviolet light, and humidity. To preserve this evidence and retain its value, it is critical that biological evidence is collected, packaged, and stored correctly to prevent degradation.

All biological evidence must be dried and placed in porous or breathable containers. This can include paper bags, cardboard boxes, envelopes, butcher paper, etc. Biological evidence should also be double-wrapped; that is, it should have both an inner and outer container. For example, a swab of suspected biological material would need to be dried, and placed in a swab box, and then the swab box would be placed in a paper envelope. A small bloodstain cut from a couch cushion would need to be thoroughly dried, then placed in a pharmacist fold, which would then be placed in a paper envelope. Both the inner and outermost containers should be labeled with biohazard stickers, to alert laboratory staff that the package contains potentially hazardous material.

Most agency's evidence rooms are climate-controlled and devoid of concentrated ultraviolet light. For this reason, dried biological evidence can be kept in an evidence or

property room without requiring refrigeration. It is only when biological evidence is collected in bulk, and still in liquid form, that the evidence must be refrigerated.

EVAWI created a model policy for Evidence Retention and Disposition and/or Removal for law enforcement agencies to adapt for their own use. The document provides sample language for an agency policy, as well as instructional commentary and supplemental materials. It can therefore be used as an educational tool as well as a resource to assist in the development of policies, protocols, and training materials on evidence retention.

One innovation is seen in the fact that the model policy addresses questions of evidence retention in cases where the report is unfounded, where the victim has declined to participate in the investigation or where the prosecuting attorney has rejected the case due to insufficient evidence or other reasons. Current evidence policies rarely address these issues and the unique dynamics involved in sexual assault investigations. The model policy can also be helpful for forensic examiner programs to evaluate whether any evidence stored at the medical facility is meeting recommended practices.

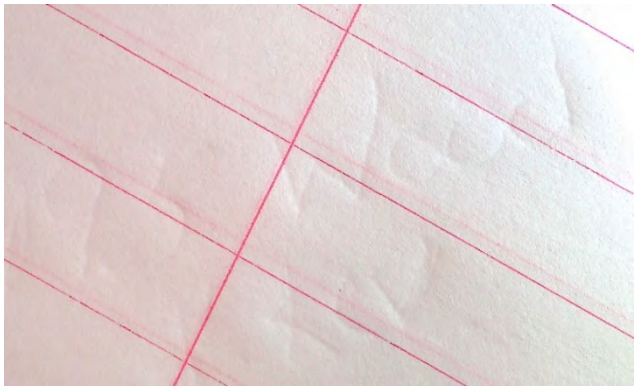
Also, included with the model policy is a summary of evidence retention laws in the US Other resources include two sample Evidence Retention Grids, and two sample *Evidence* Disposition Forms, as well as a glossary of terms related to DNA testing and evidence retention.

Documents as Evidence

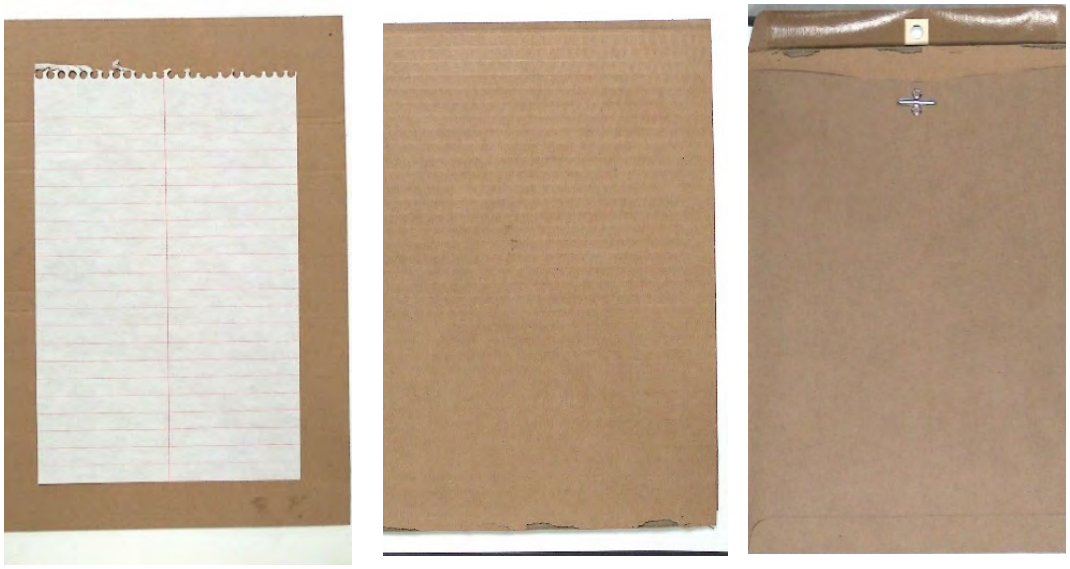
Document evidence can come in the form of a letter, card, typed message, handwritten note, or receipt. Most paper evidence can be processed for latent prints if needed. Crime laboratories will typically process these porous surfaces with Ninhydrin fumes, to look for evidence of handling. When investigators package this evidence, care should be taken to preserve any **indented writing.**

