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## **Crime Scene Investigation and Reconstruction Manual**

**Forensic Analysis and Reconstruction Unit (FARU)**

**Department of Forensic Biology**

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## I. Introduction

The goal of crime scene reconstruction is to develop information about the circumstances and events of a crime through an analysis of the crime scene or photographs, evidence, and other data collected from the scene by the investigating authorities. Among other benefits, this information can aid in the investigation of a crime, association of individuals to a crime scene, and identification of movement at a crime scene.

This manual was written for use as both a field and laboratory manual. It contains the policies and methods available as they relate to crime scene investigation and reconstruction that are used by the Forensic Analysis and Reconstruction Unit (FARU), a division of the Department of Forensic Biology at the New York City Office of Chief Medical Examiner (NYC OCME). These methods are not intended for general use in the Department of Forensic Biology.

### A. Philosophy

This manual's philosophy is rooted in the premise that criminalistics, as a part of the overall process of crime scene reconstruction, resides within the applied scientific domain. While nonscientific investigators can be trained to recognize and document physical evidence, scientists trained in the scientific method (De Forest *et al.*, 1983) have the experience to collect, assimilate, and logically analyze a diverse array of evidence to arrive at valid conclusions. It is this approach that allows the scientist to say to investigators **“Yes, that is possible”** or **“No, that is impossible,”** without becoming an advocate, and then to testify in court to his or her findings.

The analysis of bloodstain patterns found at the crime scenes has become an important tool for investigatory law enforcement. Traditionally, it has been used to corroborate statements, identify blood droplets, or document the relative positions of victim and assailant during the commission of a violent act. However, its most important function is when it is used as an integral part of reconstructing the events of a crime.

Crime scene reconstruction is a process by which evidence is analyzed, deductively, to define a reasonable theory of what happened. It is an applied science, which is over and under utilized. This may seem paradoxical but, it is not. This is a specialized approach to evidence analysis, specifically the science of crime scene reconstruction, using bloodstain pattern analysis and other physical evidence. It is over utilized by non scientists who try to “figure out” what happened, but is under utilized by trained forensic scientists, who can collate the available physical evidence and speculative, medical, and scientific information and then study it to deduce a logical sequence of events.

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## B. Basic principles

This manual is designed to provide the experienced crime scene scientist with basic procedures for examining, documenting, and analyzing crime scene evidence. It is not intended for the novice except as an on-the-job training manual to learn these specialized techniques. The specific principles presented must be learned using a hands-on approach, supervised by experienced scientists.

Bloodstain patterns are often important pieces of information used for crime scene reconstruction. Since they are complex, however, sometimes the essentials of their formation are only appreciated after they are manufactured, examined, and analyzed in a controlled laboratory setting. The practical aspects of bloodstain analysis, requiring an understanding of how they can be produced and analyzed, require experience and experimentation before an opinion is rendered.

Scene documentation refers to the archival storage of a scene using a variety of media. Most commonly, this is a photographic record of the salient elements of the scene. Unfortunately, this important aspect is often neglected or done improperly. The purpose of documentation is to preserve the scene so that another person, through the archival record, can see the scene through the recorder's eyes.

The most important goal of documentation is that the archival record would allow the retrieval of as much data as could have been obtained from the original scene investigation. While this is clearly the ideal and probably not always attainable, sufficient data should remain trapped within the documentation to allow a retrospective evaluation of the scene's important characteristics.

Sample collection is another important area of scene investigation. While the NYPD Crime Scene Unit has the responsibility for processing and documenting a scene, reconstruction may require a second, third, or more revisits where samples are collected, evidence reexamined, and additional evidence sought and collected.

## C. Conclusions

Conclusions or opinions are formed to answer questions that investigators have asked or should have asked. Sometimes these questions are implied by the scene or case circumstances and are often answered specifically, sometimes only partially. For example, **“Was the perpetrator right or left-handed?” “How many blows were struck?” “Was the victim standing during the attack?” “Was the perpetrator cut?”** are commonly asked questions.

Usually, overall conclusions about what happened cannot be made until all relevant data, scientific or otherwise, has been evaluated. Sometimes this requires laboratory analysis and experimentation, *e.g.*, determination of the mechanism of how a bloodstain was made, identification of a particular pattern as gunshot residue, DNA typing, *etc.*

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## II. General guidelines

Crime scene reconstruction cases that are received by the laboratory vary in nature. Occasionally, the cases submitted involve the analysis of New York City Police Department Crime Scene Unit (NYPD CSU) photographs and other evidence. Most often, however, laboratory personnel are requested to examine a crime scene, typically after it has already been processed by the NYPD CSU and/or an NYPD Evidence Collection Team (ECT).

The following guidelines should be followed when processing cases for reconstruction.

1. All cited references and other Forensic Biology manuals must be read before performing any of the procedures or protocols outlined in this manual.
2. All pertinent case information and physical evidence must be requested and collected from the proper authorities, generally the OCME, District Attorney's office, and the NYPD. This information and evidence may assist in the reconstruction process and must be collected, if available. This information and evidence should include, but may not be limited to, the following:
  - OCME autopsy reports, worksheets, notes, wound charts, and photographs
  - OCME medico legal investigators' reports, notes, and photographs
  - OCME Forensic Biology and Toxicology reports
  - NYPD CSU and/or ECT reports, notes, and photographs
  - FDNY Emergency Medical Service reports and notes
  - defendant, complainant, and witness statements (interviews, depositions, and/or transcript)
  - all reports pertaining to external examinations and analyses of physical evidence collected by the NYPD and DA's office
3. Two or more laboratory personnel should cooperate on a case together. Criminalists working a case will be designated as either the **assigned** or **assisting** criminalists. The assigned criminalist will usually write the report and be expected to testify to the results of the investigation. Generally, the assigned criminalist will be responsible for evidence collection and photography. The assisting criminalist will do all the scene documentation (notes, worksheets, etc.). Other duties will be set forth by either the assigned criminalist or the supervisor at the crime scene. In the best interests of the case, ideas are suggested and expected from all participating laboratory personnel during every phase of the reconstruction.
4. The following worksheets are available for use and can be found in the departmental computer network directories and Appendix D. These forms should be filled out completely, if used, and should supplement, not replace notes.
  - Scene Response Log      - Evidence Log      - Photography Log
  - Vehicle Processing Log      - Sketch Worksheet      - Case Contact Log

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5. Each crime scene should be approached carefully. Keep in mind that any item(s) removed or tested **irrevocably** alters the crime scene. Proper documentation of the scene, both before and during processing, **cannot** be overemphasized. After processing, the scene can **never** be restored to the exact state in which it was found.
6. At a crime scene and in the laboratory, alternative hypotheses **must always** be considered when doing reconstructions. Do not form “attachments” to a hypothesis or theory without first attempting to disprove it or exploring alternate hypotheses. The hypothesis must fit the evidence, not vice versa.
7. All of the individual items must be labeled with the case number and the initials of the criminalist (each page of every report and every photograph/slide).

### A. Crime scene management

Proper management of a crime scene is necessary to ensure the integrity of the scene and evidence. Following established and accepted protocols will help strengthen the investigation and processing of the scene and also counter claims made against the manner in which evidence was documented, collected, and packaged. Effective crime scene management and proper allocation of personnel and equipment will aid in this task. The steps outlined in this section were taken from “Crime Scene Investigation: A Guide for Law Enforcement” published by the U.S. Department of Justice, Office of Justice Programs, National Institute of Justice, January 2000.

#### 1. Arrival at the scene: initial response and prioritization of efforts

##### a) Initial response and receipt of information

1. Note or log dispatch information.
2. Be aware of people or vehicles at or leaving the scene.
3. Approach the scene with caution, scan the area thoroughly, and note any other areas where activity related to the incident may have occurred.
4. Assess the scene for safety issues before proceeding (look, listen, and smell).
5. Assume the crime may be ongoing. Remain alert and attentive until certain the incident is over.
6. Treat the area as a crime scene until assessed and determined otherwise.

#### 2. Scene safety procedures

1. Ensure there is no immediate threat to scene responders. Note any odors, sounds, or visual clues that may present a danger to personnel. Assess whether specialized response teams may be required, *i.e.*, Hazmat, Fire Dept, EMS, and contact the appropriate agencies as appropriate.

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2. Approach the area in a manner designed to reduce risk to personnel while maximizing the safety of victims, witnesses, and others in the area.
3. Assess the scene for dangerous persons and notify the NYPD as appropriate.
4. If any dangerous or unsafe conditions or situations present themselves, immediately notify a supervisor and await instruction.

**a) Emergency care**

1. Assess the scene for anyone that requires medical attention. Immediately call 911 for medical assistance.
2. Guide medical personnel to the injured persons to minimize contamination of the scene.
3. Document the actions of medical personnel at the scene and instruct them to avoid or minimize contact with potential evidence.
4. Instruct medical personnel not to clean up the scene or to remove or alter items.
5. Obtain the appropriate contact information for each of the responding medical personnel.

**b) Secure and control persons at the scene**

1. Control all individuals at the scene to prevent the contamination, alteration, or destruction of physical evidence.
2. Exclude all nonessential and unauthorized personnel from the scene.

**c) Boundaries: identify, establish, protect, and secure**

1. Establish boundaries of the scene starting at the focal point and extending outward to include:
  - where the crime occurred
  - potential points and paths of exit and entry of suspects and witnesses
  - places where the victim and/or evidence may have been moved
2. Set up physical boundaries or use existing boundaries.
3. Once boundaries have been established, document the entry and exit of all people entering and leaving the scene.
4. Control flow of personnel and animals entering and leaving the scene to maintain integrity.
5. Protect evidence that may be compromised or destroyed.
6. Document the original location of the victim(s) or object(s) that you observe being moved.
7. Ensure that a search warrant has been obtained, if necessary, prior to search and evidence collection.

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**d) Turn over control of the scene and brief investigator(s) in charge**

1. Brief the investigator(s) taking charge.
2. Assist in controlling the scene.
3. Turn over responsibility for the documentation of entry and exit.
4. Remain at scene until relieved of duty.

**e) Document actions and observations**

1. Document observations of the crime scene including:
  - location of people and items within the scene and the appearance of the scene upon arrival
  - conditions upon arrival (lights on, doors/windows open, weather, *etc.*)
  - personal information and any statements or comments from witnesses, victims, and suspects
  - own actions and those of others

**3. Preliminary documentation and evaluation of the scene****a) Conduct scene assessment**

1. Converse with the first responder(s) regarding observations and activities.
2. Evaluate safety issues that may affect personnel.
3. Ensure that a search warrant has been obtained, if necessary.
4. Evaluate and establish a path of entry and exit to the scene.
5. Evaluate the initial scene boundaries.
6. Determine the number and size of scene(s) and prioritize.
7. Establish a secure area near the scene for equipment and consultation.
8. Maintain communication with personnel at different scenes, if applicable.
9. Establish a secure area for the temporary storage of evidence in accordance with chain of custody and rules of evidence protocols.
10. Determine and request additional investigative resources, if needed.
11. Ensure continued scene integrity.
12. Identify potential witnesses and obtain valid ID's.
13. Ensure surrounding area is canvassed and the results documented.
14. Ensure preliminary documentation and photography of scene, injured persons, and vehicles.

**b) Conduct scene “walk-through” and initial documentation**

1. Avoid contaminating the scene by using an established path of entry.
2. Prepare preliminary documentation of the scene as observed.
3. Identify and protect fragile and/or perishable evidence. Ensure that all evidence that may be compromised is immediately documented, photographed, and collected.

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#### 4. Processing the scene

##### a) Determine team composition

1. Assess the need for additional personnel.
2. Assess the need for forensic specialists and call if needed.
3. Ensure scene security and the entry/exit documentation are continued.
4. Select qualified persons to perform specialized tasks, *e.g.*, photography, sketch, latent prints, evidence collection.
5. Document each team member and their assignment(s).

##### b) Contamination control

1. Limit scene access to people directly involved in scene processing.
2. Follow established entry/exit routes at the scene.
3. Identify first responders and consider collection of elimination samples.
4. Designate a secure area for trash and equipment.
5. Use personal protective equipment to prevent contamination of personnel and to minimize scene contamination.
6. Clean and sanitize or dispose of tools/equipment and personal protective wear between evidence collections and/or scenes.
7. When possible, utilize single-use equipment when performing direct collection of biological samples.
8. Identify an appropriate place for personal hygiene.

##### c) Documentation

1. Review scene assessment to determine the type and amount of documentation needed.
2. Coordinate photographs, video, sketches, measurements, and notes.
3. Photograph scene:
  - overall, medium, and close-up coverage
  - evidence to be collected with and without measurement scales and/or evidence identifiers
  - victims, suspects, witnesses, crowd, and vehicles
  - additional perspectives (*e.g.*, aerial, area under body)
4. Use video as an optional supplement to photographs.
5. Prepare preliminary sketches and measure:
  - immediate area of the scene, noting case identifiers and indicating north on the scene
  - relative location of items of evidence and correlate evidence items with evidence records
  - evidence prior to movement
  - rooms, furniture, or other objects
  - distance to adjacent buildings or other landmarks

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6. Generate notes at the scene:
  - document location of the scene, time of arrival, and time of departure
  - describing the scene as it appears
  - recording transient evidence (e.g., smells, sounds, sights) and conditions (e.g., temperature, weather)
  - documenting circumstances that require departures and deviations from usual procedures

**d) Prioritize collection of evidence**

1. Conduct a careful and methodical evaluation considering all physical evidence possibilities.
2. Focus first on easily accessible areas in open view and proceed to out-of-view locations.
3. Select a systematic search pattern for evidence collection based on the size and location of the scene(s).
4. Select a progression of processing/collection methods so that initial techniques do not compromise subsequent processing/collection methods.
  - concentrate on the most transient evidence and work to the least transient forms
  - move from least intrusive to most intrusive processing/collection methods
5. Continually assess environmental and other factors that may affect the evidence.
6. Be aware of multiple scenes.
7. Recognize other methods to locate, document, and collect physical evidence.

**e) Collect, preserve, inventory, package, transport, and submit evidence**

1. Maintain scene security throughout processing and until the scene is released.
2. Document the collection of evidence by recording its location at the scene, date and time of collection, and who collected it.
3. Collect each item identified as evidence.
4. Establish a chain of custody.
5. Obtain standard/reference samples from the scene.
6. Obtain control samples.
7. Consider obtaining elimination samples.
8. Secure electronically recorded evidence from the vicinity.
9. Identify and properly secure evidence in appropriate containers at the crime scene.
10. Package items to avoid contamination and cross-contamination.
11. Document the condition of firearms and other weapons prior to rendering them safe for transportation and submission.
12. Avoid excessive handling of evidence after it is collected.
13. Maintain evidence at the scene in a manner that minimizes loss or degradation.
14. Transport and submit evidence for secure storage.

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## 5. Completing and recording the crime scene investigation

### a) Establish crime scene debriefing team

1. Establish a crime scene debriefing team which includes the investigator(s) in charge of the crime scene, other investigators and evidence collection personnel, and the initial responding officers, if available.
2. Determine what evidence was collected.
3. Discuss preliminary scene findings with team.
4. Discuss potential forensic testing and the sequence of tests to be performed.
5. Initiate any action(s) identified in discussion required to complete the crime scene investigation.
6. Identify additional resources needed, *e.g.*, NYPD crime scene photographs and report(s), statements from witnesses, autopsy report(s), *etc.*
7. Brief person(s) in charge upon completion of assigned crime scene tasks.
8. Establish post-scene responsibilities for law enforcement personnel and other responders.

### b) Perform final survey of the crime scene

1. Each area identified as part of the crime scene is visually inspected.
2. Account for all evidence collected at the scene.
3. All equipment and materials generated by the investigation are removed from the scene.
4. Any dangerous materials or conditions are reported and addressed.
5. The crime scene is released in accordance with jurisdictional requirements.

### c) Documentation of the crime scene

1. The crime scene case file should contain:
  - initial responder's documentation
  - emergency medical personnel documents
  - entry/exit documentation
  - notes
  - photographs/videos
  - crime scene sketches/diagrams
  - evidence documentation
  - other responders' documentation
  - record of consent form or search warrant
2. Additional forensic/technical reports should be added to the file when they become available.

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## B. Scene safety

### 1. Basic safety measures

Proper safety precautions must be taken when processing a scene. Personnel safety is a primary concern in the field and every effort must be made to ensure that employees are not subjected to dangerous conditions. It is understood, however, that there are situations beyond the control of the supervisor and team personnel. The following general safety guidelines should be followed when possible.

1. All teams must be comprised of at least two people, however, three to four is preferable. **Under no circumstances should one person perform a field investigation.**
2. Teams should have appropriate police support in the field at all times for protection and to liaison with the public and media when necessary.
3. All team personnel must have current OCME identification on their persons at all times while in the field. Marked OCME (shirt and/or jacket) and/or protective apparel must be worn when appropriate or as needed.
4. At no time is a team to place itself in danger. If a scene location or structure is deemed unsafe, STAY OUT! Immediately contact a supervisor and await further instruction.
5. Remain aware of the locations of team members at all times. Keep all lines of communication open, with each other and the laboratory.
6. Exercise caution when handling potentially dangerous items of evidence, *i.e.*, guns, knives, syringes, broken glass, and other similar objects.
7. Universal precautions (human blood and human body fluids/tissues are to be treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens) are to be observed in ALL situations where there is a potential for contact with blood or other potentially infectious material. Blood, other body fluids/tissues, and samples suspected of containing human body fluids/tissues must be considered infectious and must always be treated as a biohazard whether wet or dry. The appropriate personal protective equipment should be utilized. Personal protective equipment is considered appropriate when it does not permit blood or other potentially infectious substances and contaminated materials to pass through and reach work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use.

Wear appropriate gloves when there is a potential for hand contact with blood, other potentially infectious materials, mucous membranes, and non-intact skin; and when handling or touching contaminated items or surfaces.

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Replace gloves if torn, punctured, contaminated, or, if their ability to function as a barrier is compromised. Disposable gloves shall be discarded immediately after use.

Remove garments penetrated by blood or other infectious materials immediately, or as soon as possible.

Wear other appropriate personal protective equipment as necessary (including, but not limited to, face shields, masks, gowns, aprons, scrubs, coveralls, *etc.*).

**If an exposure or injury occurs, immediately contact a supervisor and await instruction(s).**

Criminalists should be familiar with the following publications:

- OSHA Bloodborne Pathogens Standard
- OSHA Publication No. 3130: Occupational Exposure to Bloodborne Pathogens: Precautions for Emergency Responders

8. Each criminalist must be familiar with the proper operation procedures and safety precautions for the equipment and/or reagents used in the field.
9. The use of some reagents are volatile and will release vapors which could become overwhelming and toxic. Ensure that there is appropriate ventilation when possible.
10. Ensure that the work area is well lit when appropriate. Always use artificial lighting when so that important evidence is not overlooked.
12. When in doubt about a situation or condition, contact a supervisor immediately.

## **2. Special safety measures**

### **a) Firearms**

The following guidelines should be followed when a firearm(s) is encountered in the field:

1. ASSUME THAT THE FIREARM IS LOADED AND TREAT APPROPRIATELY.
2. Appropriately document the firearm as found with notes, sketches, and photographs.
3. Inform NYPD personnel, if available, that a firearm is present. If no NYPD officers are present, immediately inform a supervisor and contact the detective or ADA in charge of the case. DO NOT TOUCH OR HANDLE THE FIREARM.
4. With the assistance of NYPD personnel, document the details of the weapon (*e.g.*, make, model, serial number, presence and number of live and/or discharged rounds, *etc.*).

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### b) Hazardous chemicals

Situations may be encountered where hazardous or noxious chemicals are present in the environment or where there is a potential for release of chemicals into the environment. If possible, team personnel should put on a chemical respirator to match the type of chemical exposure as soon as possible. The area should be vacated immediately.

In the event of a chemical spill, the same approach should be utilized. Avoid contact (clothing and/or skin) with the chemicals. The area should be vacated immediately.

In either instance, notify a supervisor of the hazard and call the FDNY immediately (911 emergency). The FDNY communication central stations emergency numbers for each borough are also provided below:

#### EMERGENCY: 911

Bronx: (718) 665-2200  
 Brooklyn (Kings): (718) 636-1700  
 Manhattan (New York): (212) 628-2900  
 Queens: (718) 847-6600  
 Staten Island (Richmond): (718) 727-1100

Keep all staff away from the area until given clearance by the FDNY.

### c) Explosive and highly flammable chemicals

The FARU criminalist(s) may encounter explosives or highly flammable chemicals at a scene. If either of these hazards is encountered, FARU personnel must immediately vacate the area. A supervisor must be notified immediately. If an explosive or explosive device is encountered, immediately contact the NYPD Bomb Squad (emergency 911). If a flammable chemical is discovered, immediately contact the FDNY (emergency 911).

## EMERGENCY 911

An explosion can significantly weaken the integrity of a building to the extent that it may be unsafe for processing. If a request is made that the team process such a location, consult with the NYPD Bomb Squad, FDNY, city building inspectors, and the response team supervisor, for questions regarding safety.

### d) Arson scenes

A structural fire can significantly weaken the integrity of a building to the extent that it may be unsafe for processing. If a request is made that the team process such a location, consult with the FDNY, city building inspectors, and the response team supervisor for questions regarding safety.

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### C. Quality assurance/quality control issues

The importance of the integrity of evidence collected at the crime scene cannot be overstated. Doubt or concern regarding the manner in which evidence was collected and handled will affect its value in the courtroom. To avoid any potential problems, adhere to the following general quality assurance/quality control guidelines.

1. Make sure the Scene Response Log sheet is filled out completely with all of the appropriate information. Record the scene arrival and departure time on the Scene Response Log. All personnel present at the scene must be documented on the Scene Response Log. Note all arrival and departure times for personnel.
2. A Photography Log must be completed for each roll of film.
3. All paperwork must have the FARU case number, date, and criminalist's initials.
4. All items collected must be recorded on an Evidence Log at the time of collection and all field tests and results must be recorded in the notes.

**NOTE:** The lot numbers and dates for all reagents used must be included in the notes.

5. All packages must be sealed with tape, initialed and dated across the seal, marked with the case number and item number, and secured until the evidence can be transferred to NYPD personnel.

**NOTE:** Do not use staples to seal evidence packages.

6. Prior to a scene response, a FARU case number must be reserved for the crime scene run. The appropriate case information must be recorded in the FARU Case Logbook.
7. Appropriate protective attire should be worn at the scene when deemed necessary. Protective clothing should be removed and discarded when moving into a new room or area.
8. All reagents must have passed QC testing and been assigned lot numbers prior to use in the field. If possible, it is advisable to test field reagents immediately prior to a scene response to ensure the reagent reacts appropriately.
9. Adhere to all safety precautions when using chemical reagents in the field.
10. In the event that multiple, smaller teams of criminalists will process a large scene or multiple scenes, the supervisor will determine and coordinate the functions and responsibilities of each team to avoid any duplication or overlap.

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11. An area and receptacle(s) designated for trash and waste generated during the scene processing must be established. All waste must be returned to the OCME for proper disposal.
12. All FARU and Forensic Biology personnel present at the scene must satisfy the appropriate qualifications to be a member of the response team. The member designations and corresponding qualifications are listed below:

**Crime scene criminalist:** A crime scene criminalist will have completed the Crime Scene Training lecture series and successfully completed the written competency test. Also, they will have assisted the processing of a minimum of five (5) external crime scenes. This combination of training and experience make them eligible for crime scene response. A criminalist may take additional procedural competency tests, if required.

**Supervisor:** The criminalist in charge of the scene investigation. The supervisor will ensure that all scene duties and analyses are distributed and completed before departure from the scene. The supervisor will liaison with NYPD personnel, assistant district attorneys, and other investigators at the scene. The supervisor is responsible for the release of any information and/or data to personnel from other agencies.

**Assigned Criminalist:** The criminalist responsible for writing and signing the case report and providing testimony, if required. If not the supervisor, the assigned criminalist works closely with the supervisor at the scene to ensure that all necessary work is completed before departure from the scene.

**Assisting Criminalist:** The criminalist responsible for co-signing the case report and providing testimony if the assigned criminalist is unavailable. This criminalist will assist the supervisor and assigned criminalist at the scene.

**Trainee:** A trainee will have completed the Crime Scene Training lecture series and successfully completed the written competency test. Also, the trainee will be required to successfully complete additional procedural competency tests to further supplement their training. The trainee will also be required to assist at a minimum of five (5) external crime scenes in a support role only. The purpose of this aspect of the training regimen is to properly acquaint the Trainee with appropriate scene protocol and behavior, as well as appropriate investigation procedure. Upon completion of the training requirements, the trainee is eligible for crime scene criminalist status.

**Support staff:** Support staff will have completed the Crime Scene Training lecture series and the written competency test. It is not required for the Support staff to take the procedural competency tests to make them eligible for crime scene response. Their role, under these qualifications, is to assist the members of the response team.