People often write on top of a pad of paper, or a stack of documents, unaware that the pressure might impact the pages below. On scene, investigators may visualize this indented writing by carefully examining a document with oblique white light. Held at an angle, the oblique light will cast shadows inside the indented writing, which can make the content of the writing visible and decipherable. At the crime laboratory, an **electrostatic detection apparatus** can also be used, which attracts fine dust particles into the indentations on the document. (The document itself will be covered with a thin sheet of plastic to avoid being destroyed). Once the dark-colored particles settle into the indentations, the writing can often be seen.

Documents with indented writing can often be visualized using oblique white light. The light should be directed at a 45-degree angle, to create shadows in both horizontal and vertical pen strokes.



To protect documents, they should be placed inside a paper envelope that is large enough to avoid folding. The envelope should then be sandwiched between two sturdy surfaces, such as cardboard, to prevent any additional indented writing when investigators mark or seal evidence.



Documents can be placed inside a paper envelope, which is then sandwiched between two pieces of cardboard and packaged in an outer paper envelope. This will protect the document from any additional indented writing.

Handwritten Evidence

Documents with handwriting can be useful evidence if the identity of the writer is important to the investigation. A threat, an admission, or even an apology, might be handwritten, but it will require proof that the suspect wrote the message. A handwriting expert will therefore need to examine the evidence, and compare it to handwriting

samples collected from any person who might have been responsible for the writing. These samples can be collected directly from an individual, a residence, or from another type of property, depending on what the examiner specifically needs.

Official documents containing the individual's signature or other writing may be recoverable without the suspect's knowledge. However, the examiner may need the suspect to write a particular phrase or sentence numerous times in the presence of law enforcement for comparison. Each of these methods has strengths and weaknesses. For example, when suspects are compelled to provide their handwriting, they may attempt to alter it (although these efforts are seldom effective). On the other hand, samples recovered from a person's home or business might be disputed later, as having not come from the suspect. The specific circumstances of the case, and the preferences of the examiner, should drive the source of the handwriting samples.

Writing Content

Sometimes, the *content* of the writing is the most important aspect. For example, a written apology or admission of guilt can be powerful evidence. Receipts can also be valuable, since they often indicate dates and times when certain items were purchased. This can help to establish intent. They can also corroborate aspects of the victim's or suspect's statement, based on the purchase of condoms, alcohol, lubricants, etc. Finally, in cases where a suspect continuously bought a victim alcoholic beverages to facilitate a sexual assault, those receipts can help corroborate planning and intent. In all of these instances, the content of the message is important, but the documents should also be preserved, to protect fingerprint and indented writing evidence as well.

Digital Evidence

Cellular phones, tablets, and computers are now used by most Americans in their daily communications and transactions.[4] This means that these items are very likely to contain evidence that could corroborate an element of proof. For example, a victim might make a disclosure on social media, or a suspect might text a friend to ask about an alibi.

[4] According to the Pew Research Center (2017), the vast majority of Americans (95%) now own a cellular phone of some kind. The share of Americans that own smartphones is now 77%, up from just 35% in Pew Research Center's first survey of smartphone ownership in 2011. Along with mobile phones, nearly eight in ten US adults now own desktop or laptop computers, while roughly half own tablet computers, and approximately one in five own e-reader devices.

Electronic devices are also frequently used for financial transactions (such as paying for alcohol or a hotel room). In addition, cellular phones can be used to place a suspect in a certain location at a certain time, even when the phone is not used to make a call.

Browsing history can also be important. For example, a suspect might search the internet to determine which drugs can result in incapacitation, when they are mixed with alcohol. Sometimes, suspects will even take a picture of the victim when he or she is incapacitated. These digital images are often stored on cellular phones, digital cameras, SD cards, USB thumb drives, external hard drives, etc.

To provide examples of what a warrant and affidavit might look like when searching for digital evidence under various circumstances, several samples are provided in Appendix B. These materials will need to be adapted based on the facts of a specific case as well as the law and resources in a particular jurisdiction. It is important to consult with a local prosecutor during this process.

In all of these scenarios, investigators need to be familiar with the information provided by the victim, witness, and suspect(s), to help identify potential sources of communication and digital media. These items should then be included in any search warrants, along with the authorization to search the device once seized.

Digital phones can be erased remotely if a signal reaches the device. To prevent this, cell phones recovered while powered on, should be placed in "airplane mode." Devices found in an off position can be placed in static-free containers such as a Faraday bag or aluminum foil.

A great deal of controversy surrounds the right to privacy for information stored on a digital device. While this is ultimately a question for the courts to decide, law enforcement will continue to retrieve evidence stored on electronic devices. Digital evidence should always be recovered when legally permissible, even if a search warrant is later needed to examine its contents.

Whenever possible, investigators should obtain consent from the individual providing the digital device before seizing it. This consent should include the disclosure of any security features and the passwords needed to bypass them. When searching computer workstations, investigators can also look for notes or other documents that might list passwords; these may be taped underneath keyboards or stored in a nearby drawer.

When investigators are authorized to seize and examine electronic evidence, this analysis is often conducted at a computer crime laboratory. While some agency policies may require that this evidence be sent immediately to the laboratory for analysis, an increasing number of agencies have equipped their investigators with imaging equipment that can make a working copy of the contents of the device, before packaging it for transportation to the laboratory. This practice is recommended, because the copy can be searched immediately, rather than waiting for forensic analysis to be completed. This will sometimes yield actionable leads. It can also ensure that law enforcement retains the contents of the device, in case the owner revokes consent, if a warrant wasn't obtained.

Computers

When investigators need to seize electronic evidence such as a computer or laptop, there are several steps that should be followed. The first step is to determine whether the device is powered on. With computers, a dark screen can potentially be misleading, because many devices have a "power save mode" that is activated once a certain amount of time passes without activity. To ensure that the device is truly off, investigators should look for any lights that are on, and listen carefully for faint sounds, such as humming. The presence of slight vibrations or heat can also indicate that it is powered on. In some cases, a quick press of the power button can bring a device out of sleep mode, but investigators should consult with a digital evidence technician before pressing any buttons. Once it has been determined that the device is powered off, it should be left off.

Next, all cables should be photographed and labeled, to allow the computer and peripherals to be reconnected in the exact same way later. Once these connections have been documented, the cables can be disconnected and the power source removed. In the case of a computer, it can be unplugged from the wall. For a laptop, the internal battery should also be physically separated from the device.

At this point, the computer and any seized components should be placed in sturdy boxes and secured using anti-static packaging. Care should be taken to avoid exposing the device to extreme temperatures, moisture, or large magnets, because they can harm the computer's internal components.

Before disconnecting peripheral computer cables, label the cables and diagram the location of their input. This will help to re-create the exact same setup later.

To determine whether a computer is on or off, look for lights and listen for sounds coming from the device. Removable media storage cards should be secured in place prior to transport.

When a computer or laptop is actively running, investigators should observe and photograph whatever is immediately visible on the screen, without manipulating the device (hitting a key or clicking a mouse). Files should not be accessed while at the scene, unless this is done on a working copy. Manipulating digital files can destroy evidence and interfere with subsequent analysis. If a program appears to be running, investigators can contact forensic computer experts to help determine whether a destructive process is active (for example, a self-destruct process installed for security purposes).

After taking a photograph of whatever is readily visible, the power cord can be removed from the wall. Again, all cables should be photographed and labeled to allow the computer and its peripherals to be reconnected in the exact same way later. It is also a good idea to check media ports for the presence of removable media such as CDs or SD cards. These items should be documented in place and secured with a strip of tape.

Cellular Phones and Tablets

One of the reasons cellular phones and other small tablet devices are so popular is because they let the owner connect to cellular and wireless networks from essentially anywhere. However, this convenience can present a challenge for law enforcement, because as long as the device is remotely accessible, its contents are vulnerable. When seizing a mobile device, investigators should first attempt to obtain passwords or access keys and place the device in "airplane mode."

Whenever possible, the device should be kept powered on, and it should be transferred to a digital evidence technician for analysis as soon as possible. Investigators need to remember that many of these devices have a timed blackout screen feature; meaning that just because the screen display is dark, it is not necessarily off. If permissible, investigators can quickly depress the "on" button to reactivate the screen.