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## D. Preventing contamination

Preventing the contamination of evidence at a crime scene is important. This includes obvious actions such as smoking and eating. Biological substances and other traces from investigators must also be prevented from contaminating a crime scene and collected evidence.

The following guidelines should be followed at a crime scene:

1. Gloves must be changed before the collection of each sample or before handling/touching a different item.
2. Any instrument used in the collection of evidence (*i.e.*, scissors, tweezers, *etc.*) must be cleaned with alcohol (70-100% ethanol) before use. If possible, use disposable razor and scalpel blades for cutting and scraping samples. Always discard used blades into a plastic, puncture resistant biohazard container ("sharp" container) after the collection of each sample.

**NOTE:** Always use a new disposable razor or scalpel blade for each sample.

3. Individual biological stains, despite size, must not be combined, including stains taken from blood spatter patterns or other dispersed blood droplet patterns. A representative sample should be collected from spatter patterns; there is no need to collect every droplet stain if it is a part of a recognizable pattern.
4. Positive/known controls brought to a crime scene for use in field tests must be maintained so that no contamination of the scene or evidence can occur. Positive/known control testing must be done such that no contamination of evidence can occur.

**NOTE:** Bovine (or other animal) blood, if available, should be used as a positive/known control for the presumptive tests for blood.

5. Appropriate protective apparel should be worn when necessary to prevent the contamination of the scene and evidence.

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### III. Crime scene search and evidence recognition

#### A. General approach

The importance of the crime scene investigation cannot be overstated. The manner in which each step is handled can have profound and lasting effects long after the scene investigation. Every crime scene is different and poses unique problems and situations for the criminalist(s) assigned the tasks of processing and/or reconstruction. Therefore, each field investigation must be critically assessed and handled accordingly. There are no “correct,” step-by-step protocols that can be followed. The crime scene criminalist should be familiar with different approaches as described in Kirk (1953), De Forest *et al.* (1983), Fisher (1993), Geberth (1996), and other sources. Experience and expertise must form the basis for a flexible and thorough, scientific scene investigation. This may be assisted with some general guidelines.

1. Obtain and record as much information as possible regarding the scene as found from all initial respondents, including, but not limited to:
  - first officers and other police and/or investigative personnel
  - emergency medical personnel
  - fire department personnel
  - witnesses
  - any other persons present at the scene before the arrival of the unit
2. Access to the scene should be limited to necessary personnel only.
3. Prior to entering the scene, obtain an overview of the scene and current details of the incident from the case detective or other investigative personnel.
4. Enter and obtain an overview of the entire scene. Keep in mind the following:
  - be aware of any evidence that may be on the floor, *e.g.*, footwear impressions, trace evidence, *etc.* and make every effort to avoid altering or destroying the evidence by maintaining a narrow path into and out of the scene
  - walk slowly and carefully and absorb as many details about the scene as possible
  - do not touch or disturb anything on the first pass through the scene to avoid altering or destroying valuable evidence (scene photography must be done before any objects are touched, moved, or collected)
  - in addition to examining obvious locations for evidentiary material, keep an open mind to locations that are not readily obvious such as the ceiling, walls behind doors, door locks and knobs, windows locks and pulls, faucet handles, undersides of furniture, light switches, telephones, dark surfaces (electronic equipment, *etc.*), and other areas which may contain evidence
  - be aware that evidence may be stratified (items placed/touched/moved recently lie on the surface), *e.g.*, clothing on top in the clothes bins, garbage on top in the garbage pail/can, *etc.*

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- remember that the scene may extend beyond the present scope and boundaries
  - note any indications of movement at the scene and attempt to ascertain reasons for the observed movement
  - initiate the process of framing questions (*Who? What? Where? When? How? Why?*) and formulating answers
5. Utilize the thoughts and ideas of the other team personnel. Keep lines of communication open at the scene, however, avoid communication in front of other investigative personnel that may involve untested hypotheses, random thoughts, and intuitive opinions.
  6. Formulate a plan to process the scene effectively and thoroughly. Utilize the capabilities of each team member and assign roles and tasks accordingly. Brief all crime scene personnel prior to entering the scene.
  7. Relevant and significant evidence must be recognized and sorted from the irrelevant and insignificant objects that are always encountered. Remember that every case is different and that some evidence may be important in one case but less important in another.
  8. Evidence that may be easily altered or destroyed should be documented and collected as soon as possible. Scene photography and sketches should be done as soon as possible to eliminate or reduce the possibility of change during the course of the investigation.
  9. ***VISUAL AND OTHER NON-DESTRUCTIVE SEARCH TECHNIQUES MUST ALWAYS BE EMPLOYED BEFORE USING DESTRUCTIVE METHODS.***
  10. ***HIGH-INTENSITY, WHITE LIGHT SOURCES MUST ALWAYS BE USED BEFORE ANY OTHER TYPE OF ENHANCEMENT TECHNIQUE THAT WILL PERMANENTLY ALTER OR DESTROY EVIDENTIARY MATERIAL!***

**NOTE:** Illuminate surfaces with white light at varying angles of azimuth and incidence.

## B. Search methods

Some evidence may not be recognized during the initial phases of a crime scene investigation. Hypotheses and hypothetical reconstructions can assist in searching for additional evidence. It must be kept in mind that a search should not be undertaken until all other evidence has been documented and/or collected. The personnel conducting the search must be instructed properly so that they know exactly what they are looking for, how they should conduct the search, and what actions to do and not to do while searching. Only the minimum number of personnel necessary should conduct a search and only those with prior crime scene or evidence recognition experience should be enlisted. Typically, at least six (6) searchers are recommended for outdoor scenes. Searches must be conducted logically, systematically, and methodically. Several search patterns have been suggested and the type and location of a scene should guide the selection of the search pattern to be used.

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**1. Indoor search patterns****a) Zone, sector, or quadrant search****METHOD:**

1. The area or room to be search is divided into zones or quadrants of equal size.
2. Depending on the size of the zones, one or two searchers will be designated to each zone.
3. Each searcher (or team) thoroughly examines the assigned zone.
4. All discovered evidence must be photographed prior to movement or alteration.
5. Once a zone has been searched by the assigned searcher (or team), the searcher (or team) is assigned a different zone and the search is conducted once more.

**b) Point-to-point search****METHOD:**

**NOTE:** This search method may be used for small, confined areas and when a potential route of travel has been detected or is suspected.

1. Identify key locations or areas within the crime scene (points of entry/exit, location of the victim, location of weapon(s), etc.).
2. Thoroughly examine the pathways or routes that connect the key locations or areas for evidence.

**NOTE:** Be aware of any evidence that may be on the floor, e.g., footwear impressions, trace evidence, etc. and make every effort to avoid altering or destroying the evidence by maintaining a narrow path into and out of the scene.

3. All discovered evidence must be photographed prior to movement or alteration.
4. Every effort should be made to ensure that each location or area should be searched by at least two criminalists (one after the other).

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### c) Clockwise-counterclockwise search

#### METHOD:

1. Two criminalists are assigned to search an area or zone (or the entire scene depending on size).
2. One criminalist is assigned to search in a clockwise direction focusing on the area from waist-level to ceiling. The other criminalist is assigned to search counterclockwise focusing on the area from waist-level to floor.
3. All discovered evidence must be photographed prior to movement or alteration.
4. After each criminalist has search the assigned area, the criminalists reverse roles and the area or zone is searched again.

## 2. Outdoor search patterns

### a) Strip, line, or lane search

#### METHOD:

**NOTE:** Depending on the nature of the scene, it may be helpful to position stakes/string to delineate the lines/lanes to be searched to ensure full coverage.

**NOTE:** It is imperative that the team supervisor is notified immediately upon the discovery of evidence.

**NOTE:** Caution must be exercised when evidence that may be part of a repetitive pattern is discovered (*e.g.*, footwear impressions, blood droplet stains, *etc.*). When evidence such as this is uncovered, a careful examination of the surrounding area should be undertaken for additional evidence that may be part of a trail.

1. Divide the area to be searched into strips or lanes (north/south or east/west).
2. Assign teams to line up shoulder-to-shoulder (typically an arm's length apart, however, the nature of the evidence that is being searched for should dictate the separation between searchers) at the start of a strip or lane.
3. The teams are instructed to travel along the designated strip or lane slowly examining the covered terrain.

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4. When the end of the strip or lane is reached, the team will move to the adjacent strip or lane and slowly travel in the opposite direction examining the covered terrain.
5. The process is repeated until the entire scene has been searched.
6. All discovered evidence must be photographed prior to movement or alteration.

**b) Grid search****METHOD:**

**NOTE:** This method is a variation of the strip, line, or lane search and provides a more thorough search of an area.

**NOTE:** Depending on the nature of the scene, it may be helpful to position stakes/string to delineate the lines/lanes to be searched to ensure full coverage.

**NOTE:** Caution must be exercised when evidence that may be part of a repetitive pattern is discovered (*e.g.*, footwear impressions, blood droplet stains, *etc.*). When evidence such as this is uncovered, a careful examination of the surrounding area should be undertaken for additional evidence that may be part of a trail.

1. Divide the area to be searched into strips or lanes (north/south and east/west).
2. Assign teams to line up shoulder-to-shoulder (typically an arm's length apart, however, the nature of the evidence that is being searched for should dictate the separation between searchers) at the start of a north/south strip or lane.
3. The teams are instructed to travel along the designated strip or lane slowly examining the covered terrain.
4. When the end of the strip or lane is reached, the team will move to the adjacent strip or lane and slowly travel in the opposite direction examining the covered terrain.
5. The process is repeated until the entire scene has been searched.
6. The searchers are then instructed to repeat the process along the east/west strips or lanes.
7. All discovered evidence must be photographed prior to movement or alteration.

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**c) Spiral or circular search****METHOD:**

**NOTE:** This method is useful when there are a limited number of searchers available to search an outdoor scene.

**NOTE:** Caution must be exercised when evidence that may be part of a repetitive pattern is discovered (*e.g.*, footwear impressions, blood droplet stains, *etc.*). When evidence such as this is uncovered, a careful examination of the surrounding area should be undertaken for additional evidence that may be part of a trail.

1. A single searcher (possibly two) is assigned to walk in an ever-decreasing, slightly less-than-concentric circular route from the outside of the scene toward the interior, carefully examining all covered terrain.
2. The process may be reversed once the center of the scene has been reached.
3. All discovered evidence must be photographed prior to movement or alteration.

**d) Point-to-point search****METHOD:**

**NOTE:** This search method may be used for small, confined areas and when a potential route of travel has been detected or is suspected.

1. Identify key locations or areas within the crime scene (points of entry/exit, location of the victim, location of weapon(s), *etc.*).
2. Thoroughly examine the pathways or routes that connect the key locations or areas for evidence.

**NOTE:** Be aware of any evidence that may be on the ground, *e.g.*, footwear impressions, trace evidence, *etc.* and make every effort to avoid altering or destroying the evidence by maintaining a narrow path into and out of the scene.

3. All discovered evidence must be photographed prior to movement or alteration.
4. Every effort should be made to ensure that each location or area should be searched by at least two criminalists (one after the other).

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## IV. Documentation

The documentation of a crime scene or item of physical evidence is critical. Often, scenes are available for just a short time and only limited visits can be made before it is released by the police department or district attorneys office. Once released, the only remaining record is that captured in the notes, sketches, and photographs. Therefore, the importance of accurate and detailed documentation of crime scenes and physical evidence cannot be overemphasized. It is imperative that all generated documentation is retained for inclusion in the case folder.

Two distinct types of documentation exist: passive and active (De Forest, 1992). Passive documentation is a simple process, requiring minimal training and thought processes. It refers to the overall documentation of a crime scene with photography, sketches, or other media. No distinct evidence recognition process occurs before or at this point. The crime scene is being documented as it is found. Active documentation refers to the process by which physical evidence is recorded at a crime scene. It transcends passive documentation by using a scientific thought process to first recognize physical evidence and then document it thoroughly. Rigorous use of the scientific method at a crime scene yields greater thoroughness, objectivity, and flexibility to the investigation. Reconstructive thought processes will yield even greater evidence recognition. The documentation which depends on and occurs after evidence recognition, is active.

### A. Crime scene and evidence notes

The Scene Response Log must be completed when examining a crime scene.

Detailed notes must be made at the crime scene and should include:

- location of the crime scene and the date and time upon entering and exiting
- individuals present at the crime scene
- general condition of the crime scene and physical evidence
- locations, positions, and sizes (measurements) of the following:
  - individual bloodstains and bloodstain patterns
  - pattern impressions in blood, dust, soil, *etc.*
  - trace evidence
  - firearm evidence
  - other physical evidence
- date, time, and location of physical evidence collected

The following worksheets are available for use and can be found in the departmental computer network directories and Appendix D. These forms should be filled out completely, if used, and should supplement, not replace notes.

- Scene Response Log
- Evidence Log
- Photography Log
- Vehicle Processing Log
- Sketch Worksheet
- Case Contact Log

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## B. Crime scene and evidence sketches

Sketching is an integral part of the documentation process. It provides perspective to the overall scene in conjunction with mathematical dimensions. It also serves as a graphical representation of locations where physical evidence is found in relation to its surroundings. Thorough, rough sketches must be prepared of the crime scene and objects at the scene. Positions of collected evidence must be shown in the sketch(es). They must be sufficiently detailed so that final drafts can be prepared later, either by hand or computer-aided drafting and design (CADD) programs. Final diagrams must be clear and understandable. Some scenes may require the use of specialized equipment.

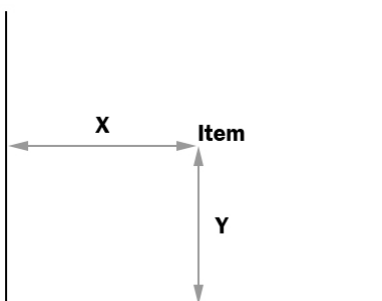
A Sketch Worksheet or graph paper should be used when preparing sketches. The case number, date, and analyst's initials/name must be included on each sketch. A brief description of the area/item being sketched should accompany each sketch. The following sections discuss the different types of sketches and the use of surveying equipment for the documentation of outdoor scenes.

### 1. Measurement techniques

When documenting a crime scene with sketches, it is important to indicate measurements in a manner that will accurately identify an item's position within the scene while not cluttering the sketch. This can be achieved by using rectangular coordinates, baseline measurement, and/or triangulation methods that are recorded in a legend. The following sections briefly describe each measurement technique.

#### a) Rectangular coordinates

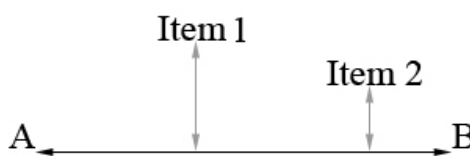
This technique uses measurements taken from two perpendicular lines and/or planes (recorded as XY coordinates) to identify the location of evidence and other significant points in a crime scene. The perpendicular lines/planes are typically stationary, permanent surfaces, *e.g.*, floor, wall, *etc.* This technique is useful for indoor scenes and some outdoor scenes.



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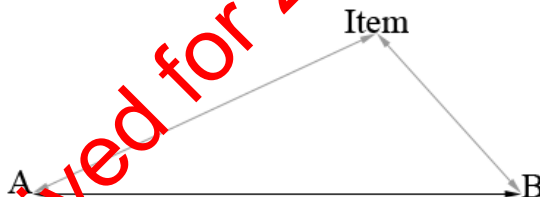
### b) Baseline measurement

A baseline measurement is a measurement along the length of two fixed points (A-B) such as the length of the side of a wall or floorboard. Items are then measured from this baseline at right angles. This method is primarily used to document large, outdoor scenes where no natural baselines exist.



### c) Triangulation

When triangulating an item of evidence, measurements are taken from two fixed, permanent points to each item/point of interest, *e.g.*, corners of a room, natural outcroppings, *etc.* This technique is useful for indoor and outdoor scenes.



## 2. Indoor scenes

For indoor crime scenes, the most common methods of sketch documentation are plan, elevation, and cross-projection sketches. Although any of these methods may be used alone, it is recommended that a combination be used. As a general rule, a cross-projection sketch may be used as an overall documentation method while an elevation or plan sketch may be used as a more detailed form of documentation. It is important to include as much detail in the sketch as possible without cluttering it. Important information and data may be obtained easily from a neat sketch.

**NOTE:** When drawing plan or elevation sketches in conjunction with cross-projection sketches, it is very important to label the area of the scene being sketched so that it can later be related to a specific area of the overall cross-projection sketch.

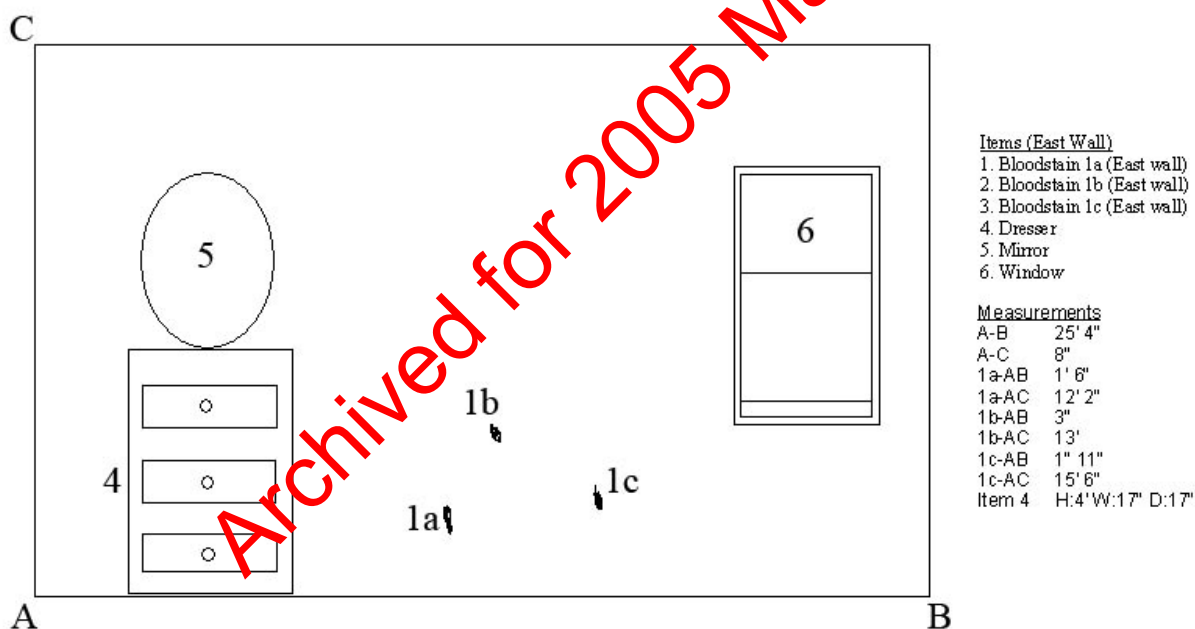
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### a) Plan sketches

A plan sketch is simply an aerial view representation of the scene. This type of sketch is helpful for documenting the relative positions of items in a room. Either the rectangular coordinate or triangulation method of measurement can be used in this type of sketch.

### b) Elevation sketches

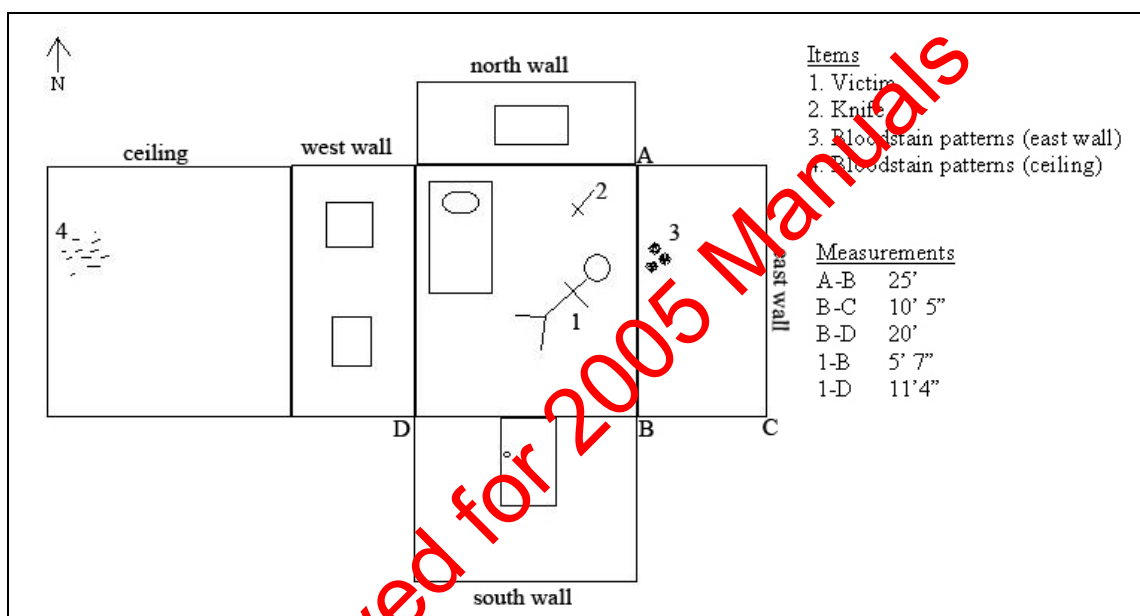
An elevation sketch typically shows the heights of objects from the floor and/or ground. This particularly useful method may be used to document the locations of bloodstains and/or bullet impact marks/holes on walls. Either the rectangular coordinate or triangulation method of measurement can be used in this type of sketch. The figure below shows an example of an elevation sketch (the bloodstains have been recorded using the rectangular coordinate method).



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### c) Cross-projection sketches

A cross-projection sketch is a combination of a plan sketch and elevation sketches. These sketches are drawn as if the walls were folded down and they appear as plan sketches. The ceiling should also be included in this type of sketch. Either the rectangular coordinate or triangulation method of measurement can be used in this type of sketch.



### 3. Outdoor scenes

Generally, outdoor scenes will be drawn in plan and will be measured using either baseline and/or triangulation methods. One difficulty typically confronted when documenting an outdoor scene is the identification of a fixed point of reference that is permanent. This is necessary to re-orient a sketch should the scene need to be revisited. In the event that no fixed point of reference is available, a Global Positioning System (GPS) reading may be taken to provide a "fixed point." GPS readings, however, should be used only in the event no fixed reference point is available or as a supplement to a fixed point because of the inaccuracy of these measurements.

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### a) Surveying equipment

Some outdoor scenes may require the use of surveying equipment to document the differences in elevation of the scene and physical evidence. Shooting scenes in which bullet impact sites occur at various heights and the topography is uneven lend themselves to the use of surveying equipment. A scenario in which an individual was standing in a roadway and fired one round into a building would require the use of surveying equipment for adequate documentation. The position of the shooter and the bullet impact site will likely be at different heights. A level is needed to describe the different heights (*i.e.*, roadway, curb/sidewalk, stairs, *etc.*). The level-transit is equipped with a 360° horizontal circle and vernier for angular measurements (refer to instruction manual). The level-transit can be used for running straight lines or determining line of sight (refer to instruction manual).

#### (1) David White LT8-300P level-transit setup and use

The following section provides brief instructions for the setup and use of the David White LT8-300P level-transit and a leveling rod.

#### METHOD:

1. Set up the tripod. The legs should have about a three (3) foot spread and the tripod head should appear level. If the leg extensions are used, ensure that the locking levers are securely tightened.  
  
If setting up on a smooth floor or paved surface, secure the points of the legs by chipping the concrete or pavement, attaching chains between the legs, or putting a brick in front of each leg.  
  
If setting up in dirt, apply full body weight to each leg to prevent further settlement.
2. Loosen the two clamps on the level-transit (refer to instruction manual). Be sure the telescope lock lever is in the closed position. Turn the leveling screws so that they are up fully.
3. Attach the level-transit to the tripod securely and hand-tighten the tripod mounting stud to the level-transit base.
4. Hang the plumb bob from the tripod using cord or string (refer to instruction manual).
5. Turn down the leveling screws until firm contact is made with the tripod head (until no shifting of the level-transit occurs). DO NOT over tighten the leveling screws.

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6. The level-transit is ready for leveling. It is important that the level-transit be leveled so that the vial bubble remains centered through a 360° rotation. When leveling, DO NOT move or touch the tripod.

Line up the telescope so that it is directly over one pair of leveling screws. Grasp these leveling screws and turn both screws equally and simultaneously in the opposite directions (one clockwise and one counterclockwise) until the vial bubble is centered.

Rotate the telescope 90° over the second pair of leveling screws and repeat the leveling procedure by turning both screws simultaneously in opposite directions.

Shift back to the original position and check the vial bubble. Make minor adjustments with the leveling screws if necessary. Repeat shifting back and forth between both sets of leveling screws (make adjustments as needed) until the vial bubble is centered in both positions.

For a final level check, rotate the telescope over each of the four leveling points to ensure the vial bubble remains centered (every 90°).

DO NOT MOVE OR TOUCH THE TRIPOD ONCE THE LEVEL HAS BEEN SET UNTIL ALL MEASUREMENTS HAVE BEEN COMPLETED.