In the event the device is powered off, it should be kept off and placed in a **Faraday or anti-static bag.** As with any electronic evidence, these items should be kept safe from extreme temperatures, moisture, and large magnets.

Other Digital Media

Frequently, when investigators have a warrant to seize personal computers, they have also sought authority to seize relevant digital media storage devices (e.g., media cards, memory sticks, flash drives, music players, CDs, DVDs). In general, these storage devices should be removed from their power sources and placed in static-free container before shipping them for analysis. However, it is best to consult with a knowledgeable digital media specialist for guidance whenever possible.

Social Media Evidence

Investigators often seize digital evidence to recover information about the victim's or suspect's online activity. What is sought, then, is not just material stored on the device, but also the data stored on public platforms such as social media websites.

Investigators must remember that even if they have seized every possible device, this does not preclude someone from accessing their accounts through some other device. Therefore, it is critical for investigators to submit preservation request letters to social

media companies as soon as possible during an investigation, to preserve the data and protect it from destruction, so it may ultimately be used in court proceedings.

Digital Evidence

For more information on the topic of digital evidence, EVAWI offers a recorded webinar entitled: *Digital Evidence: Successfully Identifying and Acquiring Electronic Evidence to Combat the CSI Effect.* The presentation is given by Sergeant Elizabeth Donegan and Sergeant Michael Crumrine of the Austin (Texas) Police Department, and it is designed to help participants recognize the different types of digital media that might be available in a sexual assault case, understand how to legally seize and examine this digital evidence, and develop a theme for any pretext communications with the suspect (e.g., phone calls, texting, email).

Drug Evidence

Evidence of drug use will often be critical in a sexual assault case. In the case of a drug-facilitated sexual assault, this evidence can be used to corroborate the element of incapacitation, and to establish the victim's inability to provide consent.

However, victims often fear that they will be punished or not believed if they admit to any voluntary use of drugs or alcohol. They may even destroy evidence of drug use, or delay reporting in the hope that any trace of alcohol or drugs will have cycled out of their system. Investigators should be sensitive to these concerns and carefully explain to victims why this information is needed. Law enforcement agencies should also work with the prosecutor's office, so they can offer assurances that victims will not be prosecuted for any underage drinking or recreational drug use (if this is true).

Pills as Evidence

Prescription pills are often the cause of diminished cognitive functioning and awareness during a sexual assault. Sometimes a victim inadvertently intensifies the effects of a prescription drug by consuming it with alcohol. In this instance, drug evidence might be recovered from the victim's home or possessions. Investigators can identify the evidence by examining the markings on the pills. However, investigators should never assume that the label on a pill bottle accurately reflects the contents.

To collect them as evidence, any pills recovered at the scene should be emptied onto a clean surface, counted, photographed, and researched based on the markings. The *Drug Identification Bible* is a publication often used by law enforcement to identify both legal and illegal drugs. A pill may be identified by its markings, shape, and color. Of course, laboratory testing of any seized pills will help identify the chemical makeup of

the drug, but the initial on-scene identification of the type of pill and its effects can be very valuable to an investigator during the early stages of an investigation.

The Drug Identification Bible can be used to identify a drug by looking up the print or stamp on a pill. Prescription drugs can amplify the effects of alcohol, contributing to severe incapacitation and a victim's inability to consent to sexual acts. Therefore, it is important to identify the presence of these drugs in a victim's system, as well as where they came from.

The container in which the pill evidence is found should also be handled with care. While the victim may readily admit to ingesting a drug, suspects also frequently give victims a drug to facilitate a sexual assault. This can be overtly or covertly, or with misleading information about the drug's effects. When appropriate, plastic prescription pill bottles should be superglue fumed and processed for fingerprint evidence. Fortunately, superglue fuming will not hinder subsequent drug chemistry analysis.

Food and Beverages

In some cases, a suspect may covertly drug a victim by slipping a drug into a drink or food. If the victim consumed the drugged food or beverage at the crime scene, investigators should attempt to seize any drug evidence in a way that preserves the remaining contents, as well as fingerprints and DNA.

When liquid remains in a container, investigators should transfer this liquid to a specimen cup and refrigerate or freeze the sample, before transferring it to a laboratory. The container can then be superglue fumed to preserve any latent friction ridge evidence. If investigators suspect the drug was delivered to the victim via food, any remaining food items suspected of containing this drug should be seized and refrigerated, or frozen until they can be transferred to a laboratory for analysis.