7. Place the leveling rod at the desired object. Use a leveling device to ensure that the leveling rod is being held perpendicular to the surface (upright). Aim the telescope at the leveling rod and sight first along the top of the telescope tube. Then look through the telescope and adjust the focus. Take and record the reading from the leveling rod using the horizontal line of the crosshairs. If necessary, record the angular position from the 360° horizontal circle and vernier.
8. Reposition the telescope and leveling rod for each point or object and record the appropriate measurement(s).

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### C. Crime scene and evidence video

The recording of a crime scene with a digital video camera can be a useful supplement to photographic documentation. The camera's ability to record audio and video allows for commentary like measurements and other descriptive information. The chemiluminescence produced from the reaction of luminol and blood can also be recorded in real time as the reagent is applied. Video recording should not supplant 35mm photography because the camera does not have sufficient resolution. Rather, it should be used for overall documentation that supplements high resolution digital or 35mm photography.

The following are general guidelines when using a video camera at a crime scene.

1. Upon arrival at an indoor scene, record the outside of the building/residence prior to entry. If possible, include a visible "marker" (*i.e.*, the street number on the building).
2. Record along all outside areas surrounding the building. If possible, include street signs as this helps to provide cross-street references for the location.
3. Maintain an open microphone. This facilitates the narration of information while moving through the scene.
4. Verbally indicate the date, time, and location at the beginning and the end of the recording. State the date, time, and location being recorded at frequent and regular intervals throughout the recording.
5. Provide a thorough commentary describing those areas/items being recorded with as much descriptive information as possible.

**NOTE:** Remember; use discretion if the microphone is kept open throughout the course of the recording, particularly when hypothesizing about observations. It is inappropriate for information to be overheard by non-response team personnel at this stage of the investigation. This will help prevent any potential misinformation or erroneous interpretation(s).

Also, the investigator should refrain from making any inappropriate comments or criticisms. This could prove potentially embarrassing when the tape is reviewed at a later time.

6. Movement of the camera should be slow in order to ensure a steady picture. A general rule of thumb is; any item(s) in the field of view should remain there approximately 7-8 seconds. This will help increase the steadiness of the recording.

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7. When recording a close-up of an item/object or area, zoom in appropriately while indicating verbally the identity of the item.
8. Move slowly from one area to the next. Indicate the area being exited and the area being entered.

### 1. Basic Sony Digital Camcorder (DSR-PD150) Operation

#### METHOD:

1. Install the microphone supplied by unscrewing the microphone holder screw on the top of the video camera and opening the cover. Place the microphone into the holder facing upward, close the cover, and tighten the screw. Connect the microphone plug into the "INPUT1" connector.
2. Install the battery pack by lifting the viewfinder and inserting the battery pack into the slot on the back of the video camera. Slide the battery pack down in the slot until it is locked into place.
3. To insert a videocassette, open the cassette compartment by pressing the blue button on the eject switch and sliding the switch down. Insert the cassette into the compartment, with the cassette window facing out and the write-protect tab facing upward. Close the cassette compartment by pressing the "PUSH" mark on the cassette compartment door.
4. Begin recording by pressing the green button on the "POWER" dial at the rear of the camera and rotate the switch to "CAMERA." Press the "REC START/STOP" button on the camera (in the center of the power switch or on the top of the camera). Press the "REC START/STOP" button again to stop recording.
5. To review the recording, rotate the power switch to "VCR." Press the rewind button ("REW") located on the top of the camera to rewind the tape. Once the tape is rewound, press the "PLAY" button located on the top of the camera.

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## D. Crime scene and evidence photography

Photography is an invaluable tool available for the accurate documentation of crime scenes and physical evidence. Properly used, it can provide highly detailed representations of the actual condition of a scene or evidence. Both black/white and color photography can be used. Black/white films can be used to yield low, medium, and high contrast images depending on the nature of the evidence.

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet before taking the first picture. It is important that the log be maintained as accurately as possible at the time photographs are taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

The first frame in each roll of film must be a photograph of the header of the Photography Log.

Each photography log must be kept with the set of corresponding photographs in the case folder.

### 1. Fundamental terms and techniques

Film speed is the measure of the light gathering ability of a film (usually expressed in ISO) and is directly correlated to the grain size. “Faster” films have more light gathering power but have lower resolution (high ISO, *e.g.*, 400). “Slower” speed films generally have higher resolution and less grain. “Slower” films require more light but have better resolution (low ISO, *e.g.*, 100). They generally have excellent resolution, even after enlargement, and are generally the choice film for crime scene and evidence photography.

Aperture refers to the size (diameter) of the adjustable lens opening and is expressed numerically as *f*-number. An *f*-stop is a calibrated position on a lens. Changing the lens aperture by one click in either direction generally changes the light reaching the film by a factor of two. In other words, the light is either doubled or halved depending on the direction. The largest aperture that a lens can achieve is lens speed. The following equation shows the relationship between *f*-number, focal length, and aperture size:

$$f\text{-number} = \frac{\text{focal length of lens}}{\text{diameter of lens aperture}}$$

Depth of field is the range of distances along the axis of a camera lens through which an object will produce a distinct image. In other words, as the depth of field increases, more of a three dimensional object will come into focus. As the size of the aperture increases (“opening the lens”), the *f*-number decreases, and less light is required for an exposure. The depth of field in this instance will also decrease. As the aperture size decreases (“stopping down the lens”), the *f*-number increases, more light is required, and the depth of field increases.

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Shutter speed refers to the time of an exposure (amount of time the shutter remains open on one frame) and is expressed in seconds or inverse fractions of a second (*e.g.*, 60=1/60).

Exposure refers to the amount of light that reaches the film in one frame and is governed by two factors: effective shutter speed and aperture. These two variables directly control the quantity of light reaching the film. Generally, both are marked in increments designed to increase or decrease the light by a factor of two. In other words, when the shutter speed is changed from 1/60 second to 1/125 second, the light is halved. Conversely, when the *f*-stop opens from *f*/11 to *f*/8, the light is doubled.

Exposure bracketing is done when critical photographs of a subject containing both light and dark areas are required. Here, the exposure reading by the camera's internal light meter may be "fooled." Simplified bracketing involves the changing of either the aperture or shutter speed to allow variations to be done (*e.g.*, altering the *f*-stop from *f*/11 to *f*/8 changes the exposure by one full stop). Many modern cameras have an exposure compensation feature that allows the photographer to bracket the exposure in fractions of a stop without having to alter either the aperture or shutter speed manually.

Films are balanced for a given type of illumination. If the film and illumination are incorrectly matched, color shifts will occur. The film must be balanced for the illumination. "Daylight" film (Type D) is balanced for sunlight and electronic flash. The Kodak Ektachrome 100 color reversal film is Type D. Tungsten film (Type T) is balanced for many floodlights and filament lamps. It is important that the correct film be used with the available lighting. Photographs should not be taken under fluorescent lighting without color correction filtration.

Illumination of a crime scene or item of evidence is extremely critical and plays an important role in determining the quality of the resultant photograph. Uncontrolled lighting produces undesirable photographs of limited value. Therefore, when photographing crime scenes or evidence, it is critical that the light is controlled. Floodlights provide the best illumination control. These lamps can be positioned so that many different angles can be achieved, from even illumination of the subject to the shadowing and highlighting of selected features. Ambient light is uncontrolled and far from ideal for evidentiary photography. The use of ambient light alone should be discouraged.

Electronic flash is the most common, portable system of illumination. With experience, a photographer can exert sufficient control using a flash system. One drawback of the electronic flash is that a "preview" of the lighting is not available before the photograph is taken. Thus, the effects of shadowing and specular reflections will be unknown until the photographs are developed. With a floodlight system, these features can be observed through the viewfinder and corrections can be made beforehand.

Establishing photography, a term used by the entertainment industry, refers to photographs that "establish" the overall scene. Establishing photographs present an overview of the crime scene or evidence without focusing on fine detail. These photographs show the relationship of various

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items of evidence and objects within a scene or the locations of individual items or stains on a piece of evidence.

Close-up photography is used to focus on a particular item or stain pattern to show greater detail. These photographs allow an independent investigator to observe the detail without having to see the evidence or scene for themselves. Generally, such field photographs are limited to 1:1 with most macro lenses.

Photomicrography is used to document items of trace evidence such as hair, fibers, *etc.* To photograph these subjects, use either a stereo microscope for moderate magnification (0.7X to 70X) or a compound light microscope for higher magnification (40X to 1000X).

Sectoring is used to document large areas of detail (*e.g.*, bloodstained wall). By dividing large areas into zones or “sectors,” both the overall larger pattern and the detail can be captured. This is done with a combination of establishing and close-up photographs, both of which must be taken, to relate the sectors.

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## 2. Nikon professional SLR camera equipment

All crime scenes and evidence must be photographed using 35mm format. For general photography, slide film (Kodak Ektachrome 100 EPZ-36 Color Reversal Film) should be used. Other film is recommended for specialized techniques (*e.g.*, luminol), subject matter where contrast is critical, or when prints are required (*e.g.*, comparison of pattern impressions).

The 35mm SLR (single lens reflex) cameras used for documentation are the Nikon F4S, Nikon F5, Nikon F3, and Nikon F100. These cameras afford ease of use while providing high quality photographs. The following sections provide brief methods for the operation of these cameras and several Nikon electronic flash units. A section is also included for using the Nikon D100 digital SLR camera.

These are general guidelines to help provide a quick start-up for functional usage of the Nikon camera systems. Given various scene conditions (*e.g.*, lighting) and types of physical evidence, deviations from these methods may be necessary to obtain the best photographic documentation possible. Additional accessories are available for many different situations (*e.g.*, tripods, remote trigger cords, waist-level viewfinders, zoom lenses, teleconverters, *etc.*).

Consult with the NYC OCME Department of Forensic Imaging for advice and assistance with unusual photographic requirements.

THOROUGHLY READ THE INSTRUCTION MANUAL FOR EACH PIECE OF EQUIPMENT OR ACCESSORY BEFORE ADVANCED USE.

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### a) Nikon 35mm film SLR cameras

#### (1) Basic Nikon F3 operation

##### METHOD:

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet BEFORE taking the first picture. It is important that the log be maintained as accurately as possible at the time each photograph is taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

ALWAYS PLACE SCALES IN PHOTOGRAPHS. The first frame in each roll of film must be a photograph of the header of the Photography Log.

1. Mount the desired lens on the camera. Typical lenses are the AF Micro Nikkor 60mm (for overall, close-up, and 1:1 photographs) and the AF Nikkor 28-85mm (for moderate telephoto, normal, and wide-angle photographs). Mounting is done by removing the rear lens cap and camera body cap, placing the lens into position (align the white dot on the camera body with the white line on the lens), and twisting it counterclockwise until it securely locks into place.

To remove the lens, press the lens release button found directly to the left of the lens and turn the lens clockwise.

2. Turn the camera on by rotating the power switch (at the film advance lever) until the red dot is visible. Check the battery power to ensure the camera has sufficient power to operate. This is done by lightly pressing the shutter release and confirming that the shutter speed is visible in the LCD. If the shutter speed is not visible, replace the camera batteries.

Refer to the Nikon F3 instruction manual for the proper method of battery installation.

3. To set the film speed, lift up the ISO film speed dial and rotate until the white dot corresponds with the proper film speed. To load film into the F3, slide the back lock lever in the direction shown and lift the film rewind knob to open the camera back. Insert the film cartridge properly and pull the film leader across the camera and insert it into a slot in the film take-up spool. Wind the film advance lever to advance film onto the take-up spool. Close the camera back. Fully depress the shutter release button and continue to make blank exposures until the frame counter shows "1."

If the film does not advance, open the camera back, remove the film, and start again.

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4. Position the item(s) to be photographed within the viewfinder focus brackets. Fill nearly the entire frame with the subject matter.
5. Focus the item(s) manually using the focus ring on the lens.
6. Adjust the lens aperture and the shutter speed until the correct exposure is obtained. This is determined by presence of both the - and + symbols in the viewfinder LCD above the M (upper left corner). The presence of only the - or the + shows an underexposure and overexposure, respectively.
7. To take the photograph, simply press the shutter release button.
8. Film advance will stop automatically at the end of the roll (film advance lever stops working). To rewind the film, turn the camera upside down and press the rewind button to disengage the film sprocket drive. Turn the camera right side up and lift the film rewind crank (in the film rewind knob). Turn the crank in the direction of the arrow (clockwise) until the tension lessens. Continue to turn for approximately two rotations (to wind the leader into the cartridge).
9. To remove the film from the camera, slide the camera back lock lever and lift the film rewind knob. The camera back will open. Remove the film from the camera and close the back.

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## (2) Basic Nikon F4S operation

### METHOD:

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet BEFORE taking the first picture. It is important that the log be maintained as accurately as possible at the time each photograph is taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

ALWAYS PLACE SCALES IN PHOTOGRAPHS. The first frame in each roll of film must be a photograph of the header of the Photography Log.

1. Mount the desired lens on the camera. Typical lenses are the AF Micro Nikkor 60mm (for overall, close-up, and 1:1 photographs) and the AF Nikkor 28-85mm (for moderate telephoto, normal, and wide-angle photographs). Mounting is done by removing the rear lens cap and camera body cap, placing the lens into position (align the white dot on the camera body with the white line on the lens), and twisting it counterclockwise until it securely locks into place.

To remove the lens, press the lens release button found directly to the left of the lens and turn the lens clockwise.

2. Check the battery power to ensure the camera has sufficient power to operate. This is done by finding the battery check button at the bottom left of the rear panel of the camera. When this button is pressed, both LEDs to the right of the button should light to show sufficient power. If only one or neither LED go on, replace the camera batteries.

Refer to the Nikon F4S instruction manual for the proper method of battery installation.

3. To set the film speed, press the lock release button and set the film speed index at DX (if using DX coded film, otherwise, set the appropriate film ISO on the dial). To load film into the F4S, slide the back lock lever in the direction shown and lift the film rewind knob to open the camera back. Insert the film cartridge properly and pull the film leader across to the red film index mark. Make sure the film is positioned with no slack and close the camera back. Fully depress the shutter release button. This will automatically advance the film to the first frame.

If the film does not advance, open the camera back, remove the film, and start again.

4. Set the focus mode, on the front left of the camera below the lens release button, to S (Single Servo Autofocus).

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5. Set the exposure mode, on the top right of the camera, to A (Aperture-Priority Auto). Set the *f*-stop on the lens to the desired value.
6. Set the metering system selector, on the top right of the viewfinder, to Matrix (refer to the F4S instruction manual for the Matrix symbol).
7. Set the film advance mode, at the shutter release button, to S (Single frame).
8. Position the item(s) to be photographed within the viewfinder focus brackets. Fill nearly the entire frame with the subject matter.
9. To focus the item(s) in the Single Servo Autofocus mode, depress the shutter release button slightly. A small green light along the top edge of the field, slightly to the right within the viewfinder, will light up indicating that the item being viewed is in focus. If focus is not obtained, a red triangle on either side will be present instead.

If the image is out of focus, a red triangle will appear and refocusing will be required. This is done by releasing the shutter release button and starting anew.

When the item to be photographed has one predominant color occupying the center of the camera's viewfinder field, the camera may have a difficult time focusing due to a lack of contrast. When this happens, focus on an item off-center which provides contrast, enabling the camera to focus properly. Then move the camera to its original center of field, maintaining slight depression of the shutter release button; be careful not to alter the focus (if the image is out of focus during this movement the red triangle will reappear (showing an out-of-focus condition)). The photograph can now be taken.

10. To take the photograph, simply press the shutter release button.
11. Film advance will stop automatically at the end of the roll. To rewind the film, turn the film rewind levers marked R1 and R2 (after pushing their respective lock release buttons at the base of each lever). The film will rewind.

During film rewind, the red LED above R2 blinks, the frame counter counts backwards, and the rewind knob turns. After completion of rewinding, the red LED should not be lit.

12. To remove the film from the camera, slide the camera back lock lever and lift the film rewind knob. The camera back will open. Remove the film from the camera and close the back.

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### (3) Basic Nikon F5 operation

#### METHOD:

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet BEFORE taking the first picture. It is important that the log be maintained as accurately as possible at the time each photograph is taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

ALWAYS PLACE SCALES IN PHOTOGRAPHS. The first frame in each roll of film must be a photograph of the header of the Photography Log.

1. Mount the desired lens on the camera. Typical lenses are the AF Micro Nikkor 60mm (for overall, close-up, and 1:1 photographs) and the AF Nikkor 28-85mm (for moderate telephoto, normal, and wide-angle photographs). Mounting is done by removing the rear lens cap and camera body cap, placing the lens into position (align the white dot on the camera body with the white line on the lens), and twisting it counterclockwise until it securely locks into place.

To remove the lens, press the lens release button found directly to the left of the lens and turn the lens clockwise.

2. Turn the camera on by rotating the power switch to ON. Check the battery power to ensure the camera has sufficient power to operate. This is done by ensuring that the full battery icon is present in the top LCD panel. If the battery icon is only partially full, blinking, or not present, replace the camera batteries.

Refer to the Nikon F5 instruction manual for the proper method of battery installation.

3. To set the film speed, press the ISO button and rotate the Main-Command dial until DX appears in the rear LCD panel (if using DX coded film, otherwise, set the appropriate film ISO so that it appears in the rear LCD panel). To load film into the F5, slide the back lock lever in the direction shown and lift the film rewind knob to open the camera back. Insert the film cartridge properly and pull the film leader across to the red film index mark. Make sure the film is positioned with no slack and close the camera back. Fully depress the shutter release button. This will automatically advance the film to the first frame.

If the film does not advance, open the camera back, remove the film, and start again.

4. Set the focus mode, on the front left of the camera below the lens release button, to S (Single Servo Autofocus).

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5. Set the exposure mode by pressing the MODE button and rotating the Main-Command dial to A (Aperture-Priority Auto). Set the  $f$ -stop on the lens to the desired value.
6. Set the metering system selector, on the top right of the viewfinder, to Matrix (refer to the F5 instruction manual for the Matrix symbol).
7. Set the film advance mode by pressing the lock release, at the film rewind knob, and rotating the film advance mode dial to S (Single frame).
8. Position the item(s) to be photographed within the viewfinder focus brackets. Fill nearly the entire frame with the subject matter.
9. To focus the item(s) in the Single Servo Autofocus mode, depress the shutter release button slightly. A small green light along the top edge of the field, slightly to the right within the viewfinder, will light up indicating that the item being viewed is in focus. If focus is not obtained, a red triangle on either side will be present instead.

If the image is out of focus, a red triangle will appear and refocusing will be required. This is done by releasing the shutter release button and starting anew.

When the item to be photographed has one predominant color occupying the center of the camera's viewfinder field, the camera may have a difficult time focusing due to a lack of contrast. When this happens, focus on an item off-center which provides contrast, enabling the camera to focus properly. Then move the camera to its original center of field, maintaining slight depression of the shutter release button; be careful not to alter the focus (if the image is out of focus during this movement the red triangle will reappear (showing an out-of-focus condition). The photograph can now be taken.

10. To take the photograph, simply press the shutter release button.
11. Film advance will stop automatically at the end of the roll. To rewind the film, open the film rewind button 1 cover and press the button. Then turn the film rewind lever 2 while pressing the lock release. The film will rewind.

During film rewind, the red LED above rewind lever 2 blinks, the frame counter counts backwards, and the rewind knob turns. After completion of rewinding, the red LED turns off.

12. To remove the film from the camera, slide the camera back lock lever and lift the film rewind knob. The camera back will open. Remove the film from the camera and close the back.

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#### (4) Basic Nikon F100 operation

##### METHOD:

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet BEFORE taking the first picture. It is important that the log be maintained as accurately as possible at the time each photograph is taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

ALWAYS PLACE SCALES IN PHOTOGRAPHS. The first frame in each roll of film must be a photograph of the header of the Photography Log.

1. Mount the desired lens on the camera. Typical lenses are the AF Micro Nikkor 60mm (for overall, close-up, and 1:1 photographs) and the AF Nikkor 28-85mm (for moderate telephoto, normal, and wide-angle photographs). Mounting is done by removing the rear lens cap and camera body cap, placing the lens into position (align the white dot on the camera body with the white line on the lens), and twisting it counterclockwise until it securely locks into place.

To remove the lens, press the lens release button found directly to the left of the lens and turn the lens clockwise.

2. Turn the camera on by rotating the power switch to ON. Check the battery power to ensure the camera has sufficient power to operate. This is done by ensuring that the full battery icon is present in the top LCD panel. If the battery icon is only partially full, blinking, or not present, replace the camera batteries.

Refer to the Nikon F100 instruction manual for the proper method of battery installation.

3. To set the film speed, press the ISO button and rotate the Main-Command dial until **DX** appears in the rear LCD panel (if using DX coded film, otherwise, set the appropriate film ISO so that it appears in the LCD panel).
4. To load film into the F100, slide the back lock lever down while pressing the camera back lock release. This should open the camera back. Insert the film cartridge properly and pull the film leader across to the red film index mark. Make sure the film is positioned with no slack and close the camera back. Fully depress the shutter release button. This will automatically advance the film to the first frame.

If the film does not advance, open the camera back, remove the film, and start again.

5. Set the focus mode, on the front left of the camera below the lens release button, to S (Single Servo Autofocus).

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6. Set the exposure mode by pressing the MODE button and rotating the Main-Command dial to A (Aperture-Priority Auto). Set the *f*-stop on the lens to the desired value.
7. Set the metering system selector, on the top right of the viewfinder, to Matrix (refer to the F100 instruction manual for the Matrix symbol).
8. Set the film advance mode by pressing the lock release, located on the left side of the camera, and rotating the film advance mode dial to S (Single frame).
9. Position the item(s) to be photographed within the viewfinder focus brackets. Fill nearly the entire frame with the subject matter.
10. To focus the item(s) in the Single Servo Autofocus mode, depress the shutter release button slightly. A small green light, on the bottom left within the viewfinder, will light up indicating that the item being viewed is in focus. If focus is not obtained, a red triangle on either side will be present instead.

If the image is out of focus, refocusing will be required. This is done by releasing the shutter release button and starting anew.

When the item to be photographed has one predominant color occupying the center of the camera's viewfinder field, the camera may have a difficult time focusing due to a lack of contrast. When this happens, focus on an item off-center which provides contrast, enabling the camera to focus properly. Then move the camera to its original center of field, maintaining slight depression of the shutter release button; be careful not to alter the focus (if the image is out of focus during this movement the red triangle will reappear (showing an out-of-focus condition). The photograph can now be taken.

11. To take the photograph, simply press the shutter release button.
12. Film advance will stop automatically at the end of the roll. To rewind the film, press the two film rewind buttons down simultaneously and hold for approximately 1 second (refer to Nikon F100 instruction manual for the location of rewind buttons). The symbol "o \_ \_" will flash in the top left corner of the LCD display for the duration of the rewind process. When the film is completely rewound, the frame counter will show a blinking "E."
13. To remove the film from the camera, slide the back lock lever down while pressing the camera back lock release. The camera back will open. Remove the film from the camera and close the back.

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## b) Nikon digital SLR cameras

### (1) Basic Nikon D100 operation

#### METHOD:

Photography Logs must be used for all photographic documentation. All pertinent information should be filled out on the sheet BEFORE taking the first picture. It is important that the log be maintained as accurately as possible at the time each photograph is taken. This will help ensure an organized and systematic collection and analysis of the photographic documentation.

Be sure that the D100 EN-EL3 battery unit is fully charged before use. Refer to the D100 quick start guide or the D100 guide to digital photography for battery recharging instructions.

NOTE: The Nikon SB-20, SB-26, SB-27, SB-28, SB-21B and SB-29 Speedlights can be used with the Nikon D100 digital SLR camera. However, if using these Nikon Speedlights with the D100, TTL metering cannot be used. The *f*-stop on the flash must be set manually in order to achieve the appropriate exposure and exposure bracketing is recommended to achieve the best exposure possible. Refer to the particular Nikon Speedlight instruction manual for manual flash operation procedures.

ALWAYS PLACE SCALES IN PHOTOGRAPHS. The first frame in each roll of film must be a photograph of the header of the Photography Log.

1. Mount the desired lens on the camera. Typical lenses are the AF Micro Nikkor 60mm (for overall, close-up, and 1:1 photographs) and the AF Nikkor 28-85mm (for moderate telephoto, normal and wide-angle photographs). Mounting is done by removing the rear lens cap and camera body cap, placing the lens into position (align the white dot on the camera body with the white line on the lens), and twisting it counterclockwise until it securely locks into place.

To remove the lens, press the lens release button found directly to the left of the lens and turn the lens clockwise.

2. Insert the memory card. Be sure that you are using either a CompactFlash type I or II card, or a microdrive card. While the camera is off, unlatch the card-slot cover. Insert the memory card with the rear label toward the camera monitor. Slide the card in until it is fully seated in the contacts on the back of the slot. Close the card slot cover.
3. Turn the camera on by rotating the power switch to ON. Check the battery power to ensure the camera has sufficient power to operate. This is done by ensuring that the full battery icon is present in the top LCD panel. If the battery icon is blinking, or not present, recharge the camera battery.