Evidence of Drug Use

If a drug container is empty, it should still be seized and sent to the laboratory to attempt to recover any trace amount of residue that might have remained in the container. Evidence of illegal drug use may be more likely to be hidden or destroyed before law enforcement arrives. Therefore, warrants and search efforts should include locations such as bathrooms, toilets, dumpsters, and trash cans.

Trace amounts of any drugs can be carefully scraped into a pharmacist fold or paper envelope. Material recovered in bulk should be seized in a way that allows for both the identification of the substance, as well as the examination of the container's surface. Plastic bags and containers are well suited for superglue fuming, and while the controlled substance can be removed prior to fuming, it is not a requirement.

Weight Considerations

Investigators should remember that part of their documentation of a controlled substance is its weight at the time of seizure. This information must be collected immediately, because the weight of the substance may fluctuate over time. Some materials, such as heroin, will absorb moisture from the air and eventually increase in weight, while other substances, such as marijuana, will dry over time and decrease in weight. Additionally, laboratory analysis will necessarily consume a portion of the material, resulting in a decrease in weight as well.

These variations are understandable, but law enforcement's documentation must include a reliable starting weight. Agency policy may vary regarding whether the seized substance should be weighed inside or outside its original container. Regardless of the option used, investigators should clearly document whether the weight taken upon seizure of the substance included the container.

Drug Paraphernalia

Although it is not uncommon to find that controlled substances were destroyed prior to law enforcement's arrival, drug paraphernalia often remains at the scene, and it should be seized if it is relevant to the investigation. Any pipes or needles should be handled with precautions for biologically hazardous materials. Their packaging should reflect this as well. Needles should also display a warning on the outer packaging that the contents are sharp and present a biohazard.

Any nonporous paraphernalia should be superglue fumed to preserve friction ridge evidence, which can be used to identify who handled the object. Investigators can also collect a swab of any part of the paraphernalia that may have come into contact with a human mouth. This trace DNA evidence can be collected after superglue fuming at the crime laboratory.

Unique Crime Scene Challenges and Considerations

Crime scene processing and evidence analysis often focuses on the identification of an individual. This is critical when investigators have identified a suspect who has no legitimate reason for being present at the crime scene. However, most sexual assaults are committed by someone the victim knows, whether they know each other extremely well or only just briefly met. This can make the identification, analysis, and interpretation of evidence more complicated.

Evidence analysis is especially complicated when the suspect resides in or frequently visits the victim's home. In these cases, fingerprints, DNA evidence, footwear impressions, and trace evidence might not offer any value to the investigation. Should this type of evidence even be collected? The answer to this question is not easy or clear-cut. It depends on the facts of the case and what exactly is in dispute. What is certain, though, is that crime scene processing should not automatically be abandoned, simply because the suspect and victim reside in the same home or frequent the same location. Instead, investigators should carefully consider what evidence might be available to corroborate aspects of the victim's, suspect's, or witnesses' statements. At the very least, processing of an intimate partner sexual assault scene can help demonstrate the absence of any other possible suspect.

Scenes that are accessible to the public can also present challenges. In fact, the very idea of processing a public crime scene can be daunting – not because evidence can't be recovered, but because the investigator is almost guaranteed to recover more evidence than can possibly be helpful. Public spaces can potentially contain contributions from countless individuals. However, this does not mean it is acceptable to simply skip crime scene processing. Instead, investigators must focus their efforts on areas specifically described by the victim or suspect, keeping in mind that surfaces frequently touched by many people may still contain the largest contribution from the individual who last touched them. Therefore, doorknobs in hotel rooms or faucets in public restrooms, may still provide identifying information about the last person who touched the surface, if they are processed as soon as possible after the sexual assault.[5]

Other potential challenges are posed by delayed reporting. Sexual assault victims often do not report to authorities right away, for a variety of reasons. In many cases, this means that certain types of evidence will no longer be available. However, this again does not justify abandoning all crime scene processing procedures and attempts to collect evidence. For example, clothing or bedding may still contain DNA evidence,

[5] There have been several research studies conducted to determine the likelihood of recovering trace amounts of DNA from surfaces touched during the commission of a crime. Wickenheiser's article on trace DNA (2002) includes case studies where suspects handled objects that were previously touched by the victim or several other individuals, yet the major DNA contribution recovered was that of the suspect. This finding indicates that the last person who handles an object may sufficiently remove the material left by others, replacing it with their own, in sufficient quantities to constitute the majority of DNA recovered.

even if they have already been washed. There may also be DNA or other types of evidence on couches and carpets, since these surfaces are generally cleaned less frequently than clothing.