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Refer to the Nikon D100 instruction manual for the proper method of battery installation and recharging.

4. Format the memory card. This is done by pressing the format buttons (exposure compensation button and LCD illuminator button) simultaneously for approximately 2 seconds. A blinking “For” will appear in the frame count screen on the top LCD. Pressing down the two format buttons a second time will format the memory card. During formatting, the letters “For” will flash in the frame-count display. Do not remove the card or power off the camera during the formatting process. When formatting is complete, the frame-count will display the number of photographs that can be recorded on the CompactFlash card being used (this number can vary based on the storage capacity of the memory card being used as well as the camera resolution and image quality settings).
5. To set the sensitivity (digital equivalent of ISO film speed), rotate the function dial located on the left side of the camera to the ISO setting. The main command dial (located on the back of the camera just below the top LCD display) should then be rotated until an ISO equivalent of 200 is selected.
6. Set the shooting mode to single frame. This is done by pressing the shooting mode dial lock located on the top left of the function dial. The shooting mode dial can then be rotated and set to “S”.
7. Set the focus mode, on the front left of the camera below the lens release button, to S (Single Servo Autofocus).
8. Set the white balance to automatic. Rotate the function dial to “WB”. Rotate the main command dial until an “A” (automatic) is displayed on the top LCD.
9. Set the image quality to JPEG-Fine. This is achieved by rotating the function dial to the “QUAL” setting. The main command dial can then be rotated until JPEG-Fine is displayed on the top LCD display.
10. Set the image size to large. While the function dial is on the “QUAL” setting, rotate the sub-command dial (located on the front of the camera just below the shutter button) until “L” appears on the top LCD display.
11. Set the autofocus mode to single-area autofocus. Rotate the function dial to the “[+]” position. The main command dial can then be rotated until the empty bracket “[ ]” is displayed on the top LCD.
12. Set the exposure mode by rotating the function dial to A (Aperture-Priority Auto). The f-stop on the lens can be set to the desired value by rotating the sub-command dial.

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13. Position the item(s) to be photographed within the viewfinder focus brackets. Fill nearly the entire frame with the subject matter.
14. To focus the item(s) in the Single Servo Autofocus mode, depress the shutter release button slightly. A small green light on the bottom left within the viewfinder, will light up indicating that the item being viewed is in focus.

If the image is out of focus, refocusing will be required. This is done by releasing the shutter release button and starting anew.

When the item to be photographed has one predominant color occupying the center of the camera's viewfinder field, the camera may have a difficult time focusing due to a lack of contrast. When this happens, focus on an item off-center which provides contrast, enabling the camera to focus properly. Then move the camera to its original center of field, maintaining slight depression of the shutter release button; be careful not to alter the focus. If the image is out of focus during this movement the green light on the bottom left of the viewfinder will blink, indicating an out-of-focus condition. Once the object is in focus, the photograph can be taken.

15. To take the photograph, simply press the shutter release button.
16. To play photographs back, press the monitor button located on the top and to the left of the back LCD. To scroll through photographs in the order recorded, press the multi selector button down.
17. Once the Digital recording media is full and no more exposures are available, the digital images need to be transferred to a computer or laptop. A new CompactFlash card may also be inserted should additional photos be required.

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### c) Nikon electronic flashes

#### (1) Electronic flashes for the Nikon F4S, F5, and F100 cameras

Electronic flash can be used to provide artificially, daylight balanced illumination under which scenes or physical evidence can be photographed. Several electronic flashes are available for these two cameras. The SB-20, SB-26, SB-27, and SB-28 Speedlights are designed for general use. The SB-21B and SB-29 electronic flashes are designed for close-up and 1:1 photography.

NOTE: The Nikon SB-20, SB-26, SB-27, SB-28, SB-21B, and SB-29 Speedlights can be used with the Nikon D100 digital SLR camera. However, if using these Nikon Speedlights with the D100, TTL metering cannot be used. The *f*-stop on the flash must be set manually in order to achieve the appropriate exposure and exposure bracketing is recommended to achieve the best exposure possible. Refer to the particular Nikon Speedlight instruction manual for manual flash operation procedures.

#### (a) Basic Nikon Autofocus Speedlight SB-20 operation

##### METHOD:

1. Make sure fresh batteries are in the unit before use. Refer to the SB-20 instruction manual for proper battery installation.

A possible alternative is to use a rechargeable battery power pack. These units give the user repeated flash over an extended time period and can be recharged. An example of such a unit is the Turbo Battery by Quantum. Refer to the battery's instruction manual for proper attachment to the flash unit and recharging. The instructions may vary depending upon which battery unit is used.

2. To attach the flash to the camera, turn the mounting foot locking wheel (at the bottom of the flash unit) clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Adjust the flash head, using the bounce angle set knob, to zero (0°). This is found on the right-hand side of the flash unit. Adjust the bounce angle to 0.7° if the reproduction ratio is 1:2 or greater.

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6. Rotate the zoom set ring to the desired position:  
W (wide) for wide angle lenses <28mm  
N (normal) for normal lenses 35-60mm  
T (telephoto) for telephoto lenses >80mm

The zoom set ring is found on the left side of the unit opposite the bounce angle set knob.

Adjust the distance scale selector (in the lower right-hand corner of the flash) to correspond with the zoom set ring.

7. Set the flash unit to TTL (Through the Lens) metering. This is found on the back of the flash near the top.
8. To ensure proper flash function when in TTL mode, align the film speed index to the film ISO being used. This button is found on the back left of the flash.
9. Turn the power switch to the ON or STBY position.
10. To read the proper shooting distance range, make sure the distance scale selector button (in the back lower right-hand corner of the flash) is set to the corresponding letter in the zoom indicator window. Read the proper shooting distance range in the rear LCD panel to ensure that the flash can supply sufficient illumination.

Make sure when using film with an ISO of 100, set the film speed index to 100. For films with an intermediate film speed, set the film speed index to the closest value.

11. Before taking the photograph ensure that the flash unit is charged and ready for operation. This is done by looking through the viewfinder and slightly depressing the shutter release button. If the unit is ready, a small ready-light in the shape of a red lightning bolt will be present and a red READY light on the back of the flash will be lit. If these indicators are absent, the unit will not function properly when the photograph is taken.
12. Take the photograph.

NOTE: Another way to use the SB-20 is by removing it from the camera body and attaching a flash extension cord (Nikon SC-17). The advantage is that the photographer can easily vary the position of the flash to employ different flash angles. This is helpful in reducing light reflectance.

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**(b) Basic Nikon Autofocus Speedlight SB-26 operation**

1. Make sure fresh batteries are in the unit before use. Refer to the SB-26 instruction manual for proper battery installation.

A possible alternative is to use a rechargeable battery power pack. These units give the user repeated flash over an extended time period and can be recharged. An example of such a unit is the Turbo Battery by Quantum. Refer to the battery's instruction manual for proper attachment to the flash unit and recharging. The instructions may vary depending upon which battery unit is used.

2. To attach the flash to the camera, turn the mounting foot locking wheel (at the bottom of the flash unit) clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Adjust the flash head, using the bounce angle set knob, to zero (0°). Adjust the bounce angle to -7° if the reproduction ratio is 1:2 or greater.
6. Set the flash unit to TTL (Through the Lens) metering. This is on the back of the flash.
7. Turn the power switch to the ON or STBY position.
8. Read the proper shooting distance range in the rear LCD panel to ensure that the flash can supply sufficient illumination.
9. Before taking the photograph ensure that the flash unit is charged and ready for operation. This is done by looking through the viewfinder and slightly depressing the shutter release button. If the unit is ready, a small ready-light in the shape of a red lightning bolt will be present and a red indicator light on the back of the flash will be lit. If these indicators are absent, the unit will not function properly when the photograph is taken.
10. Take the photograph.

NOTE: Another way to use the SB-26 is by removing it from the camera body and attaching a flash extension cord (Nikon SC-17). The advantage is that the photographer can easily vary the position of the flash to employ different flash angles. This is helpful in reducing light reflectance.

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**(c) Basic Nikon Autofocus Speedlight SB-27 operation**

1. Make sure fresh batteries are in the unit before use. Refer to the SB-27 instruction manual for proper battery installation.
2. To attach the flash to the camera, turn the mounting foot locking wheel (at the bottom of the flash unit) clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Position the flash head in the horizontal position.
6. Set the flash unit to TTL (Through the Lens) metering. This is on the back of the flash.
7. Turn the power switch to the AUTO position.
8. Read the proper shooting distance range on the rear LCD panel to ensure that the flash can supply sufficient illumination.
9. Before taking the photograph ensure that the flash unit is charged and ready for operation. This is done by looking through the viewfinder and slightly depressing the shutter release button. If the unit is ready, a small ready-light in the shape of a red lightning bolt will be present and a red indicator light on the back of the flash will be lit. If these indicators are absent, the unit will not function properly when the photograph is taken.
10. Take the photograph.

NOTE: Another way to use the SB-27 is by removing it from the camera body and attaching a flash extension cord (Nikon SC-17). The advantage is that the photographer can easily vary the position of the flash to employ different flash angles. This is helpful in reducing light reflectance.

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**(d) Basic Nikon Autofocus Speedlight SB-28 operation**

1. Make sure fresh batteries are in the unit before use. Refer to the SB-28 instruction manual for proper battery installation.
2. To attach the flash to the camera, turn the mounting foot locking wheel (at the bottom of the flash unit) clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Adjust the flash head, using the tilting/rotating lock release, to zero (0°). Adjust the bounce angle to -7° if the reproduction ratio is 1:2 or greater.
6. To turn the power on, depress and hold the ON/OFF button for approximately ½ second.
7. Ensure that the flash is in TTL mode (TTL should appear in the rear LCD panel).
8. Read the proper shooting distance range in the rear LCD panel to ensure that the flash can supply sufficient illumination.
9. Before taking the photograph ensure that the flash unit is charged and ready for operation. This is done by looking through the viewfinder and slightly depressing the shutter release button. If the unit is ready, a small ready-light in the shape of a red lightning bolt will be present and a red indicator light on the back of the flash will be lit. If these indicators are absent, the unit will not function properly when the photograph is taken.
10. Take the photograph.

NOTE: Another way to use the SB-28 is by removing it from the camera body and attaching a flash extension cord (Nikon SC-17). The advantage is that the photographer can easily vary the position of the flash to employ different flash angles. This is helpful in reducing light reflectance.

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**(e) Basic Nikon Macro Speedlight SB-21B operation**

Another electronic flash that can be used is the SB-21B. This flash provides illumination for close-up and 1:1 photography with the 60mm Micro lens. The output of the unit is insufficient for anything other than close-up photography.

**METHOD:**

1. Make sure fresh batteries are in the unit. Refer to the SB-21B instruction manual for proper battery installation.
2. Attach the Nikon AS-14 Macro Speedlight Controller unit to the camera by turning the locking wheel of the AS-14 clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Turn the controller unit to the horizontal position so the aperture/reproduction ratio dial is on top.
6. Attach the SB-21B flash unit by screwing the appropriate adapter ring (52mm or 62mm) into the front lens mount.
7. Depress the mounting levers on both sides of the SB-21B and attach it to the adapter ring.
8. Connect the SB-21B to the AS-14 controller by inserting the plug from the SB-21B's power cord into the controller's flash terminal. Align the rib found inside the plug with the notch found inside the terminal.
9. Set the flash unit for TTL (Through the Lens) metering by placing the light output selector button to the TTL position.
10. Set the film speed ring on the aperture/reproduction ratio dial to the film speed in use. The film speed ring is the outside component of the aperture/reproduction ratio dial.  
  
For example, set the film speed ring to 100 if ISO 100 film is being used.
11. Turn the lens select knob (the inside knob on the aperture/reproduction ratio dial) to set the lens index. This value is the equivalent of the focal length of the lens being used. When a lens is not listed on the scale, use an intermediate value close to the focal length.

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12. To select and set the aperture, first determine the desired reproduction ratio. Then, follow the line from the white reproduction ratio scale (found on the aperture/reproduction ratio dial) to read the usable range of apertures.

For example, to obtain a reproduction ratio of 1:10 using an AF Micro-Nikkor 55mm lens with ISO 100 film, follow the white line from the 10 on the reproduction ratio scale to read the usable range of apertures. In this example, the range would be from  $f/4$  to  $f/16$ .

For high reproduction ratios, use the smallest aperture possible for greater depth of field.

13. Set the controller power/mode switch to TTL to turn the unit on. This is on the back of the unit.
14. Check through the viewfinder to see if the unit is charged and ready for operation by slightly depressing the shutter release button and checking for the presence of the red lightning bolt ready-light indicator.
15. Set the flash unit so that both the left and right flash bulbs fire.
16. Take the photograph.
17. After taking the photograph, if the overexposure warning lights up for a few seconds, use a smaller aperture (larger  $f$ -number). If the underexposure warning and viewfinder ready-light blink for a few seconds after the shot, use a larger aperture (smaller  $f$ -number).
18. Set the power/mode switch to OFF when finished.

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### (f) Basic Nikon Macro Speedlight SB-29 operation

Another electronic flash that can be used is the SB-29. This flash provides illumination for close-up and 1:1 photography with the 60mm Micro lens. The output of the unit is insufficient for anything other than close-up photography.

#### METHOD:

1. Make sure fresh batteries are in the unit. Refer to the SB-29 instruction manual for proper battery installation.
2. Attach the Nikon SB-29 Macro Speedlight Controller unit to the camera by turning the locking wheel clockwise as far as possible.
3. Slide the mounting foot forward into the camera's accessory shoe (on top of the viewfinder) as far as possible, making sure the contacts are in proper alignment.
4. Tighten the locking wheel firmly.
5. Attach the SB-29 flash unit by screwing the appropriate adapter ring (52mm or 62mm) into the front lens mount.
6. Depress the mounting levers on both sides of the SB-29 and attach it to the adapter ring.
7. Set the flash unit for TTL (Through the Lens) metering by placing the light output selector button to the TTL position.
8. Set the correct aperture on the camera. To select and set the aperture, first determine the desired reproduction ratio. Then, follow the line from the white reproduction ratio scale (found on the aperture/reproduction ratio dial) to read the usable range of apertures.

For example, to obtain a reproduction ratio of 1:10 using an AF Micro-Nikkor 60mm lens with ISO 100 film, follow the white line from the 1:10 on the reproduction ratio scale to read the usable range of apertures under the ISO100 column. In this example, the range would be from  $f/4$  to  $f/16$ .

For high reproduction ratios, use the smallest aperture possible for greater depth of field.

9. Set the controller power switch to on. This is located on the back of the unit.
10. Check through the viewfinder to see if the unit is charged and ready for operation by slightly depressing the shutter release button and checking for the presence of the red lightning bolt ready-light indicator.

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11. Set the flash unit so that both the left and right flash bulbs fire.
12. Take the photograph.
13. After taking the photograph, if the overexposure warning lights up for a few seconds, use a smaller aperture (larger  $f$ -number). If the underexposure warning and viewfinder ready-light blink for a few seconds after the shot, use a larger aperture (smaller  $f$ -number).
14. Set the power/mode switch to OFF when finished.

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## (2) Electronic flashes for the Nikon F3 camera

Electronic flash can be used to provide artificially, daylight balanced illumination under which scenes or physical evidence can be photographed. The Speedlight SB-16A is designed for general use with the Nikon F3 camera.

### (a) Basic Nikon Speedlight SB-16A operation

1. Make sure fresh batteries are in the unit before use. Refer to the SB-16A instruction manual for proper battery installation.
2. Set the open/closed knob on the flash unit coupler AS-8 to the OPEN position. Line up the flash unit coupler and the flash unit. Then, while applying pressure to the open/closed knob, push the flash unit coupler into the flash unit until it clicks into place. Lock the flash unit coupler by turning the open/closed knob to the CLOSED position.
3. Turn the locking ring around the mounting foot counterclockwise until the flash unit coupler foot is uncovered. Attach the flash unit to the Nikon F3 camera by sliding the mounting foot onto the camera's accessory shoe as far as it will go.
4. Tighten the locking ring firmly by turning clockwise until it stops.
5. Adjust the flash head, using the flash head locking lever, to 90°. Set the zoom head on the flash unit until the letter shown matches the focal length of the camera lens. There are four possible settings (plus one with an adapter) for five different lens groups:  
W1 (with wide flash adapter SW-7) for lens <28mm  
W1 for lens 28-35mm  
N for lens 35-50mm  
S for lens 50-85mm  
T for lens >85mm
6. Set the ASA/ISO film speed for the film being used by turning the ASA/ISO film speed setting ring (back of the flash unit around the exposure calculator dial) until the index is opposite the desired speed.
7. Set the zoom setting exposure knob on the exposure calculator dial to the letter that corresponds with the flash zoom head setting (e.g., if shooting with the Nikon 60mm Micro lens, the zoom head and zoom setting exposure knob should both be set to S).
8. Set the shutter speed dial to 60 on the camera for proper flash synchronization.
9. Set the flash unit's mode selector to TTL (Through the Lens) metering.

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10. To select and set the aperture, first determine the approximate camera to subject distance. Then find the appropriate white distance line on the exposure calculator dial and read the usable range of apertures.

For example, to photograph a subject at a distance of 10 feet with a Nikon 60mm Micro lens and ISO 100 film, set the zoom head and the zoom setting exposure knob to S. Follow the white line that corresponds to 10 feet to read the usable range of apertures. In this example, the range would be from  $f/2.8$  to  $f/11$ .

11. Select and set the lens aperture ring to an appropriate value within the usable range.
12. Turn the flash unit on by sliding the ON/OFF switch to ON.
13. Before taking the photograph ensure that the flash unit is charged and ready for operation. This is done by looking through the viewfinder and slightly depressing the shutter release button. If the unit is ready, a small ready-light (red LED) will be present and a red indicator light on the back of the flash will be lit. If these indicators are absent, the unit will not function properly when the photograph is taken.
14. Take the photograph.

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### 3. Film

Several types of film are available for use in the field. In most instances, color transparency film (Kodak Ektachrome 100G) will be used for the documentation of scenes and physical evidence. Special circumstances may dictate the use of different film, however. Descriptions for some commonly used film types are provided with information on when their use may be appropriate.

#### *Color transparency film*

##### Kodak Professional Ektachrome 100G

A low speed, extremely fine grain transparency (slide) film. For daylight and electronic flash use only. Should not be used under tungsten or fluorescent lighting. For general crime scene and evidence documentation.

##### Kodak Professional Ektachrome 64T

A low speed, fine grain transparency (slide) film. For tungsten light (3200K) use only. Do not use in daylight or with electronic flash. For general crime scene and evidence documentation with tungsten lighting.

##### Kodak Professional Ektachrome 160T

A medium speed, fine grain transparency (slide) film. For tungsten light (3200K) use only. Do not use in daylight or with electronic flash. For general crime scene and evidence documentation with tungsten lighting.

##### Kodak Professional Ektachrome 400X

A medium speed, medium grain transparency (slide) film. For daylight and electronic flash use only. Should not be used under tungsten or fluorescent lighting. For general crime scene and evidence documentation in low-light level situations.

#### *Color negative film*

##### Kodak Professional Portra 100T

A low speed, fine grain negative (print) film. For tungsten light (3200K) use only. Do not use in daylight or with electronic flash. For general crime scene and evidence documentation with tungsten lighting.

##### Kodak Professional Portra 160NC

A medium speed, fine grain negative (print) film. For daylight and electronic flash use only. Should not be used under tungsten or fluorescent lighting. For general crime scene and evidence documentation.

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### ***Black and white negative film***

#### Kodak Professional T-MAX 100

A low speed, nearly invisible grain negative (print) film. For general crime scene and evidence documentation when highly detailed images are required and color is not required.

#### Kodak Professional T-MAX 400

A medium speed, fine grain negative (print) film. For general crime scene and evidence documentation in low-light level situations and when color is not required.

#### Kodak Professional T-MAX P3200

A high speed, coarse grain negative (print) film. For general crime scene and evidence documentation in very low light level situations and when color is not required. May be used to document the chemiluminescence produced from luminol reactions.

### **4. Illumination**

For evidence that has reflective surfaces, many photographs must be taken or floodlights should be used. These photographs should include a large number in which the angle of flash illumination is varied. Incident light variations should range from oblique (90°) to perpendicular (0°). The azimuth angles should also be varied. This increases the likelihood of obtaining satisfactory photographs.

### **5. Establishing photography**

Generally, several overall photographs are required to properly “establish” a crime scene. When photographing a crime scene or item of evidence, it is required that enough establishing shots are taken so that all areas and objects, or detail on a piece of evidence can be clearly related to each other. Yellow plastic evidence markers (letters A through Z and numbers 1 through 40) are available for use and should be placed around the scene to show the approximate position of smaller items or stains that may not be apparent in the establishing photographs.

### **6. Close-up photography**

Close-up photographs are required for any item of evidence that needs to be documented in great detail. Examples include bloodstain patterns, gunshot residue patterns, and the locations of trace evidence. Close-up photographs must be taken so that the area of detail fills nearly the entire frame of the photograph, leaving enough space on two axes for the placement of a right-angle scale or two perpendicularly oriented straight scales. Scales must be present in all photographs.

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## 7. Photomicrography

Occasionally, photographing items that are too small to be captured with macro photography may be necessary. Examples would include the documentation of the cut end of a hair or tissue on a piece of clothing. Two microscopes are available for this: an Olympus BX60 polarizing light microscope and an Olympus SZH10 Research stereo microscope. Refer to the instruction manuals of each microscope for their operation.

## 8. Sectoring

A large area with many bloodstain patterns (*e.g.*, wall) can pose a documentation problem. One way to overcome this is to use a sector method.

The following section provides the procedure used to document large surface areas that contain detail.

### METHOD:

1. Photograph the entire area using a wide angle lens (20-28mm or wider if needed).
2. Place a normal lens on the camera (50-60mm) and move closer to the subject until the finer detail can be discerned. Make sure the film plane is parallel to the subject plane.
3. Measure the distance from the camera lens to the subject.
4. Mark the four corners on the wall visualized through the viewfinder, leaving a small margin (a couple of inches) in each corner.
5. Grid the entire surface area of the subject with a permanent marker using the distance between the corners (width and height) as standard units of measurement.
6. Number or label each grid sector in order (*e.g.*, from left to right and top to bottom).
7. Photograph each grid sector MAINTAINING the parallelism AND distance between the camera lens and subject plane. Include a right angle scale or two straight scales in each photograph.
8. After all sectors have been documented, take additional wide angle photographs with the grid lines present.

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## V. Scientific techniques

Several scientific techniques are used at crime scenes that can aid the reconstruction process. Bloodstains, gunshot residue, pattern impressions, and other types of physical evidence are important, and many methods exist that can, and must often, be used in the field. The following sections will provide basic information and methods for these techniques and analyses.

### A. Blood and other body fluids/tissues

#### 1. Blood

Blood is frequently the byproduct of a serious crime. Often, the individuality of bloodstains found at crime scenes or on one's person can be important in the positioning of individuals. Occasions exist where an attempt has been made to clean up liquid blood or bloodstains or it is necessary to know if a stain is blood. The following sections provide basic background information and methods for the examination and analysis of suspected bloodstains, bloodstain patterns, and the enhancement of bloodstains.

##### a) Presumptive (catalytic) tests

Presumptive tests are used to "screen" samples to determine whether they may be blood and to find faint or latent bloodstains. These tests are generally fast, sensitive, and easy to use. Presumptive tests are catalytic tests that use the heme present in red blood cells to catalyze the oxidation of a chromophoric or chemiluminescent compound with an oxidizing agent (e.g., hydrogen peroxide or sodium perborate). Their drawback, however, is that the reactions are not specific for blood, hence, the term presumptive. Other substances may have peroxidase-like properties that may produce "false" positives.

Chemical and plant oxidants may produce "false" positives, therefore, the one-step methods must be used with caution. Some of these "false" positives can be eliminated with a two-step procedure. The test reagent is added to the unknown sample before the oxidizing agent. If a color change is produced before the addition of the oxidizer, it is due to a chemical oxidant present in the sample. Plant peroxidases may be mistaken for blood since their catalytic mechanisms are similar, however, they are thermolabile. Heme is stable at higher temperatures, thus, heat can be used to eliminate them.

The leucomalachite green and benzidine reagents are examples of acidic tests. Phenolphthalin and luminol are basic reagents. These chemical differences may offer certain advantages depending on the situation. Benzidine was commonly used because of its unmistakable brilliant blue color, however, because it is carcinogenic, its use has declined. Luminol is a reagent that must be used in a dark environment to visualize the chemiluminescence.

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**(1) Phenolphthalin (Kastle-Meyer, KM)**

**BRIEF:** Basic reagent that produces a pink color that may vary in intensity depending on heme concentration. Very sensitive ( $\approx 1/100,000$  to  $1/1,000,000$  dilution of whole blood).

See Forensic Biology Biochemistry Methods Manual for preparation and usage.

**(2) Leucomalachite green (LMG)**

**BRIEF:** Acidic reagent that produces a blue-green color that may vary in intensity depending on heme concentration. Very sensitive ( $\approx 1/100,000$  to  $1/1,000,000$  dilution of whole blood).

See Forensic Biology Biochemistry Methods Manual for preparation and usage.

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### (3) Luminol

**BRIEF:** Basic reagent that produces a blue chemiluminescence that may vary in intensity depending on heme concentration. Most sensitive catalytic test ( $\approx 1/5,000,000$  dilution of whole blood). MUST be used in the dark. It is commonly applied by aerosolizing the reagent onto the target surface.

**Stock solutions:**      A)      8g NaOH

Dissolve in 500mL distilled water (final concentration = 0.4 M).

                                 B)      10mL 30%  $H_2O_2$

Add to 490mL distilled water (final concentration = 0.176 M).

                                 C)      0.354g luminol (3-aminophthalhydrazide)

Dissolve in 62.5mL 0.4M NaOH (stock solution A). Bring to 500mL with distilled water (final concentration = 0.004M luminol).

**Working solution:** Add 100mL each of stock solutions A, B, and C to 700mL distilled water (final volume = 1000mL).

1. Test positive and negative controls BEFORE application of luminol reagent to evidence.  
  
A positive control should consist of a piece of filter paper containing dried stains prepared from the following dilutions of whole blood: neat, 1/10, 1/100, 1/1,000, 1/10,000, 1/100,000, 1/1,000,000, and 1/10,000,000.
2. Luminol can be sprayed onto an area suspected of containing minute traces of blood. Spray the area with luminol reagent and observe any reaction.
3. An immediate blue chemiluminescence is a positive result (must be interpreted with caution).

CERTAIN METALS (*e.g.*, brass and copper), CLEANING AGENTS (*e.g.*, bleach), AND OTHER SUBSTANCES MAY PRODUCE “FALSE” POSITIVES.

**NOTE:** BLEACH WILL PRODUCE AN INTENSE CHEMILUMINESCENCE FOR A SHORT DURATION.

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## **b) Contrast enhancement**

Occasionally, pattern impressions such as fingerprints or footwear impressions may not be readily visible. If the impressions are made in blood, techniques are available for increasing contrast, which may aid photographic documentation.

If it is critical to individualize the blood in the pattern and document it for comparison purposes, a small portion from an area with no comparative information should be collected and packaged appropriately AFTER photographic documentation has been completed.

### **(1) Ultraviolet light (UV)**

Ultraviolet (UV) light can be used to provide contrast between bloodstains and the substrate on which they are deposited. UV light may prove to be a useful contrast enhancement technique if blood has been deposited on clothing or other fabric (especially ones that may have been laundered). Optical brighteners, used in many laundry detergents, will remain in washed items and can impart background fluorescence to the material. Bloodstains will not fluoresce under UV light and will remain dark. Therefore, the contrast between bloodstains and washed materials may be enhanced.

Ultraviolet light is a relatively nondestructive technique when used for short durations, however, prolonged exposure to UV light may destroy DNA and proteins.

**CAUTION:** Eye protection is required when using UV light.

#### **METHOD:**

1. Scan the evidence with both short (254nm) and long (365nm) wavelength UV light.
2. Document and photograph any observed patterns.

Photography can be done with regular slide film. An ultraviolet filter must be used over the camera lens. If necessary, consult with the NYC OCME Department of Forensic Imaging for advice and assistance with UV imaging and photography.

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**(2) Luminol**

Refer to the **Presumptive (catalytic) tests** section for preparation and usage.

**(3) Leucocrystal Violet (LCV)**

**BRIEF:** Catalytic reagent for blood. Also has an affinity for proteins.

**Stock solution:** 10g 5-sulfosalicylic acid  
3.7g sodium acetate  
1g leucocrystal violet (LCV)

Dissolve 5-sulfosalicylic acid in 500mL 3% hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>).  
Add sodium acetate. Add leucocrystal violet.

If LCV crystals are yellow, DO NOT USE! Crystals should be white!

**METHOD:**

1. Heat the stain-bearing surface with a lamp (quartz halogen or other heat-producing lamp) for 30-60 minutes. Ideally, the temperature should approach 100°C for 30 minutes. Less heat can be applied longer.

Many surfaces can be damaged by intense heat. First, test a control area with heat to prevent the potential destruction of the pattern-containing surface.

2. Immerse the item to be stained in enough stock solution to cover it fully, or apply enough of the stock solution to the item by pouring or spraying. Allow to react for at least 30 seconds.
3. Remove the item from the solution. For a floor or similar large, flat surface, absorb as much of the solution as possible using an appropriate absorbent material. Do not disturb the pattern!
4. Rinse gently with distilled water.
5. Fully record and document all visualized or enhanced patterns.

If the surface to be developed is in a bright environment (*i.e.*, outdoors), photograph the patterns as soon as possible to prevent the background becoming violet.

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**(4) Amido Black 10B**

**BRIEF:** Amido Black 10B is a general protein stain. It binds to all proteins, including hemoglobin (protein in blood), changing bloodstains blue-black.

Staining techniques are permanent, will destroy any chances of individualizing the bloodstains, and should only be employed after thorough photographic documentation and sample collection for laboratory analysis.

**(a) Methanol-base preparation****METHOD:**

**Stain Solution:** 0.2g Amido Black 10B

Dissolve in a combination of 90mL of methanol and 10mL of glacial acetic acid.

**Destain Solution:** Combine 90mL methanol and 10mL glacial acetic acid.

**CAUTION:** Appropriate ventilation should be used as the stain/destain solutions are volatile and the resulting vapors can be overwhelming and toxic.

**CAUTION:** Methanol is a poison. Use caution when handling.

1. Immerse the item to be stained in enough stain solution to cover it fully, or apply enough of the stain solution to the item by pouring or spraying. Allow to stain for 1-2 minutes.

The methanol content of these solutions may adversely affect certain surfaces. First, test a control area with some rinse solution to prevent the potential destruction of the pattern-containing surface. If any surface alteration or destruction occurs, use the water base formula.

2. Remove the item from the stain. For a floor or similar large, flat surface, absorb as much of the stain as possible using an appropriate absorbent material. Do not disturb the pattern!
3. Rinse gently with the destain solution until excess stain has been removed, changing destain solution as necessary.
4. Fully record and document all visualized or enhanced patterns.

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**(b) Water-base preparation****METHOD:**

**Stain Solution:** 19g citric acid, anhydrous  
2g Amido Black 10B  
2mL Kodak Photo-Flo 600 (or equivalent, *e.g.*, 6mL Kodak Photo-Flo 200)

Dissolve citric acid in 1L distilled water. Add Amido Black 10B and stir for 30 minutes. Add Photo-Flo and stir lightly.

**Destain Solution:** 38g citric acid

Dissolve in 2L distilled water.

1. Heat the stain-bearing surface with a lamp (quartz halogen or other heat-producing lamp) for 30-60 minutes. Ideally, the temperature should approach 100°C for 30 minutes. Less heat can be applied longer.

Many surfaces can be damaged by intense heat. First, test a control area with heat to prevent the potential destruction of the pattern-containing surface.

2. Immerse the item to be stained in enough stain solution to cover it fully, or apply enough of the stain solution to the item by pouring or spraying. Allow to stain for 1-2 minutes.
3. Remove the item from the stain. For a floor or similar large, flat surface, absorb as much of the stain as possible using an appropriate absorbent material. Do not disturb the pattern!
4. Rinse gently with the destain solution until excess stain has been removed, changing destain solution as necessary.
5. Fully record and document all visualized or enhanced patterns.

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### c) Patterns

#### (1) General overview

The source or identity (individuality) of a stain can be very important, *e.g.*, if an individual asserts that he or she was not present at the scene yet has blood on his/her clothing. The identity of stains become less important, however, when an individual states that he or she was present but did not commit the crime. Then, bloodstain patterns may hold tremendous evidentiary value in evaluating activity at a crime scene. They can yield probative information such as the position of the victim or the type of action that produced a pattern.

Experimentation is crucial and must be done whenever applicable.

#### (2) Recognition and identification

##### (a) Contact patterns

Contact bloodstain patterns are produced when a wet, bloody object contacts another object (that may or may not have blood on it), and a transfer of blood occurs from one surface to the other. This results in a pattern that may reveal the identity of the blood covered surface. For instance, a “bloody” hand impression will result when a blood-covered hand is pressed against a wall and then removed (without any other movement). Static contact transfers occur when there is no lateral movement of either object. Dynamic contact transfers occur when at least one of the objects moves laterally across the surface of the other surface.

Many different bloodstain patterns can be produced. Some examples include footwear impressions, fingerprints, weapon impressions, and fabric patterns. A smear is also an example of a contact pattern. It occurs when a bloody object is moved while in contact with another object. For example, moving a blood-covered hand along a wall will create a long stain. These patterns may suggest the identities of the surface that created them and the direction they were moving.

##### (b) Non-contact patterns

Non-contact patterns are produced when blood travels through the air before depositing itself on a surface. Typical patterns include:

Radial spatter patterns are created when a weapon strikes pooled blood causing it to radiate outward from the impact site.

Arc or “cast-off” patterns are created when blood on a weapon or other object is thrown off due to centrifugal force as the weapon or object is swung in an arc.

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Arterial spurt/spray patterns are formed when blood is projected from a breached or severed artery under the fluctuating pressure caused by the rhythmic contractions of the heart.

Trail patterns are produced when blood continuously drips from a moving object or person (*e.g.*, walking, running, carrying a blood-covered object, *etc.*).

Back spatter is blood that projected from the site of a gunshot entrance wound back toward the weapon and shooter (opposite the direction of the fired projectile). These spatters are generally very fine (<1-2mm).

Forward spatter is blood that leaves a gunshot exit wound and is projected forward in the direction of the fired projectile (away from the weapon and shooter).

Secondary spatter are the small droplets generated as a result of blood dripping into a developing pool or an existing source of liquid blood. These small droplets are projected radially from the site of dripping.

Expired blood patterns are created from blood that exits the nose and/or mouth with the breath. Expecterated blood patterns are the result of blood that has been forcefully expelled during coughing.

Often, the direction that a droplet of blood was traveling when it struck a surface can be established by its shape. In addition, its dimensions can be correlated to the angle at which it struck the surface. When this information is obtained for several stains in an overall spatter pattern, an approximate three-dimensional point of origin for the source of the spatters can be determined.

Five factors influence the size and shape of droplet stains and must be considered when examining bloodstain patterns. These variables are droplet volume, droplet velocity, surface texture, surface porosity/absorbency, and surface resiliency.

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### (c) Other types of bloodstains and patterns

Several other types of bloodstain patterns may exist that do not fall into either previously mentioned category. These may include:

- flow patterns
- pooled blood and other large stains
- diluted blood (water, saliva, and other liquids)
- void patterns
- splash patterns
- clotted blood
- artifacts (post-event factors)
  - o human
    - creation and alteration of bloodstains
    - removal of blood and bloodstains
  - o animal and insect activity
  - o differential spread of blood through fabric

Flow patterns of blood can be helpful in determining the movement of an injured individual and may help identify the approximate position or movement of a victim, even after death. Flow patterns which change direction may show post mortem movement of a body or ante mortem movement of a victim. The examination of pooled blood and other large stains may yield information as well. An estimate of the volume and the drying time may be critical sometimes.

Diluted blood is observed with some frequency at crime scenes. Perpetrators may often attempt to remove wet blood from themselves after an incident or dried blood from a location in an attempt to remove or destroy evidence. Diluted blood is often found around sinks and bathtubs. Water is the most common diluent, however, blood may also be diluted with saliva, cleaning fluids, detergents, *etc.*

Void patterns are created when an intervening object blocks or intercepts the transfer of blood onto another surface. Splash patterns are created when large volumes of blood are projected or splashed onto a surface. Clotted blood is usually observed in pooled blood, however, small clots may be observed in other locations as a result of other factors. For example, clotted blood may be projected with spattered blood as a result of a blunt force trauma incident.

Artifacts are created as a result of post-event factors that may be from human, animal, or insect activity. Bloodstains may be created or altered from the actions of investigators, witnesses, animals, insects, and others. Attempts to remove (clean) blood from a scene are also considered artifacts. Occasionally, blood deposited on fabric may spread differentially through the material due to compositional differences (fiber content and direction).

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### (3) Reconstruction of radial spatter patterns

#### (a) Calculation of angles of incidence and impact

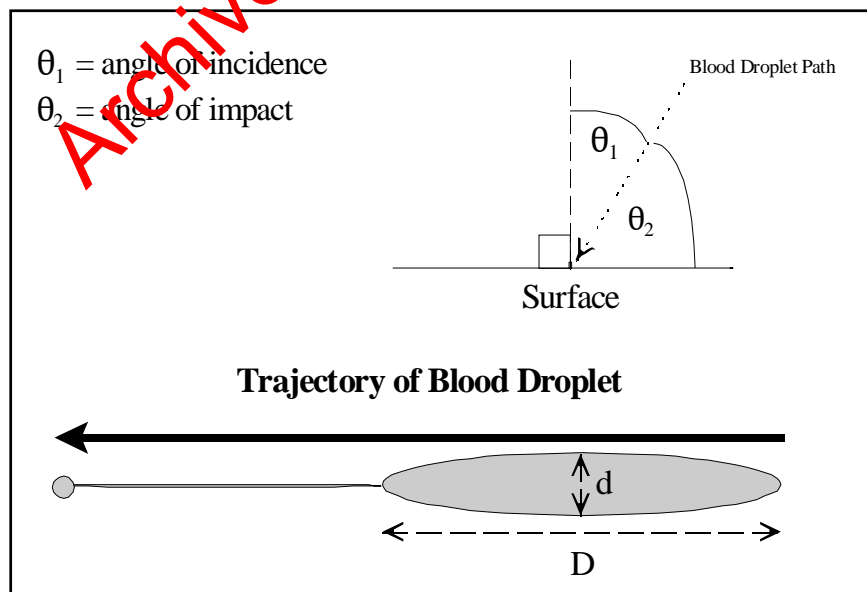
Radial spatter patterns can yield information regarding the location or point of origin of the blood source that produced the pattern. By examining several representative droplet stains within an overall pattern, an approximate point of origin can be established. When a blood droplet strikes a surface normal to its plane (angle of incidence defined as  $0^\circ$ ), a circular stain will result. As the angle of incidence increases, the stains become more elongated (the “tail” of the stain points in the direction of travel of the blood droplet). This correlation of stain dimensions to angle of incidence was previously described by French researchers (Balthazard *et al.*, 1939). Later, a formula was derived to calculate an approximate angle of impact (MacDonell, 1981).

The long axis (major diameter) of a bloodstain is symbolized by  $D$  and the maximum width (minor diameter) is symbolized by  $d$  (see figure below). The cosine of the angle of incidence ( $\theta_1$ ) is equal to the ratio of  $d/D$  (MacDonell, 1981 used sine to calculate the angle of impact). The equation is:

$$\cos \theta_1 = \frac{d}{D} \quad (\sin \theta_2 = \frac{d}{D})$$

Thus, to calculate the angle of incidence using the width and length of a bloodstain, the equation becomes:

$$\theta_1 = \arccos \frac{d}{D} \quad (\theta_2 = \arcsin \frac{d}{D})$$



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**(b) Determination of point/area of origin****(i) String and protractor**

Measurements of bloodstains are approximate and their accuracy is not better than  $\pm 5^\circ$  (use the table in Appendix A). String can be used to visualize the approximate trajectories of the selected blood droplet stains using the following procedure.

**METHOD:**

1. Select, document, and label several stains from the overall pattern.
2. Measure and record the lengths and widths for each stain (a hand magnifier may be helpful).
3. Calculate and record the angles of incidence for each stain.
4. Take a piece of string (long enough to back project to another object to which it can be anchored) and affix it (with cellophane tape) to a measured stain in the direction of travel of that blood droplet so that the remaining length of the string can be used to visualize the path of the blood droplet.
5. Using a protractor, position the string so that it attains the correct angle of incidence and direction (laser protractors are available to assist: see the following section). When correctly aligned, fasten the free end of the string with cellophane tape.
6. Repeat steps 4 and 5 for the remaining stains.
7. When completed, the approximate point of origin will be visualized where the strings come together. This origin will not be a singular point in space, but a general area, the size of which will depend on numerous factors.
8. Measure and record the approximate point of origin.

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## (ii) String and laser protractor

Protractors that hold a laser pointer can be employed to shorten the time involved in positioning strings. One such protractor is manufactured by EVI-PAQ. They are designed to hold a cylindrical laser pointer on a positional carriage. The following procedure provides instruction for their use.

## METHOD:

1. Select, document, and label several stains from the overall pattern.
2. Measure and record the lengths and widths for each stain (a hand magnifier may be helpful).
3. Calculate and record the angles of incidence for each stain.
4. Position a laser protractor on each stain so that it attains the correct angle of incidence and direction. When correctly aligned, mark the impact point of the laser beam.
5. Take a piece of string and affix it to both the bloodstain and the laser beam impact point. The string can be used to visualize the path of the blood droplet.
6. Repeat steps 4 and 5 for the remaining stains.
7. When completed, the approximate point of origin will be visualized where the strings come together. This origin will not be a singular point in space, but a general area, the size of which will depend on numerous factors.
8. Measure and record the approximate point of origin.

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## (iii)Tangent method (no string)

This method is useful in situations where string cannot easily be placed or fastened.

## METHOD:

1. Select, document, and label several stains from the overall pattern.
2. Measure and record the lengths and widths for each stain (a hand magnifier may be helpful).
3. Calculate and record the angle of impact ( $\theta_{\text{impact}}$ ) for each stain.
4. Using a straightedge, draw a line through the long axis of each stain and continue until the line extends through the two dimensional “point” of origin (will develop with the lines as more stains are used).
5. If possible, mark the approximate two dimensional “point” of origin on the surface.
6. Measure and record the distance from each stain to the selected two dimensional “point” of origin.
7. Calculate the value  $z$  for each stain using the following equation:
 
$$z = (\tan \theta_{\text{impact}}) \times (\text{distance to 2D “point” of origin})$$
8. Calculate the average  $z$  value for all stains.
9. The average  $z$  value represents the third dimension of the “point” of origin.

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## 2. Semen

Semen is seen in cases involving sexual assault or other sexual activity. The following sections provide methods for the recognition, enhancement, and examination of suspected semen stains.

### a) Presumptive tests

Presumptive tests are used to “screen” samples to determine whether they may be semen. These tests are generally fast, sensitive, and easy to use. A drawback, however, is that the reactions are not specific for semen, hence, the term presumptive. Other body fluids may contain varying levels of acid phosphatase, *e.g.*, vaginal secretions, *etc.* and may produce “false” positives.

#### (1) Acid phosphatase (AP)

**BRIEF:** The enzymatic hydrolysis of the substrate solution (calcium  $\alpha$ -naphthyl phosphate) is brought about by the presence of acid phosphatase in the suspected stain. The hydrolyzed phosphate groups are then available for binding to the dye solution (Fast Blue B). This results in the formation of an insoluble purple colored precipitate, indicating a positive test result.

See Forensic Biology Biochemistry Methods Manual for preparation and usage.

### b) Contrast enhancement

Occasionally, semen may not be readily visible. Techniques are available for increasing contrast, which may aid visualization and photographic documentation.

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### (1) Ultraviolet light (UV)

Ultraviolet (UV) light can be used to provide contrast between semen and the substrate on which it is deposited. Semen will fluoresce under UV light providing enhanced contrast of the stain and fabric in some situations.

Ultraviolet light is a relatively nondestructive technique when used for short durations, however, prolonged exposure to UV light may destroy DNA and proteins.

CAUTION: Eye protection is required when using UV light.

#### METHOD:

1. Scan the evidence with both short (254nm) and long (365nm) wavelength UV light.
2. Document and photograph any observed stains and/or patterns.

Photography can be done with regular slide film. An ultraviolet filter must be used over the camera lens. If necessary, consult with the NYC OCME Department of Forensic Imaging for advice and assistance with UV imaging and photography.

### (2) High intensity, tunable wavelength light source ("alternate"/"forensic" light source)

High-intensity, tunable wavelength light sources ("alternate" or "forensic" light sources) are continuous sources that generally employ a metal vapor arc discharge lamp. With the use of filtration techniques, these light sources may help provide a means of visualizing evidence not possible with commonly available light sources. With many models, adjustments can be made to the wavelength. This in turn helps give the criminalist a wide range of conditions under which to view an object. Occasionally, the item being viewed may contain semen stains that are not readily apparent. The following section provides a procedure for use of the CrimeScope CS-16-10 (a high-intensity, tunable wavelength light source) to search for semen stains.

#### (a) CrimeScope CS-16-10

For specifications, maintenance, and general guidelines, refer to the operation manual.

#### METHOD:

1. Make sure a 115V AC power source and extension cord are available for operation. This will help for those scenes that may be outdoors or require movement of the unit. Plug in the unit.

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2. Move the FANS switch to the ON position. Allow the unit to warm up for 5-10 minutes.
3. Move the LAMP switch to the ON position. The lamp should ignite within 1-3 seconds. If clicking is heard, wait 5-6 seconds. If the lamp does not ignite, move the LAMP and FANS switches to the OFF position and repeat step 3 after 30 seconds. If unsuccessful, consult the operation manual.
4. When the lamp ignites, the unit will auto-calibrate itself and display “CSS” on the LED display. The unit should emit a bright blue light (ensure that filter wheel #2 is set on “MAX. POWER”).
5. The “CSS” filter (orange goggles) should be used for general searching/scanning of physical evidence and crime scenes. Other filter combinations can be used (refer to operation manual for additional combinations not listed below). Refer the chart below for the appropriate goggles for use with each filter.

Wavelength Value	Nominal Bandpass ( $\pm 5\text{nm}$ )	Goggles
415	45	Yellow
430	45	Yellow
445	40	yellow or orange
455	70 (no UV or green)	Orange
475	45	Orange
495	45	Orange
CSS	130	Orange
515	30	orange or red
530	40	orange or red

6. After selecting the appropriate filter/goggle combination, direct the light beam onto the area to be examined.
7. Observe the area suspected of containing semen stains very carefully. Typically, light in the “CSS” setting (or 415-530nm range) and orange goggles will produce fluorescence from a semen stain.

Changing filter/goggle combinations may alter the contrast. The substrate will play a role in determining which filter/goggle combination to use for optimum contrast. Experimentation may be required.

8. Document all observed fluorescent stains as thoroughly as possible (i.e., photographically).
9. When finished, move the LAMP switch to the OFF position. After 3-5 minutes, move the FANS switch to the OFF position (NOTE – a rapid shutdown without allowing the lamp to cool will rapidly decrease the life of the lamp).

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### 3. Saliva and urine

Saliva and urine may be encountered at some crime scenes. Odor may assist in locating suspected urine stains. The following sections provide methods for the enhancement and examination of suspected saliva and urine stains.

#### a) Contrast enhancement

Occasionally, saliva and urine may not be readily visible. Techniques are available for increasing contrast, which may aid visualization and photographic documentation.

##### (1) Ultraviolet light (UV)

Refer to the UV section in the semen section for guidelines.

##### (2) High-intensity, tunable wavelength light source ("alternate"/"forensic" light source)

Refer to the high-intensity, tunable wavelength light source section in the semen section for guidelines.

### 4. Other biological evidence

Other biological evidence such as sweat, vomitus, feces, vaginal secretions, tears, and pus may also be encountered with far less frequency at crime scenes. Use of intense white light, UV, and high-intensity, tunable wavelength light sources may assist in visualization and enhancement of these substances. Refer to the semen section for guidelines.

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## B. Firearms evidence

The prevalence of firearms evidence at crime scenes has steadily increased over the years. Firearms evidence can be as simple as a recovered projectile to the complexity of a projectile trajectory analysis. Gunshot residue particles and patterns are other examples of firearm evidence. The following sections will provide basic background information and methods for the examination and analysis of gunshot residue and projectile trajectory analyses.

### 1. Gunshot residue (GSR)

Gunshot residue (GSR) refers to the vaporous and particulate material expelled into the space around a weapon upon discharge. This residue is propelled almost exclusively from the muzzle of the weapon, however, revolvers will also issue residue from the cylinder gap. Gunshot residue can result from any combination of the following: primer, propellant, lubricants, and metals from the projectile, cartridge case, and gun barrel (may contain rust, oil, and fouling from previous shots). GSR adheres loosely to most surfaces upon which it lands. Therefore, it is imperative that surfaces suspected of having GSR are not unduly disturbed. That could include any surface at a crime scene in close proximity to a discharged weapon or on the hands or clothing of a shooter or victim of a shooting. The persistence of GSR can pose problems with handling and analysis. Samples must be handled very carefully and the absence of GSR could be an artifact produced by poor handling or packaging of a sample.