Partial processing efforts can also be helpful, if only to document the reality of the scene environment. Investigators should therefore consider visiting the scene to take notes and photographs that can later be used to depict the scene and to understand any movement described by the victim or suspect. In other words, there are numerous possibilities that justify some degree of crime scene processing and documentation, even with a delayed report. Investigators should consider both agency policy and the unique circumstances of the case, to determine which procedures might be warranted.

Potential Evidence Quick Reference Chart

Appendix C includes a Quick Reference Chart, which summarizes much of the information provided in this training module. For each evidence category – biological, digital, document, drugs, footwear impressions, friction ridge, trace, and other frequently encountered items – the chart offers information on where to find the evidence, how to visualize or enhance it, how to package it, what information it may yield, and any items needed for comparative analysis. This chart can therefore serve as a training tool or a handy reminder for investigators to enhance the retrieval and value of potentially useful evidence. In addition to the Appendix, it is also available as a freestanding document, so you can print it out as reference material.

Concluding Thoughts

Despite the tremendous strides criminal justice professionals have made in recognizing the severity and impact of sexual assault, these cases are all-too-often described as simply “he said, she said.” The case is then dismissed as impossible to resolve, even before an investigation is initiated.

Whether conscious or not, individual biases and attitudes tend to affect the amount of resources, dedication, and effort investigators and agencies expend to respond to and investigate gender-based crimes such as sexual assault, intimate partner violence and human trafficking. A thorough investigation, which includes processing all available crime scenes, can go a long way to changing these mistaken perceptions.

While there may be no “smoking gun” in most sexual assault cases, there is often a cumulative effect of evidence that corroborates one person’s account of events over another’s and leads us closer to the determination of the truth. While there may be no “smoking gun” in most sexual assault cases, there is often a cumulative effect of evidence that corroborates one person’s account of events over another’s. This leads us closer to the determination of the truth. The recovery of physical evidence can

therefore help us to hold sex offenders accountable for their crimes, and prevent future re-perpetration. It can also exclude suspects where appropriate, and exonerate the wrongfully accused. All of these are vital functions of law enforcement – and well within our power to achieve.

If we want to encourage sexual assault victims to report to law enforcement, and to stay engaged in the criminal justice process so we can hold perpetrators accountable, we must all do our part. This means that law enforcement must dedicate the resources necessary to scientifically process the sexual assault crime scene, by systematically recovering, storing, and analyzing evidence that is crucial to the pursuit of justice.

References

Gardner, R.M. (2012). *Practical crime scene processing and investigation* (2nd ed.). Boca Raton, FL: CRC Press.

Lonsway, K., Archambault, J. & Berkowitz, A. (2017). *False reports: Moving beyond the issue to successfully investigate and prosecute non-stranger sexual assault* [Online course]. End Violence Against Women International OnLine Training Institute. Retrieved from http://olti.evawintl.org/Courses.aspx

Perkins, D.G. & Thomas, W.M. (1991). Cyanoacrylate fuming prior to submission of evidence to the laboratory. *Journal of Forensic Identification*, *41*(3), p. 157-162.
Pew Research Center (2017). *Mobile Fact Sheet*. Retrieved from http://www.pewinternet.org/fact-sheet/mobile/

Ritter, N. (2008). DNA solves property crimes (But are we ready for that?). *NIJ Journal*, *Issue 261.* Retrieved from https://www.nij.gov/journals/261/pages/dna-solves-property-crimes.aspx

Robinson, E.M. (2016). *Crime scene photography* (3rd ed.). London, UK and San Diego, CA: Academic Press.

United States Department of Justice. (2015a). *Identifying and preventing gender bias in law enforcement response to sexual assault and domestic violence* [Guidance document]. Retrieved from https://www.justice.gov/opa/file/799366/download

United States Department of Justice. (2015b, December 15). *Justice Department issues guidance on identifying and preventing gender bias in law enforcement response to sexual assault and domestic violence* [Press release]. Retrieved from https://www.justice.gov/opa/pr/justice-department-issues-guidance-identifying-and-preventing-gender-bias-law-enforcement

Wickenheiser, R.A. (2002). Trace DNA: A review, discussion of theory, and application of the transfer of trace quantities of DNA through skin contact. *Journal of Forensic Science*, 47(3), p. 442-450.

Appendices

Appendix A: Decision Tree

Appendix B: Search Warrants

Appendix C: Quick Reference Chart