The following outlines the procedures that must be performed sequentially in GSR examination and analysis:

- a. visual examination (unaided eye and stereo microscope)
- b. pattern enhancement techniques
  - i. high intensity, tunable wavelength light source (CrimeScope)
  - ii. infrared light/photography (if possible)
- c. presumptive tests
  - i. dithiooxamide (DTO, rubenic acid) and/or sodium rhodizonate
  - ii. diphenylamine (DPA)

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### a) Visual examination

A visual examination should be completed first. Use the unaided eye to search for gross GSR particles and patterns; in cases that involve close range shootings (contact to 24 inches), patterns may be observed with the naked eye. These should be documented with thorough sketches and photography, if possible. In situations where the background material is dark, infrared photography may be useful. The use of a high-intensity, tunable wavelength light source may also enhance visualization of a pattern. A stereo microscope should then be used to examine the particles in a pattern. All observations should be recorded and documented.

Several particles (three or more depending on the number available) should be collected for further analyses. Remove the particles with fine tweezers (a small piece of cellophane tape wrapped around the tip may be helpful) and place onto a small section of Gellifters®. The area(s) containing the collected particles should be marked on the clear plastic cover of the Gellifters® with a permanent marker. An SEM sampling stub (aluminum stub covered with adhesive) may also be used.

### b) Pattern enhancement

An attempt to enhance GSR patterns nondestructively should be done after a visual inspection. Nondestructive methods include the use of high-intensity, variable wavelength light sources and infrared imaging. A method to be used as a last step in the examination and analysis of GSR patterns is the modified Griess test, a chemical test that chromophorically reacts with nitrites.

The following sections provide basic background information and methods.

#### (1) High-intensity, tunable wavelength light source ("alternate"/"forensic" light source)

High-intensity, tunable wavelength light sources ("alternate" or "forensic" light sources) are continuous sources that generally employ a metal vapor arc discharge lamp. With the use of filtration techniques, these light sources may help provide a means of visualizing evidence not possible with commonly available light sources. With many models, adjustments can be made to the wavelength. This in turn helps give the criminalist a wide range of conditions under which to view an object. Occasionally, the item being viewed is a pattern of suspected gunshot residue. The following section provides a procedure for use of the CrimeScope CS-16-10 (a high-intensity, tunable wavelength light source).

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## (a) CrimeScope CS-16-10

For specifications, maintenance, and general guidelines, refer to the operation manual.

## METHOD:

1. Make sure a 115V AC power source and extension cord are available for operation. This will help for those scenes that may be outdoors or require movement of the unit. Plug in the unit.
2. Move the FANS switch to the ON position. Allow the unit to warm up for 5-10 minutes.
3. Move the LAMP switch to the ON position. The lamp should ignite within 1-3 seconds. If clicking is heard, wait 5-6 seconds. If the lamp does not ignite, move the LAMP and FANS switches to the OFF position and repeat step 3 after 30 seconds. If unsuccessful, consult the operation manual.
4. When the lamp ignites, the unit will auto-calibrate itself and display "CSS" on the LED display. The unit should emit a bright blue light (ensure that filter wheel #2 is set on "MAX. POWER").
5. The "CSS" filter (orange goggles) should be used for general searching/scanning of physical evidence and crime scenes. Other filter combinations can be used (refer to operation manual for additional combinations not listed below). Refer the chart below for the appropriate goggles for use with each filter.

Wavelength Value	Nominal Bandpass ( $\pm 5\text{nm}$ )	Goggles
lateral UV	280-380	UV
lateral IR	630-1100	none
000	white light	none or grey
415	45	yellow
430	45	yellow
445	40	yellow or orange
455	70 (no UV or green)	orange
475	45	orange
495	45	orange
CSS	130	orange
515	30	orange or red
530	40	orange or red
555	30	red
575	see manual	red
600	50	see manual
640	50	see manual
675	50	see manual

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6. After selecting the appropriate filter/goggle combination, direct the light beam onto the area to be examined.
7. Observe the area of suspected GSR very carefully. Typically, light in the 450nm range and orange goggles will produce fluorescence from a GSR pattern.

Changing filter/goggle combinations may alter the contrast. The substrate will play a role in determining which filter/goggle combination to use for optimum contrast. Experimentation may be required.

8. Observe the pattern carefully. Mark the general area of the suspected pattern and label it thoroughly. Be careful not to dislodge any of the particles present in the pattern.

A pattern “overlay” should be made at this point. Take a piece of transparency film and gently place it over the pattern in question (be careful not to dislodge any particulates). The film should be large enough to fit the whole pattern. Secure the film so it does not move. Take a permanent marker and mark each location of orange fluorescence on the film under the CrimeScope. When finished, mark the exact orientation of the film in relation to its position on the substrate.

9. Document the pattern as thoroughly as possible (*i.e.*, photographically).
10. Process items for analysis while under the CrimeScope to aid visualization.
11. When finished, move the LAMP switch to the OFF position. After 3-5 minutes, move the FANS switch to the OFF position (NOTE – a rapid shutdown without allowing the lamp to cool will rapidly decrease the life of the lamp).

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## (2) Infrared photography

Infrared (IR) photography can be used to enhance GSR patterns on dark objects. While many materials reflect IR radiation, gunshot residue will absorb it. Due to this difference, the contrast between gunshot residue and other materials may be enhanced.

NOTE: MUST BE DONE IN A DARKROOM!

### METHOD:

1. Scan the evidence with IR light and an appropriate IR imaging device.
2. Document and photograph any observed patterns.

Photography must be done with IR sensitive film in a darkroom. If necessary, consult with the NYC OCME Department of Forensic Imaging for advice and assistance with IR imaging and photography.

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### c) Presumptive tests

Presumptive tests allow the criminalist to employ a quick, sensitive test to determine if a material may contain GSR particles. As the name implies, it is a presumptive determination, and a positive result cannot be interpreted as proof of GSR. Confirmatory testing must be done to establish identity.

In the analysis of alleged GSR samples, three possible presumptive tests can be employed. These are the detection of lead with sodium rhodizonate, copper and nickel with dithiooxamide, and nitrate-containing compounds with diphenylamine. Any positive test results should be followed up with confirmatory tests (*i.e.*, SEM/EDX).

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**(1) Dithiooxamide (DTO, rubeanic acid)**

**BRIEF:** Test reagent that detects the presence of copper and nickel in suspected GSR. Sensitive and quick.

**METHOD:**

0.1%  
dithiooxamide: 0.1g dithiooxamide  
  
Dissolve in 100mL distilled water.

10% ammonium  
hydroxide: Combine 10mL ammonium hydroxide and 90mL distilled water.

**Controls:** Known copper and nickel and negative control.

Make sure that any Griess testing that is required is completed first. The testing of the material with dithiooxamide adversely affects the reactivity of the nitrites detected by the Griess test. Dithiooxamide testing should be done before sodium rhodizonate.

1. Place the evidence or known face up (GSR side face up).
2. Cover the area to be tested with a sheet of filter paper (Whatman #1) that has been pre-saturated with 10% ammonium hydroxide.
3. Press firmly with a gloved hand to ensure good contact between sample area and filter paper.
4. Press firmly with a hot iron until almost dry. Remove the filter paper.
5. Develop the filter paper by spraying with 0.1% dithiooxamide (or dipping in a tray).
6. If copper or nickel is present, colors will develop immediately. A green color suggests the presence of copper; a blue/pink color suggests the presence of nickel. Lead will occasionally appear as a yellow color.
7. Drying the paper may slightly improve visibility of the pattern. Upon drying, any yellow color indicative of lead will turn to a red color.
8. Photograph the pattern.

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**(2) Sodium rhodizonate (rhodizonic acid, sodium salt)**

**BRIEF:** Test reagent that detects the presence of lead in suspected GSR. Sensitive and quick. Also, useful for detecting and visualizing “bullet wipe” around a suspected bullet hole.

**METHOD:**

**Stock solution:** Saturated solution of sodium rhodizonate. Add sodium rhodizonate to a small volume of water (5-10mL or more if needed).

**Controls:** Known lead and negative control.

Make sure that any modified Griess and dithiooxamide testing is completed first. The testing of the material with sodium rhodizonate adversely affects the reactivity of the nitrites detected by the Griess test.

1. The test may be done on a “wipe” of the sample or by “mapping” the sample using a large piece of filter paper (Whatman #1) covering the entire suspected pattern. The position of the paper must be marked in relation to bullet holes, tears, rips, *etc.* (for “mapping”).
2. Swab or “map” the sample to be tested with a filter paper wet with 15% acetic acid.
3. Apply the sodium rhodizonate reagent to the filter paper and observe any color changes. A red-violet color is a positive result.
4. Test the positive and negative controls simultaneously.

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**(3) Diphenylamine (DPA)**

**BRIEF:** Test reagent that detects nitrate-containing compounds in suspected GSR samples. Sensitive and quick. Nitrate-containing compounds (fertilizers, *etc.*) may be ubiquitous in certain environments and “false positives” may be encountered.

**METHOD:**

**Stock solution:** 1g diphenylamine

Dissolve in 100mL of concentrated sulfuric acid.

**Controls:** Known nitrate-containing compound and negative control.

Diphenylamine (DPA) is a destructive test. Refrain from consuming all of the suspected GSR sample if possible. Other testing procedures must be considered first.

1. Testing can be done directly on a cut portion of the area in question or on a “wipe” of the area.
2. Place the sample in a porcelain spot plate. Apply 1 to 2 drops of the DPA reagent directly to the material.
3. Observe any color change. A dark blue color shows the presence of an oxidizing agent such as nitrates and nitrites. Interpret with caution.
4. Test the positive and negative controls simultaneously.

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## 2. Projectile trajectory analysis

Occasionally, an analysis of a projectile's path is necessary as part of a crime scene reconstruction and may be important to learn the position of a victim or perpetrator during the shooting. Realistically, bullet paths are not straight lines, but rather arcs. For short distances (<50 yards), however, a bullet path may be approximated as a straight line.

String can be used to visualize projectile flight paths, however, lasers are often better suited for this purpose. Laser beams are projected in straight lines and can be set up to trace a bullet's path (without the sagging and bending problems inherent with string). Geometry dictates that two points are required to define a line. A bullet impact site in a surface and a perforating hole in an intermediate target can be used to allow a laser to establish the trajectory.

Once a path has been established, it may be possible to approximate the position(s) of the perpetrator and/or victim when the shooting occurred. Any other evidence may help determine the sequence of shots fired (*e.g.*, glass fracture patterns).

The documentation of crime scenes where firearms have been discharged must be thoroughly documented and photographed. The use of surveying equipment to assist in the documentation may be advisable, particularly in cases where multiple shots have been fired with multiple impacts. Refer to the sections detailing the use of surveying equipment prior to use.

### a) Bullet impact sites

Bullet impact sites (often called bullet impact marks or BIM's) are locations where a projectile strikes a surface, *i.e.*, a ricochet or a projectile not possessing the requisite energy to penetrate the surface. Occasionally, a projectile may have sufficient energy to impress a surface such as wood or a ceiling tile, leaving an indentation that will vary in size depending upon the velocity of the projectile, or penetrate the surface and travel through the object, emerging from the opposite side.

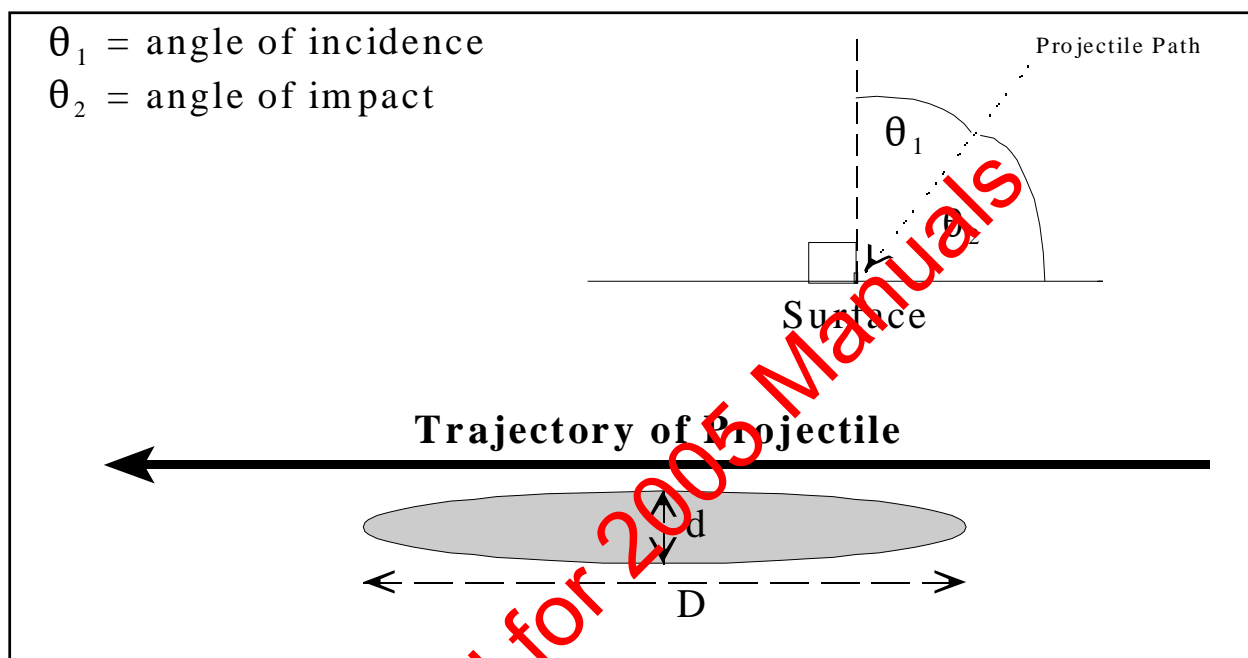
In the instances where a projectile has traveled entirely through an object with some thickness, using this short path to identify the course the projectile traveled before striking the object is possible. This can only be done when the projectile has not altered its course before exiting. This analysis can be done when the projectile has passed through enough of an object so that its path can be established (assuming no deviation).

A bullet impact site, where the projectile merely marks the surface, can be used with an impact site through an intermediate target (*e.g.*, pane of glass) to establish the trajectory. Periodically, these marks alone may show an approximate range of travel. As the angle of incidence increases, the mark made by a ricocheting projectile will elongate. As with blood droplet stains, the angle of impact of the bullet to the target surface may be approximated using the same

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formula (see figure below). There may be a much higher error associated with these calculations due to several factors. Bullet tumbling must always be considered when examining bullet impact sites, as this can severely affect the analysis. To predict the angle of incidence more reliably, test fires must be performed using the surface involved.



#### b) Pattern impressions/trace evidence on bullets

It has been reported (Petraco *et al.*, 1990) that trace evidence and pattern impressions can be valuable evidence. Pattern impressions may yield valuable information concerning intermediate targets and can aid in the reconstruction of the flight path of a projectile. Trace evidence can also be picked up along the path of a projectile, particularly those with an exposed lead nose or hollow point. Hollow point ammunition, by nature, can retain trace evidence as it passes through objects. The examination of this material and the layering of it (if present) can help to reconstruct the trajectory.

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### c) Projectile trajectory identification

#### METHOD:

**CAUTION:** Laser beams can damage the retina of the eye permanently. DO NOT look directly into a laser when it is on. Use the shutter at the emission end of the laser head whenever possible to avoid injury.

1. Identify at least two points to establish the path of the projectile. A bullet impact site and another location on an intermediate target are ideal.

The path of a projectile completely through a thick item (e.g., wall) may be enough to define the flight path.

Sometimes, finding a bullet impact site may be impossible, but a range of possibilities may be determined based on other evidence. For example, a bullet that passes through a victim inside an automobile and exits through an open window has several paths defined by the window.

2. Set up a laser so that the beam passes through the hole (intermediate target) to the bullet impact site.
3. Accurately describe (using immovable landmarks) the defined path in the handwritten notes and with photography.
4. If possible, visualize the laser beam using smoke (or other colloidal suspension) and photograph.

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## C. Pattern impression evidence

Various pattern impressions may be left behind at a crime scene. Often, these patterns can help place an individual at the scene. Also, learning the general sequence of events when these patterns are carefully considered with other types of evidence may be possible, such as the distribution of various bloodstain patterns. The following sections will provide basic background information and methods for the examination and analysis of pattern impression evidence.

### 1. Characteristics

Generally, there are two types of information that may be obtained from the analysis of pattern impressions: class characteristics and individual characteristics.

#### a) Class characteristics

Class characteristics are points of comparison found in a pattern impression that establish the source as belonging to a particular group, or brand, of items. For example, the analysis of a sneaker impression left at a scene shows that the sneaker was a NIKE™ brand. When compared with other impression patterns made from other brands of sneakers, no other group had the same pattern. This analysis allows the investigator to narrow the number of possible donors. Class characteristics can include a particular item as the possible donor of the pattern impression in question, or exclude an item completely.

#### b) Individual characteristics

Individual characteristics are points of comparison found in a pattern impression that can establish a particular item (*i.e.*, one specific shoe or sneaker) as the source of the impression. These characteristics are points that can be found only on that particular item. This implies that even when an item in question is compared with other items that exhibit the same class characteristics (*e.g.*, other NIKE™ brand shoes), the questioned item is unique, based on the number of identifiable individual characteristics. The impression of this item has characteristics unlike any other, and when they are found, they can be attributed only to that particular item. This item is then said to be individualized from those in the group (class).

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## 2. Types

Many different objects can produce pattern impressions. Pattern impressions vary depending upon the item and substrate from which they are made.

### a) Footwear

Often found at crime scenes, footwear pattern impressions can be left in many types of material. For example, often these footwear impressions are found in blood. Other times, they may be found in substrates such as soil, snow, sand, dust, dirt, grease, *etc.* Often the usefulness of these impressions will depend upon the type of surface on which they are found.

#### METHOD:

1. Determine if there is a footwear impression pattern present on an item/surface by close inspection. Visualize the pattern using lighting of varying incidence.
2. Once visualization is achieved, prepare the pattern for photographing. This may require an enhancement technique (Amido Black 10B) to visualize its finer details.

The choice of enhancement techniques will depend upon the substrate surface characteristics (smooth vs. rough) and the contrast conditions surrounding the questioned impression. For example, the use of Amido Black 10B (which stains blue-black) is ineffective on an impression deposited on a dark background.

3. Make sure that scales are present in the photograph; bracket the impression by placing them at right angles, or by using a right angle scale. This will ensure the presence of a scale along the long side of the impression, while also having one present at the toe/heel. These will aid in making measurements for comparison purposes.

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### b) Fabric

Fabric impressions are another impression type found at crime scenes. One important aspect of the pattern is the weave of the fabric; the weave is an example of a class characteristic. This helps the criminalist to identify the type of fabric. Any fabric irregularities, which may be present in the impression, may be used as individualizing characteristics, and used to identify the fabric pattern further. A combination of class and individual characteristics may be sufficient to identify a fabric as the source of the impression.

Fabric impressions can be found in blood, dirt, grease, and on varied substrates (floors, bed sheets, bodies, walls, *etc.*). Fabric impressions can be just as valued a piece of physical evidence as a footwear impression. Therefore, the same care in processing and analyzing should be employed.

Consultation with a fabric science (Pizzuto, 1985) text may help provide a working knowledge of the different types of fabrics and their respective weaves. This will aid in identification and comparison purposes.

### 3. Impressions in dust

Disturbances in dust can be an overlooked source of evidence. These types of disturbances can often contain impression evidence that may yield two dimensional prints (hand, finger, footwear, fabric, *etc.*). Impression evidence can contribute a great deal to an investigation by possibly providing class and individual characteristics of the object that made the impression. Careful examination of the locations where these types of impressions may be left should be performed with the use of high-intensity, white light sources held at an oblique angle.

The processing of patterns in dust can present the analyst with several problems. It cannot be overstated that before any attempt is made to collect impression evidence, it must be thoroughly documented and photographed in detail. Dust impressions are particularly labile. If detailed documentation is not performed prior to collection, any pattern information can easily be lost from the print.

Prior to collection, the nature of the substrate on which the impression resides needs to be carefully evaluated. If the impression is on an object that can be easily and safely removed from the scene for laboratory examination, this should be the goal of the collection procedure. However, if the impression is on a surface that cannot be easily removed, then an appropriate lifting technique must be utilized. Electrostatic lifting is one method that can be employed for the collection of dust print evidence. Refer to the section on electrostatic lifting for the collection procedure of impressions in dust.

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## VI. Experimentation

Occasionally, *ad hoc* experimentation may be required to address an issue(s) and/or answer a question(s) in a case. Many of the experiments that are done in casework are designed to reproduce the actions/events that created observed evidence, *i.e.*, a bloodstain pattern, bullet impact mark, *etc.* It is important that experiments be designed and executed properly and without bias. Careful observation of the process and results must be recorded to maintain the integrity and validity of the experiment(s). The following suggestions may provide guidance when designing and implementing experiments in casework.

1. Ensure that the experiment replicates the conditions of the scene and incident as closely as possible (surfaces, materials, clothing, temperature, *etc.*)
2. Several different approaches to create the desired effect must be attempted. This will narrow the range of possibilities.
3. The experimental design, execution, and analysis should be peer-reviewed.
4. Only one variable should be altered at a time to properly evaluate its effects.
5. Experiments must always be run in duplicate (and in some cases, triplicate).
6. Detailed notes and photographs of the experimentation must be recorded. All observations (including the experimental design and setup, notes and photographs taken during the experimentation process, *etc.*) must be included in the case binder.

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## VII. Evidence collection and packaging

Often, evidence needs to be collected from a crime scene for further laboratory analysis. It is critical that physical evidence is collected and packaged properly to preserve its integrity during transport and to minimize loss and/or alteration. The importance of proper collection and packaging cannot be overstated. The following provides general guidelines for the collection and packaging of various types of physical evidence.

1. Blood, body fluids/tissues, and samples suspected of containing human blood or body fluids/tissues **MUST** be considered infectious and **MUST ALWAYS** be treated as a biohazard whether wet or dry.
2. Disposable latex rubber gloves, shoe and hair coverings (*i.e.*, booties and hair nets), and coveralls or other full body protective garments must be worn when appropriate. If contaminated, protective garments must be changed as soon as possible.
3. Any instruments used in the collection of biological evidence (*i.e.*, scissors, tweezers, *etc.*) must be cleaned between samples with alcohol (70-100% ethanol). If possible, use disposable razor and scalpel blades for cutting and scraping samples. Always discard used blades into a plastic, puncture resistant biohazard container ("sharps" container) before collecting new samples.
4. Gloves must be changed before the collection of each sample.
5. All evidence (stains, fibers, *etc.*) must be documented photographically before collection. A scale must be included in each photograph. For a complex pattern consisting of many stains, a hand-drawn sketch is recommended to supplement photographic documentation.
6. An evidence collection log must be maintained which details all information about the collection of each sample: case number, date, criminalist, unique identifier, item description, location, collection method, and time of collection. See Appendix D for a copy of the evidence collection log sheet.
7. Large enough samples must be collected, when possible, so that a full battery of laboratory analyses can be completed. If possible, there should be enough sample for further testing by an independent laboratory.
8. Individual biological stains, despite size, **MUST NOT** be combined. This includes stains taken from blood spatter patterns. A representative sample should be collected from spatter patterns; there is no need to collect every droplet stain, if it is a part of a recognizable pattern.

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9. Clothing removed from suspects, witnesses, or victims **MUST NOT** be altered. Stains, fibers, gunshot residue, or other evidence **MUST NOT** be taken from any item of clothing removed from an individual. The analysis of bloodstain patterns could be important to the case.
10. Samples that are damp or wet must be thoroughly air dried before packaging. Wet samples will not be accepted by the laboratory.
11. **DO NOT** package biological evidence in plastic.
12. Each item must be packaged separately and listed individually on the voucher.
13. Items must be packaged safely. Sharp and pointed objects must be packaged in puncture resistant containers. If a plastic puncture resistant container is used, the item/stains must be **THOROUGHLY DRY!!!** Packaging must not have blood on the outside. Items that are not packaged safely will not be accepted by the laboratory.
14. Samples must be packaged and sealed so that no loss or deleterious change occurs. Packages must be sealed with tape. Improperly sealed items will not be accepted by the laboratory.
15. Evidence must be transported to the laboratory as soon as possible.

**A. Blood and other body fluids/tissues**

Blood and other body fluid/tissues are commonly found at crime scenes. Because of the biological nature of blood and other body fluids/tissues, they are subject to degradation and must be handled properly. **BLOOD AND OTHER BODY FLUIDS/TISSUES MUST ALSO BE CONSIDERED INFECTIOUS AND SHOULD BE TREATED AS BIOHAZARDS.**

Large enough samples should be collected, when possible, so that a full battery of laboratory analyses can be completed on the samples. For blood spatter patterns, individual stains **MAY NOT** be combined, no matter how small. Representative samples should be collected from a spatter pattern; there is no need to collect every stain if it is a part of a recognizable pattern.

Wet bloodstains must be dried before packaging. All swabs must be thoroughly dried before packaging.

Bloodstains may never be packaged in plastic. Paper envelopes or bags must be used exclusively. Packages must be sealed so that none of the sample can escape.

Various collection methods exist for the collection of bloodstain evidence. The following sections provide the procedures for evidence collection.

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## 1. Collection using moistened swabs

Bloodstains, saliva, and other biological (DNA) evidence may be collected from non-porous objects such as firearms, painted surfaces, *etc.* Large stains may be swabbed using cotton-tipped swabs similar to Q-tips®. Smaller stains may be swabbed with individual cotton threads using a pair of tweezers. When encountering wet bloodstains, swab in the following manner except using DRY swabs (DO NOT use water). The following method provides guidelines for the collection of biological (DNA) evidence from non-porous surfaces and objects.

### METHOD:

Change gloves BEFORE and AFTER the collection of each sample. If tweezers are used, clean with 10% bleach followed by 70% ethanol BEFORE and AFTER the collection of each sample.

All relevant information MUST be entered on the Evidence Log

1. Appropriately document the stain in the case notes with a sketch and photograph the stain prior to collection (include a scale in the photographs). Assign each separate stain to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item that each sample was collected from, particularly when multiple items from a similar or identical class are encountered.

2. **Large stains/areas:** Wet the tip of a new, sterile cotton swab with a minimal amount (approximately one drop) of sterile, distilled and/or deionized water. Collect the stain by rubbing the swab on the stain. Try to concentrate the sample onto the tip (or one area) of the swab. If the stain has not been completely removed, rotate the swab and concentrate the sample on another area of the swab. Repeat until the entire stain has been removed or two (2) swabs have been collected.

**NOTE:** DO NOT soak the swab with water as this may dilute the sample unnecessarily. Using too much water will significantly increase the amount of time required to dry the swab and it could adversely affect the DNA analysis of small samples.

**Small stains/areas:** Wet the tip of a new, sterile cotton swab with a minimal amount (less than one drop) of sterile, distilled and/or deionized water. Collect the stain by rubbing the swab on the stain. Concentrate the sample onto the tip (or one area) of the swab.

**NOTE:** DO NOT soak the swab with water as this will dilute the sample unnecessarily. Using too much water will significantly increase the amount of time required to dry the swab and it could adversely affect the DNA analysis of small samples.

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As an alternate method for extremely small stains, wet a cotton thread (removed from a sterile gauze pad) with a minimal amount of water. While holding the thread with clean tweezers, use the thread to rub the stain until it becomes darkly stained. If the stain has not been completely removed, repeat with new threads until the entire stain has been removed.

**Wet samples:** Collect using DRY swabs.

3. **COMPLETELY DRY the swab(s) or thread(s) before packaging.**
4. Record the time of collection.
5. Package the swab(s) or thread(s) in a clean paper envelope. Ensure that the envelope contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the sample. Seal the envelope with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample in a separate envelope.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the OCME Forensic Biology for DNA analysis.

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## 2. Collection by cutting

Bloodstains can also be removed from items by cutting the stain from the item. Clothing and other fabric, paper, cardboard, and other similar surfaces are amenable to this procedure. Razor/scalpel blades or scissors may be used to remove samples.

### METHOD:

Change gloves BEFORE and AFTER the collection of each sample. Use a new razor/scalpel blade for each sample. If scissors and/or tweezers are used, clean with 10% bleach followed by 70% ethanol BEFORE and AFTER the collection of each sample.

All relevant information MUST be entered on the Evidence Log.

1. Appropriately document the stain in the case notes with a sketch and photograph the stain prior to collection (include a scale in the photographs). Assign each separate stain to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item that each sample was collected from, particularly when multiple items from a similar or identical class are encountered.

2. Remove the sample from the material simply by cutting it out. Collect enough of the sample for laboratory analysis or the entire sample, if small.
3. Record the time of collection.
4. Package the cutting in a clean paper envelope. Ensure that the envelope contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the sample. Seal the envelope with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample in a separate envelope.

5. Instruct the case detective or other designated police officer to voucher the evidence and submit to the OCME Forensic Biology for DNA analysis.

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### 3. Collection by scraping

Bloodstains can also be scraped from non-porous objects such as knives, baseball bats, *etc.* This may be accomplished by using either razor or scalpel blades.

#### METHOD:

Change gloves BEFORE and AFTER the collection of each sample. Use a new razor/scalpel blade for each sample. If scissors and/or tweezers are used, clean with 10% bleach followed by 70% ethanol BEFORE and AFTER the collection of each sample.

All relevant information MUST be entered on the Evidence Log.

1. Appropriately document the stain in the case notes with a sketch and photograph the stain prior to collection (include a scale in the photographs). Assign each separate stain to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item that each sample was collected from, particularly when multiple items from a similar or identical class are encountered.

2. Use a clean blade for each sample collected. Using the razor/scalpel blade, scrape the bloodstain off the surface onto a small piece of clean white paper (or into a druggist fold - see Appendix C for directions on making a druggist fold). Collect enough of the sample for laboratory analysis or the entire stain, if small.
3. Fold the paper so that the scraping cannot be lost (or seal the druggist fold).
4. Record the time of collection.
5. Package the scraping (in folded paper or druggist fold) in a clean paper envelope. Ensure that the envelope contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the sample. Seal the envelope with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample in a separate envelope.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the OCME Forensic Biology for DNA analysis.

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#### 4. Collection of entire item

Occasionally, it may become necessary to collect the entire item for laboratory analysis.

##### METHOD:

Change gloves BEFORE and AFTER the collection of each item.

All relevant information MUST be entered on the Evidence Log.

1. Appropriately document the item/object in the case notes with a sketch and photograph the item prior to collection (include a scale in the photograph). Assign each separate item/object to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item/object that each item was collected from, particularly when multiple items from a similar or identical class are encountered.

2. Record the time of collection.
3. Package the item/object in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the OCME Forensic Biology for DNA analysis.

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**B. Hair and fibers**

Fiber evidence (including hair) is another commonly encountered type of physical evidence. Fibers can be readily transferred from one object/person to another upon contact and they can adhere well to many different types of surfaces. It is important to note the location (notes and photographs) of any discovered fiber evidence. Fibers may be easily lost due to size and the ease with which they can be transferred among objects/surfaces. Therefore, the utmost care must be used when handling and collecting fiber evidence. The following guidelines should be followed.

**1. Collection using tweezers/forceps**

This method is useful where individual fibers are observed.

**METHOD:**

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the fiber evidence in the case notes with a sketch and photograph the fiber(s) prior to collection (include a scale in the photographs). Assign each sample to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item that each fiber/sample was collected from, particularly when multiple items from a similar or identical class are encountered.

2. Clean the tweezers/forceps with a Kimwipe® lint-free wipe moistened with alcohol. Do not use an alcohol swab or any other method that would transfer fibers to the tweezers/forceps.
3. Grasp the fiber(s) with the tweezers/forceps and remove from the surface. Immediately transfer the fiber(s) into a druggist fold or a Gellifters® gelatin lifter.
4. Record the time of collection.
6. Package the druggist fold or gelatin lifter in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for hair/fiber analysis.

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## 2. Collection with gelatin lifters

Some instances may benefit from collecting fiber evidence directly onto a gelatin lifter. Gelatin lifters may be used to collect fiber evidence distributed over large areas by repeated applications of the same lifter or by arranging a series of lifters in an organized manner to preserve the distribution of the evidence. In either case, clear documentation is required to avoid later confusion.

### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the fiber evidence and area to be processed with the gelatin lifter in the case notes with a sketch and photograph the fiber(s) prior to collection (include a scale in the photographs). Assign each area to be collected a unique identifier.

**NOTE:** Clearly indicate the location, orientation, and item that each gelatin lifter was placed on, particularly when multiple items from a similar or identical class are encountered.

2. Remove the plastic protective sheet from the adhesive surface of the gelatin lifter. Lifters can be cut and/or shaped as needed.
3. Place the gelatin lifter (adhesive side down) directly onto the surface to be processed. Apply firm, even pressure over the entire back of the gelatin lifter.
4. Remove the gelatin lifter from the surface and replace the protective sheet onto the adhesive surface.
5. Record the time of collection.
6. Label the back of the gelatin lifter with the appropriate case and sample information. Package the gelatin lifter in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for hair/fiber analysis.

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### 3. Collection with adhesive tape

Fiber evidence can also be collected with adhesive tape. Like gelatin lifters, adhesive tape may be used to collect fiber evidence distributed over large areas by repeated applications of the same tape.

#### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the fiber evidence and area to be processed with adhesive tape in the case notes with a sketch and photograph the fiber(s) prior to collection (include a scale in the photographs). Assign each area to be collected a unique identifier.

**NOTE:** Clearly indicate the location, orientation, and item that the adhesive tape was placed on, particularly when multiple items from a similar or identical class are encountered.

2. Cut a section of adhesive tape to the size required.
3. Place the tape (adhesive side down) directly onto the surface to be processed. Apply firm, even pressure over the entire back of the tape.
4. Remove the tape from the surface and place the tape onto a transparent plastic sheet (adhesive side down).
5. Record the time of collection.
6. Label the transparent plastic sheet with the appropriate case and sample information. Package the tape lift in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each tape lift separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for hair/fiber analysis.

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**4. Collection of entire item**

Occasionally, collecting the entire item for laboratory analysis is preferred or necessary.

**METHOD:**

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the item/object in the case notes with a sketch and photograph the item/object prior to collection (include a scale in the photographs). Assign each item/object to be collected a unique identifier.
2. Place a sheet(s) of white paper (from a roll) large enough to cover the entire item or surface containing the fiber evidence. Fasten the sheet(s) with tape to the object so that almost no movement is allowed.
3. Cover the entire item or surface with brown packaging paper (from a roll) and fasten with tape (evidence, masking, or cellophane tape) so that all areas and holes are sealed.
4. Record the time of collection.
5. Package the item/object in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for hair/fiber analysis.

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## 5. Collection of comparison samples

Frequently, comparison samples will need to be collected for hair/fiber analysis. Experience and case circumstances will dictate when and how these samples will be collected. In some cases, it may be sufficient to remove a portion(s) of fabric from an item (*e.g.*, couch, bed sheet, automobile upholstery, *etc.*). In other instances, it may be desirable to collect the entire item (*e.g.*, article of clothing, *etc.*).

### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the area from which the comparison sample will be removed or the item/object in the case notes with a sketch and photograph the area prior to collection (include a scale in the photographs). Assign each area or item/object to be collected a unique identifier.

**NOTE:** Clearly label each collected area or item/object as a comparison sample.

2. Record the time of collection.
3. Package the comparison sample in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the comparison sample. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each comparison sample separately.

4. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for hair/fiber analysis.

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### C. Paint, glass, plastic, and other fragmentary trace materials

Paint, glass, and plastic, and other material that can be fractured and broken are also encountered as physical evidence. Small fragments of these materials can be readily transferred from one object/person to another upon contact and some may adhere well to different types of fabrics. It is important to note the location (notes and photographs) of this evidence on clothing and other surfaces. These small traces may be easily lost due to size and the ease with which they can be transferred among objects/surfaces. Therefore, the utmost care must be used when handling and collecting this type of evidence. The following general guidelines should be followed.

1. Collect and package fragments carefully!

**NOTE:** It must be kept in mind that these materials may hold valuable information in the form of fingerprint evidence and/or physical matching of broken/fractured edges.

2. Never package comparison samples and questioned samples together.
3. Evidence should be packaged in paper or cardboard. The use of druggist folds for packaging small fragments is recommended. Never package these materials in plastic containers as static electric charges may cause the loss of small evidentiary fragments.
4. Collect any dislodged fragments from the area(s) of damage. It may be possible to physically fit these with other fragments from the source vehicle or from fragments found at the scene.
5. Fragmented areas/sections that have remained together must be packaged as a whole and in a manner that will prevent the separation of the individual pieces.

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**1. Collection using tweezers/forceps**

This method is useful where individual fragments of paint, glass, plastic, or similar material are observed.

**METHOD:**

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the evidence in the case notes with a sketch and photograph the fragment(s) prior to collection (include a scale in the photographs). Assign each sample to be collected a unique identifier.

**NOTE:** Clearly indicate the location and item that each fragment was collected from, particularly when multiple items from a similar or identical class are encountered.

2. Clean the tweezers/forceps with a Kimwipe® lint-free wipe moistened with alcohol. Do not use an alcohol swab or any other method that would transfer any trace material to the tweezers/forceps.
3. Grasp the fragment(s) with the tweezers/forceps and remove from the surface. Immediately transfer the fragment(s) into a druggist fold or a Gellifters® gelatin lifter.
4. Record the time of collection.
6. Package the druggist fold or gelatin lifter in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for trace evidence analysis.

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## 2. Collection with gelatin lifters

Some instances may benefit from collecting this type of evidence directly onto a gelatin lifter. Gelatin lifters may be used to collect this type of evidence distributed over large areas by repeated applications of the same lifter or by arranging a series of lifters in an organized manner to preserve the distribution of the evidence. In either case, clear documentation is required to avoid later confusion.

### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the evidence and area to be processed with the gelatin lifter in the case notes with a sketch and photograph the fragment(s) prior to collection (include a scale in the photographs). Assign each area to be collected a unique identifier.

**NOTE:** Clearly indicate the location, orientation, and item that each gelatin lifter was placed on, particularly when multiple items from a similar or identical class are encountered.

2. Remove the plastic protective sheet from the adhesive surface of the gelatin lifter. Lifters can be cut and/or shaped as needed.
3. Place the gelatin lifter (adhesive side down) directly onto the surface to be processed. Apply firm, even pressure over the entire back of the gelatin lifter.
4. Remove the gelatin lifter from the surface and replace the protective sheet onto the adhesive surface.
5. Record the time of collection.
6. Label the back of the gelatin lifter with the appropriate case and sample information. Package the gelatin lifter in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for trace evidence analysis.

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### 3. Collection using adhesive tape

Paint, glass, plastic, and other similar fragments can also be collected with adhesive tape. Like gelatin lifters, adhesive tape may be used to collect trace evidence distributed over large areas by repeated applications of the same tape.

#### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the evidence and area to be processed with adhesive tape in the case notes with a sketch and photograph the fragment(s) prior to collection (include a scale in the photographs). Assign each area to be collected a unique identifier.

**NOTE:** Clearly indicate the location, orientation, and item that the adhesive tape was placed on, particularly when multiple items from a similar or identical class are encountered.

2. Cut a section of adhesive tape to the size required.
3. Place the tape (adhesive side down) directly onto the surface to be processed. Apply firm, even pressure over the entire back of the tape.
4. Remove the tape from the surface and place the tape onto a transparent plastic sheet (adhesive side down).
5. Record the time of collection.
6. Label the transparent plastic sheet with the appropriate case and sample information. Package the tape lift in a clean paper envelope. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each tape lift separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for trace evidence analysis.

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#### 4. Collection of entire item

Occasionally, collecting the entire item for laboratory analysis is preferred or necessary.

##### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the item/object in the case notes with a sketch and photograph the item/object prior to collection (include a scale in the photographs). Assign each item/object to be collected a unique identifier.
2. Place a sheet(s) of white paper (from a roll) large enough to cover the entire item or surface containing the fiber evidence. Fasten the sheet(s) with tape to the object so that almost no movement is allowed.
3. Cover the entire item or surface with brown packaging paper (from a roll) and fasten with tape (evidence, masking, or cellophane tape) so that all areas and holes are sealed.
4. Record the time of collection.
5. Package the item/object in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for trace evidence analysis.

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## 5. Collection of comparison samples

Frequently, comparison samples of paint, glass, plastic, and other material will need to be collected for trace evidence analysis. Experience and case circumstances will dictate when and how these samples will be collected. In automobile collision cases, at least two paint samples must be collected from each vehicle examined and packaged separately: a sample from the damaged area(s) and a sample from an undamaged area that is as close to the damaged area as possible. In some cases, it may be sufficient to remove a portion(s) of the material from an item (e.g., automobile paint, window glass, lamp housing plastic, *etc.*). In other instances, it may be desirable to collect the entire item (e.g., lamp housing, *etc.*).

### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the area from which the comparison sample will be removed or the item/object in the case notes with a sketch and photograph the area prior to collection (include a scale in the photographs). Assign each area or item/object to be collected a unique identifier.

**NOTE:** Clearly label each collected area or item/object as a comparison sample.

2. Record the time of collection.
3. Package the comparison sample in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the comparison sample. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each comparison sample separately.

4. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for trace evidence analysis.

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**D. Dust impressions**

Impressions in dust or ones composed of dust present the criminalist with several challenges. Fortunately, the collection of dust prints is possible with an electrostatic lifter. The electrostatic dust print lifter is useful for collecting and enhancing the contrast of footwear impressions that are on light colored surfaces. With the use of static electricity, the lifter will transfer dust impressions from a variety of surfaces onto a dark colored background. This will enhance the contrast of a dust impression making it more suitable for detailed photography.

**1. Basic Electrostatic Dustprint Lifter® operation**

The following general guidelines should be considered when using the dust print lifter:

- Read all of the unit instructions prior to use.
- Keep the unit dry. Do not operate the unit in wet conditions or rainy weather.
- Use extreme caution when lifting prints from metallic surfaces.
- Electric shock can occur if the unit is used improperly.
- When photographing lifted impressions, always use an appropriate scale.

**METHOD:**

**NOTE: Do not touch the probe tip! Do not touch anyone with the probe tip!**

1. Appropriately document the dust impression(s) in the case notes with a sketch and photograph the impression(s) prior to collection (include a scale in the photographs). Assign each separate impression to be collected a unique identifier.
2. Plug the red wire from the probe into the red plug on the power unit.
3. Plug the yellow/green wire into either of the two yellow/green plugs on the power unit.
4. Use a 2-3 inch sheet of the metallic lifting paper supplied as a “ground film” (a sheet should already be set aside for this purpose). The ground film should be taped (silver side down) about 1-2 inches from where the lifting film will be set down, over the suspected print area. Once the procedure is over, the ground film can be saved and used over.
5. Attach the alligator clip to the ground film. If the alligator clip or ground film touches the lift film while performing the lift, a short circuit may shutdown the power pack. If this occurs, reset the power pack by turning it off and then turning it back on.

**NOTE:** When dealing with metal surfaces, connect the alligator clip directly to the metal rather than using a ground film.

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6. Place the lift film over the suspected area with the black side facing the print surface. Do not slide it into position. Sliding or moving the lift film will disturb the dust impression.
7. Turn the unit on by pushing the switch to either “Variable” or “Max.” A red light will come on indicating the power is on.

**NOTE: Do not touch the metal tip of the probe while the unit is powered on!**

8. In the “Variable” setting, the Low-High knob can be adjusted to provide more or less power. Use the variable setting when lifting from metal and other surfaces. Attempt to use the least amount of power when lifting. Using too much power can damage the lift film. Turn the power unit to “Max” for use on plastic surfaces and plastic counter tops.
9. Touch the tip of the probe directly to the silver side of the lift film. The ground and lift films should suddenly cling to the surface beneath them. A crackling sound may be heard.
10. While maintaining the electric charge by keeping the probe in contact with the lift film, use the roller to apply gentle pressure on the film. This will help obtain maximum contact between the film and the surface.
11. When finished, turn off the unit by pushing the “Variable/Max” switch to the center position. The red light on the power unit will go off. Continue to hold the probe on the film for about five (5) seconds to allow it to discharge.
12. Carefully remove the lift film. Handle the lift film very carefully and try to keep it as flat as possible!
13. Since dust adhering to the metallic film is not permanent, take detailed photographs of the resulting impression as soon as possible. Make sure to include a scale in the photographs.
14. Record the time of collection.
15. Tape the lift film to a sheet of cardboard and place it in a shallow box. Ensure that the box contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the impression. Seal the box with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each lift separately.

16. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for impression analysis.

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## E. Gunshot residue

GSR is another common type of physical evidence. Generally, GSR is easily removed from a surface from handling. Brushing and improper folding can result in the loss of GSR from a surface. Extreme care **MUST** be taken when collecting and packaging GSR evidence. The following guidelines should be followed.

### 1. Collection by cutting

Suspected GSR patterns can be cut from large surfaces (*e.g.*, automobile headliners, *etc.*) for transport to the laboratory.

#### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the suspected area with GSR in the case notes with a sketch and photograph the area prior to collection (include a scale in the photographs). Assign each separate area to be collected a unique identifier.
2. Remove the entire area leaving a reasonable margin (6-12 inches or more) around the suspected pattern using a razor or scalpel blade.
3. Place a sheet(s) of white paper (from a roll) large enough to cover the entire item or surface containing the suspected GSR pattern or particles. Fasten the sheet(s) with tape to the object so that almost no movement is allowed.
4. Cover the entire item or surface with brown packaging paper (from a roll) and fasten with tape (evidence, masking, or cellophane tape) so that all areas and holes are sealed.
5. Record the time of collection.
6. Package the item in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

7. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for GSR analysis.

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## 2. Collection of entire item

Occasionally, collecting the entire item for laboratory analysis is preferred or necessary.

### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the suspected item/object in the case notes with a sketch and photograph the item/object prior to collection (include a scale in the photographs). Assign each separate item/object to be collected a unique identifier.
2. Place a sheet(s) of white paper (from a roll) large enough to cover the entire item or surface containing the suspected GSR pattern or particles. Fasten the sheet(s) with tape to the object so that almost no movement is allowed.
3. Cover the entire item or surface with brown packaging paper (from a roll) and fasten with tape (evidence, masking, or cellophane tape) so that all areas and holes are sealed.
4. Record the time of collection.
5. Package the item in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

6. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for GSR analysis.

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## F. Soil

Soil can be defined as a complex mixture of diverse particulate matter including, mineral grains, organic matter from plants in various states of decay, and matter resulting from human activity. Human contribution to soil matter can include paint particles, glass, pollutants, hair, fibers, and other trace materials. Furthermore, the concentrations of these components can vary dramatically between locations. For these reasons, the examination of soil can be an important and abundant source of evidence in a case.

### 1. Collection of questioned samples

Questioned soil samples will generally come from an item of evidence being examined such as shoes, clothing, or any other items collected from a suspect or victim that contains the particulate matter of soil. When collecting these items, it is important to remember that soil can form layers (particularly in shoes or tire treads) which should be preserved as well as possible. This kind of evidence can demonstrate that an item has traversed through areas that contain different types of soil.

#### METHOD:

All relevant information **MUST** be entered on the Evidence Log.

1. Appropriately document the questioned sample in the case notes with a sketch and photograph the item/object prior to collection (include a scale in the photographs). Assign each separate sample to be collected a unique identifier.
2. The questioned soil sample should be placed into a druggist fold (or other suitable clean container/package) and sealed. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

**NOTE:** Wet/damp samples must be dried before packaging.

3. Record the time of collection.
4. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for soil analysis.

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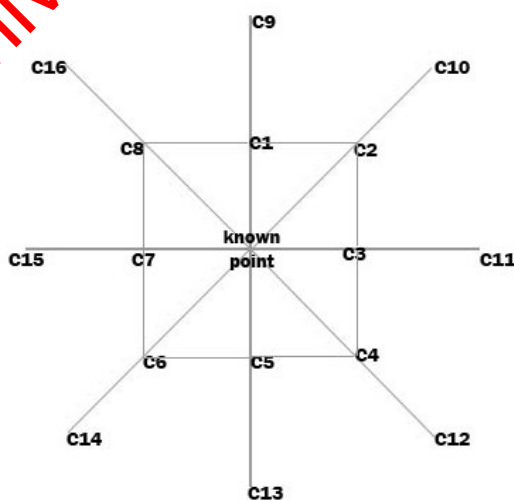
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## 2. Collection of comparison samples

A comparison sample will be comprised of soil that comes from the area where the questioned samples are believed to have originated. The identification of an area from which to collect comparison samples must be carefully selected. If circumstances pertaining to the case are known, a preliminary reconstruction could be useful in determining from where comparison samples should be collected. If a suspect(s) makes any statements regarding his/her whereabouts, soil samples should be carefully collected from these locations so that they can be compared to any soil evidence that is collected from evidence removed from the suspect(s).

In order for a questioned soil sample to be considered a match to a comparison sample, it must be compared to surrounding soil so that a considerable difference in composition can be demonstrated between the comparison and questioned samples. When a degree of variation is shown between the questioned and comparison samples, the significance of a soil match is increased. For this reason, additional comparison samples need to be collected from the areas surrounding the location of the established comparison sample point. The selection points for collection of the additional comparison samples will be contingent on the layout of the crime scene. If the crime scene is located on an open field, then a geometric configuration can be used as a template, such as the eight point pattern (shown below), for soil collection locations. Other patterns exist and may be used at the discretion of the criminalist.

**NOTE:** Samples C1-C8 should be collected approximately 10 feet from the central comparison sample. Samples C9-C16 should be collected approximately 50 feet from the central comparison sample.



If the crime scene is situated in a manner that does not lend itself to a geometric collection scheme, then a preliminary reconstruction may help logically determine the best locations for additional comparison sample collection points.

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**METHOD:**

All relevant information **MUST** be entered on the Evidence Log.

**NOTE:** Be aware of pattern impression evidence at the scene. If any pattern evidence is present, such as vehicle tire tracks or footwear impressions, they must be thoroughly documented and photographed prior to any soil collection attempts.

1. Appropriately document the area from which comparison samples are to be collected in the case notes with a sketch and photograph the area prior to collection. Assign each separate comparison sample to be collected a unique identifier.
2. Approximately three (3) tablespoons of soil should be collected using a clean spatula (or other suitable device).
3. Record the time of collection.
4. The comparison soil sample should be placed into a druggist fold (or other suitable clean container/package) and sealed. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

**NOTE:** Wet/damp samples must be dried before packaging.

5. Instruct the case detective or other designated police officer to voucher the evidence and submit to the NYPD Forensic Investigations Division laboratory for soil analysis.

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## G. Other types of physical evidence

Physical evidence that does not fall into any of the previously categorized types may be encountered, such as projectiles, soil, condoms, powders, *etc.* during a crime scene investigation that will need to be collected. The following guidelines provide general procedures for collecting other types of physical evidence.

Caution **MUST** be used when collecting physical evidence. Thorough documentation of the evidence and its position at a scene or on clothing is necessary.

When handling projectiles and other items/surfaces that contain tool marks or pattern impressions, **USE EXTREME CAUTION** so that any individual and/or class characteristics are not altered or destroyed.

All relevant information **MUST** be entered on the Evidence Log.

### METHOD:

1. Appropriately document the suspected item/object/area in the case notes with a sketch and photograph the item/object/area prior to collection (include a scale in the photographs). Assign each separate item/object/area to be collected a unique identifier.

**NOTE: Document, record, and collect appropriate control and/or comparison samples as necessary.**

2. Collect the item/object/area in an appropriate manner.
3. Record the time of collection.
4. Package the item/object/collected area in a clean paper envelope, bag, cardboard box, or other suitable container. Ensure that the package contains the appropriate case identification information (case number, date, type of sample, location collected, collector initials, *etc.*) and the unique identifier for the item. Seal the package with tape. Using a pen or marker, initial and date across the seal.

**NOTE:** Package each sample separately.

5. Instruct the case detective or other designated police officer to voucher the evidence and submit to the appropriate laboratory for analysis.

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## VIII. Crime scene reconstruction

Crime scene reconstruction is the final stage of an investigation. It involves the analysis of a vast array of physical evidence and data. A reconstruction generally consists of determining only a fraction of the events that occurred during an incident. Rarely is it possible to “reconstruct” all of the actions that occurred. As more singular events are resolved, a hypothesis concerning the overall chain of events can be formulated. Logic, analysis, experience, and employment of the scientific method will determine whether the hypothesis is refined enough to become a reasonable theory.

The initial hypothesis may provide other avenues of exploration. Either evidentiary or investigatory, and new evidence and data developed must be evaluated scientifically and objectively. The hypothesis may have to be altered in light of any new information and must be changed as required by the scientific analysis of physical evidence. Personal “attachment” to a hypothesis must be avoided. All hypotheses must conform to the physical evidence available; the evidence should not be made to “fit” the hypothesis. Do not be biased by an investigator’s or district attorney’s “theory” and do not make the evidence fit their vision of the events or their hypothesis of what happened.

The production of a laboratory report is the final stage of the reconstruction. This report may find its way into a court of law and be called into question by opposing counsel. Therefore, no conclusions should be drawn without a valid scientific basis. All assumptions should be clearly identified and a conservative approach is recommended so that the significance of the evidence or its analyses is not overstated or exaggerated.

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## IX. Case management

### A. Introduction

The goal of the Forensic Analysis and Reconstruction Unit is to provide users of its services, the NYPD, District Attorneys, Legal Aid, Capital Defenders Attorneys, and other agencies and attorneys within or serving the City of New York's criminal justice system, access to scientific analyses conducted in criminal investigations. These analyses are conducted independently, objectively, and reliably. Consistent with available resources, test results, opinions/conclusions, and reports represent high quality, integrity, and accuracy as dictated by the Department of Forensic Biology's Quality Assurance (QA) program, as described in the Quality Manual and other procedural manuals. The Forensic Analysis and Reconstruction Unit strives to stay abreast of current research, methodology, and techniques in the areas of crime scene investigation and reconstruction in order to remain a state-of-the-art service.

### B. Case acceptance

The following types of investigation and/or reconstruction cases may be accepted by the Forensic Analysis and Reconstruction Unit:

- homicide
- suicide
- accidental death
- undetermined death
- missing person
- sexual assault
- vehicle/pedestrian and vehicle/vehicle accidents
- assault, robbery and other cases (accepted at the discretion of the Unit Supervisor or Laboratory Director)

**NOTE:** The Unit Supervisor or Laboratory Director must approve acceptance of each case. Refer to the following two subsections for the general guidelines regarding case acceptance.

**NOTE:** Legitimate requests for FARU involvement may be made from the NYPD (rank of Detective or above), District Attorneys Office (one of the five counties within the City of New York), or the OCME (medical examiner or medico legal investigator). All other requests must be evaluated and discussed with the Laboratory Director or Chief Medical Examiner. Final approval for acceptance of these cases must be made by the Laboratory Director or the Chief Medical Examiner.

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When a case (one incident) has been accepted by the unit, the following steps should be completed:

1. Document the request for FARU involvement and the case details (and all subsequent conversations) on a Case Contact Log, if available. All conversations with outside personnel/agencies concerning a case must be recorded. If a Case Contact Log is unavailable, use any means necessary to record conversations. The media used to record conversations (or a copy) must be kept in the case binder/folder.
2. Assign the next (sequential) available FARU case number to the case and enter the appropriate information in the FARU Case Logbook.

**NOTE:** Each incident has a unique FARU case number. The case number should have one of two general formats (YY designates the last two digits of the year of acceptance and xxxx is a sequential number starting with 0001 for the first case of each year):

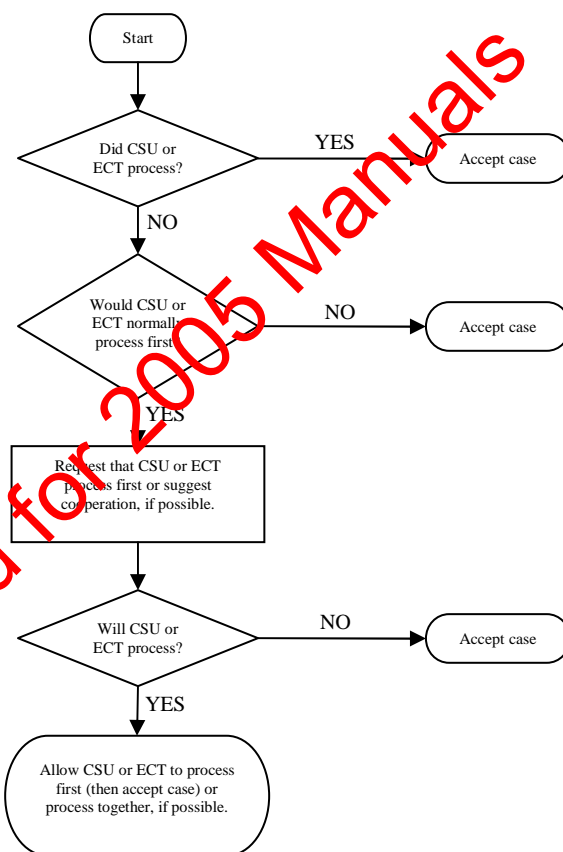
- FARU case no. YY/xxxx
- RUY/xxxx

3. Label an appropriately sized black binder or file folder with the FARU case number. Enter all case worksheets, logs, notes, sketches, photographs, and any other case information and/or data into the binder/folder. Enter into the case binder/folder copies of any reports, photographs, or other information obtained while the case is active.
4. Enter the appropriate information into the Paradox database on the OCME computer network (I:\users\FARU CaseLog\Logbook).

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## 1. Investigation/processing cases

Occasionally, FARU is requested to process a scene for the recognition, documentation, and collection of physical evidence. Typically, these cases are processed first by either the NYPD CSU or an ECT, however, exceptions exist. The following flowchart illustrates the process by which FARU will accept an investigation/processing case.



## 2. Reconstruction cases

When a legitimate request is made for a reconstruction, the case may be accepted by FARU without restriction by the Unit Supervisor or Laboratory Director.

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### C. Case binders/folders

All information regarding a case must be kept in the case binder/folder. The binder contents should be organized such that the information and data can be located easily. Separate sections should be designated for external reports and photographs, *e.g.*, autopsy report(s) and notes, NYPD CSU photographs and report(s), *etc.* All external reports and/or photographs, *etc.* must be labeled with the date and initials of the criminalist.

There must be no loose pages. Pages may be placed into a binder by punching holes along the left margin or by using full-sheet plastic protectors. Photographs (slides or film) may be stored in a binder using slide or full-sheet plastic protectors. All pages generated as a result of a field or laboratory analysis (*e.g.*, slides/photographs, notes, sketches, logs, and other data worksheets) must be numbered sequentially. Each page must also contain the date and initials of the criminalist.

Administrative paperwork (Case Contact Logs, Scheduled Examination and Analysis sheets, Chain of Custody sheets, *etc.*) must be stored in a separate and easily identifiable section within a binder/folder.

### D. Evidence handling and chain of custody issues

As discussed previously, evidence must be handled in a fashion that prevents loss or alteration. Evidence collected as a result of an investigation should be packaged and transferred as soon as possible to NYPD personnel prior to leaving the scene or location. Generally, the evidence will be transferred to the assigned case detective or an officer designated by the case detective or prosecutor.

In rare instances, it may be necessary for members of FARU to retain evidence at the OCME until such time as it can be transferred to the NYPD. The following general guidelines are provided to ensure that the integrity of the evidence and its chain of custody are not compromised.

1. Ensure that the evidence is packaged and labeled properly prior to leaving the scene or location.
2. Maintain possession of the evidence at all times until it can be secured at the OCME. The evidence must be secured during transport (either in the front passenger cab of the vehicle or in a locked rear storage compartment).
3. Upon return to the OCME, the evidence must be transported immediately to the FARU office where it must be stored in a secure (keyed padlock) locker. Only FARU members and the Laboratory Director are permitted to have access to this locker.

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4. The evidence must remain secured until such time as it can be transferred directly to a member of the NYPD.
5. Upon transferal to the NYPD, the bottom portion of the Evidence Log must be completed by the officer receiving the evidence.

## E. Opinions and conclusions

Opinions will be generated throughout the course of a crime scene investigation and reconstruction. Some of the preliminary opinions may change as new data, information, and laboratory analyses are received by the criminalist. It is important that scientific objectivity be maintained during a reconstruction. The criminalist must exercise extreme caution when releasing preliminary information to investigators and care must be taken to ensure the accuracy and validity of information released prior to the generation of a written report. The following sections provide general guidelines for the generation and release of information and opinions.

### 1. Preliminary opinions/conclusions

During the course of an investigation in the field (or office if examining photographs, *etc.*), the criminalist should be formulating a hypothesis (preliminary reconstruction). The criminalist should also be framing questions that will assist in the investigation and the development of additional evidence and information. Occasionally, it will be necessary to release preliminary information, either in the field to investigators or to prosecutors in the form of a preliminary report. The following sections discuss guidelines to handle these situations.

#### a) Release of information in field

Oftentimes, a criminalist will be asked to release preliminary opinions to investigators and/or prosecutors while in the field. It is important to understand that this information may be necessary to assist the investigative side of a case. Information released early may provide investigators with additional leads/information and also give them valuable information to use during interviews/interrogations. The following guidelines should be followed prior to releasing any preliminary information to investigators.

1. Do not release any information to anyone other than investigators (NYPD or other police agency, prosecutors/ADA's, and/or OCME personnel).
2. Discuss all opinions and data with FARU members (debriefing) prior to its release.
3. Release opinions that are conservative in nature. Do not overstate or exaggerate.
4. Inform investigators that any opinions released are preliminary and that they could change upon receipt of new evidence or information.

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5. Information must be released while in the presence of another member of FARU.
6. Record the content of information released and to whom it was released to in a Case Contact Log.

### **b) Generation and release of preliminary reports**

With less frequency, a criminalist may be asked to release a preliminary report to an ADA for the purpose of introducing evidence to a Grand Jury. It is important to understand that this information may be necessary to aid in the indictment process of a suspect. The following guidelines should be followed prior to the release of a preliminary report.

1. Reports must be written in narrative style.
2. Reports must be conservative in nature. Do not overstate or exaggerate opinions.
3. The information and data on which the opinions are based must be clearly delineated in the report.
4. The report must state that the opinions within could change upon receipt of new evidence or information.
5. All technical words/phrases must be clearly explained for a layperson.
6. The report must be peer-reviewed prior to release. Another criminalist (Assisting Criminalist) should co-sign the report. Both criminalists must be competent in the techniques and areas of investigation/reconstruction used to be able to write a case report.
7. Record the release of the report in the case binder and Case Contact Log.

### **2. Final opinions/conclusions**

At the conclusion of an investigation and reconstruction, all generated opinions will be placed into a written report that is narrative in style. This document serves as a synopsis of the scientist's efforts and analyses. Reconstruction reports are written very differently than those typically written by criminalists in the Forensic Biology laboratory. In addition to the final conclusions, the report must include a summary of all the examinations, analyses, assumptions, and experimentation. The report may also consider alternative scenarios and how the physical evidence relates to each. There may be times when conclusions cannot be drawn. In this latter event, stating this is important because it implies that no valid analyses should be made and may call into question analyses made by other, independent, investigators or experts.

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### a) Generation and release of final reports

The following suggestions are provided to assist in the preparation of a final report. The general guidelines for generation and release of preliminary reports also apply to final reports. Final reports will generally be more extensive than preliminary reports because of the amount of information that becomes available over time. Final opinions should be grounded more firmly and there may be more opinions generated depending on the case. Technical terminology, jargon, and misleading statements must be avoided. If any technical terminology is used in the report, the term(s) should be footnoted and defined using the glossary of terminology in this manual. The conclusions in each report must be supported by the evidence and data.

### b) Additional and amended reports

Occasionally, if new data or evidence is received after the generation of a final report, it may be necessary to produce either an additional or amended report. An additional report would be written if more opinions were formed upon review of the new evidence. Otherwise, an amended report would be required if the new evidence caused a change(s) in the prior opinion(s). In some instances, previous opinions may change and new opinions may be generated. This would require the preparation of an amended report with a clear delineation of the additional opinions and changes.

**NOTE:** If an additional or amended report is generated, this will be noted immediately before the OPINION section using the following standard statements:

**ADDITIONAL REPORT:** This is an additional report. For previous opinions, see report(s) dated (insert date(s) of prior report(s)).

**AMENDED REPORT:** This is an amended version of the report dated (insert date of original report). An additional sentence describing the nature of the correction(s) must be included.

## 3. Testimony

The general principles of crime scene reconstruction can be complex and their explanation in court problematic. Convincing the court that the science of crime scene reconstruction is reliable and the analyses accurate equate to preparing for an evidentiary or Frye hearing.

The burden of proving that the science is reliable and accurate is not within the realm of non-scientists because they are not trained in the scientific method. Though many police investigators may instinctively use a simplified form of the method in evaluating crime scenes and physical evidence, the forensic scientist should prove that the analyses employed are based on reliable scientific principles. The forensic scientist should also explain through testimony that sufficient documentation exists to support the opinions and analyses presented.

BIBLIOGRAPHY		
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## X. Bibliography

Abrink, A., Andersson, C., and Maehly, A. C., **"A Video System for the Visualization of Gunpowder Patterns,"** *Journal of Forensic Sciences*, Vol. 29, No. 4, October 1984, pp. 1223-1224.

Adam, J. R., Lindblad, N. R., and Hendricks, C. D., **"The Collision, Coalescence, and Disruption of Water Droplets,"** *Journal of Applied Physics*, Vol. 39, No. 11, October 1968, pp. 5173-5180.

Adler, W. F., **"Liquid Drop Collisions on Deformable Media,"** *J. Materials Sci.*, Vol. 12, 1977, pp. 1253-1271.

Afghan, B. K. and Ryan, J. F., **"A Modified Procedure for the Determination of Nitrate in Sediments and some Natural Waters,"** *Environmental Letters*, Vol. 9, No. 1, 1975, pp. 59-73.

Almog, J. and Glattstein, B., **"Detection of Firearms Imprints on Hands of Suspects: Study of the PDT-Based Field Test,"** *Journal of Forensic Sciences*, Vol. 42, No. 6, 1997, pp. 993-996.

Andrasko, J. and Maehly, A. C., **"Detection of Gunshot Residues on Hands by Scanning Electron Microscopy,"** *Journal of Forensic Sciences*, Vol. 22, No. 2, April 1977, pp. 279-287.

Balthazard, V., Piédelièvre, R., Desoille, H., and Dérobert, L., **"Étude des Gouttes de Sang Projeté,"** *Annales de Médecine Légale de Criminologie, Police Scientifique, Médecine Sociale, et Toxicologie*, Vol. 19, 1939, pp. 265-323.

Basu, S., **"Formation of Gunshot Residues,"** *Journal of Forensic Sciences*, Vol. 27, No. 1, January 1982, pp. 72-91.

Basu, S., Feriss, S., and Horn, R., **"Suicide Reconstruction by Glue-Lift of Gunshot Residue,"** *Journal of Forensic Sciences*, Vol. 29, No. 3, July 1984, pp. 843-864.

Basu, S., Boone, C. E., Denio, D. J., and Miazga, R. A., **"Fundamental Studies of Gunshot Residue Deposition by Glue-Lift,"** *Journal of Forensic Sciences*, Vol. 42, No. 4, 1997, pp. 571-581.

Beard, K. V., Ochs, H. T., and Kubesh, R. J., **"Natural Oscillations of Small Raindrops,"** *Nature*, Vol. 342, November 1989, pp. 408-410.

Betz, P., Peschel, O., Stiefel, D., and Eisenmenger, W., **"Frequency of Blood Spatters on the Shooting Hand and of Conjunctival Petechiae Following Suicidal Gunshots Wounds to the Head,"** *Forensic Science International*, Vol. 76, 1995, pp. 47-53.

BIBLIOGRAPHY		
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Bevel, T., **“Geometric Bloodstain Interpretation,”** *F.B.I. Law Enforcement Bulletin*, Vol. 52, No. 5, May 1983, pp. 7-10.

Bevel, T. and Gardner, R. M., *Bloodstain Pattern Analysis: With an Introduction to Crime Scene Reconstruction*, CRC Press, Boca Raton, FL, 1997.

Blanchard, D. C., **“The Behaviour of Water Drops at Terminal Velocity in Air,”** *Trans. Amer. Geophys. Union*, Vol. 31, No. 6, December 1950, pp. 836-842.

Bodziak, W. J., **“Use of Leuco Crystal Violet to Enhance Shoe Prints in Blood,”** *Forensic Science International*, Vol. 82, 1996, pp. 45-52.

Bodziak, W. J., *Footwear Impression Evidence: Detection, Recovery, and Examination*, 2<sup>nd</sup> Ed. CRC Press, Boca Raton, FL, 2000.

Bohannon, E. W. and Van Galen, D. A., **“A Sensitive Electrochemical Method for the Analysis of Nitrite Ion and Metals in Gunshot Residue,”** *Journal of Forensic Sciences*, Vol. 36, No. 3, May 1991, pp. 886-893.

Bosen, S. F. and Scheuing, D. R., **“A Rapid Microtechnique for the Detection of Trace Metals from Gunshot Residues,”** *Journal of Forensic Sciences*, Vol. 21, No. 1, January 1976, pp. 163-170.

Briner, R. C., **“An Interesting Gunshot Residue Pattern,”** *Journal of Forensic Sciences*, Vol. 30, No. 3, July 1985, pp. 945-947.

Brunelle, R. L., Hoffman, C. M., and Snow, K. B., **“Comparison of Elemental Composition of Pistol Bullets by Atomic Absorption: Preliminary Study,”** *Journal of the Association of Official Analytical Chemists*, Vol. 53, No. 3, 1970, pp. 470-474.

Burke, T. W. and Rowe, W. F., **“Bullet Ricochet: A Comprehensive Review,”** *Journal of Forensic Sciences*, Vol. 37, No. 5, September 1992, pp. 1254-1260.

Burnett, B. R., **“Detection of Bone and Bone-plus-Bullet Particles in Backspatter from Close-range Shots to Heads,”** *Journal of Forensic Sciences*, Vol. 36, No. 6, 1991, pp. 1745-1752.

Capannesi, G., Ciavola, C., and Sedda, A. F., **“Determination of Firing Distance and Firing Angle by Neutron Activation Analysis in a Case Involving Gunshot Wounds,”** *Forensic Science International*, Vol. 61, 1993, pp. 75-84.

BIBLIOGRAPHY		
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Carter, A. L. and Podworny, E. J., **“Bloodstain Pattern Analysis with a Scientific Calculator,”** *Journal of the Canadian Society of Forensic Science*, Vol. 24, No. 1, 1991, pp. 37-42.

Castellanos, I. and Plasencia, R., **“The Paraffin Gauntlet: A New Technique for the Dermo-Nitrate Test,”** *Journal of Criminal Law & Criminology*, Vol. 32, 1941, pp. 465-467.

Castellanos, I., **“Dermo-Nitrate Test in Cuba,”** *Journal of Criminal Law and Criminology*, Vol. 33, 1943, pp. 482-486.

Chandrasekar, V., Cooper, W. A., and Bringi, V. N., **“Axis Ratios and Oscillations of Raindrops,”** *Journal of the Atmospheric Sciences*, Vol. 45, No. 8, 1988, pp. 1323-1332.

Ching, B., Golay, M. W., and Johnson, T. J., **“Droplet Impacts upon Liquid Surfaces,”** *Science*, Vol. 226, November 1984, pp. 535-537.

Chisum, W. J., **“Pitfalls in Bloodstain Pattern Interpretation,”** *CAC (California Association of Criminalists) News*, 4th Quarter, 1998, pp. 14-17.

Cornelis, R. and Timperman, J., **“Gunfiring Detection Method based on Sb, Ba, Pb, and Hg Deposits on Hands. Evaluation of the Credibility of the Test,”** *Medicine, Science, and the Law*, Vol. 14, No. 2, April 1974, pp. 98-116.

Cowan, M. E. and Purdon, P. L., **“A Study of the “Paraffin Test,”** *Journal of Forensic Sciences*, Vol. 12, No. 1, January 1967, pp. 19-36.

De Forest, P. R., **“The Forensic Scientist and the Crime Scene,”** presented at the 11th International Symposium of the Australia and New Zealand Forensic Science Society, Hobart, Tasmania, August 17-21, 1992.

De Forest, P. R., **“A Review of Interpretation of Bloodstain Evidence at Crime Scenes,”** *Journal of Forensic Sciences*, Vol. 35, No. 6, 1990, pp. 1491-1495.

De Forest, P. R., Gaensslen, R. E., and Lee, H. C., *Forensic Science: An Introduction to Criminalistics*, McGraw-Hill Book Company, New York City, NY, 1983.

Deinet, W. and Leszczynski, C., **“Examinations to Determine Close-Range Firing Distances using a Process Control Computer,”** *Forensic Science International*, Vol. 31, 1986, pp. 41-54.

Di Maio, V. J. M., Dana, S. E., Taylor, W. E., and Ondrusek, J., **“Use of Scanning Electron Microscopy and Energy Dispersive X-Ray Analysis (SEM-EDXA) in Identification of Foreign Material on Bullets,”** *Journal of Forensic Sciences*, Vol. 32, No. 1, January 1987, pp. 38-47.

BIBLIOGRAPHY		
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Dillon, Jr., J. H., **“The Modified Griess Test: A Chemically Specific Chromophoric Test for Nitrite Compounds in Gunshot Residues,”** *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 22, No. 3, July 1990, pp. 243-250.

Dillon, Jr., J. H., **“The Sodium Rhodizonate Test: A Chemically Specific Chromophoric Test for Lead in Gunshot Residues,”** *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 22, No. 3, July 1990, pp. 251-256.

Dillon, Jr., J. H., **“A Protocol for Gunshot Residue Examinations in Muzzle-to-Target Distance Determinations,”** *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 22, No. 3, July 1990, pp. 257-274.

Eckert, W. G. and James, S. H., *Blood Evidence in Crime Scene Investigation*, INFORM Publications, Wichita, Kansas, 1987.

Eckert, W. G. and James, S. H., *Interpretation of Bloodstain Evidence at Crime Scenes*, Elsevier Science Publishing Company, New York, NY, 1989.

Fisher, B. A. J., *Techniques of Crime Scene Investigation*, 5<sup>th</sup> Ed., CRC Press, Boca Raton, FL, 1993.

Flower, W. D., **“The Terminal Velocity of Drops,”** *Proc. Phys. Soc., Lon.*, Vol. 40, 1928, pp. 167-176.

Foote, G. B., **“The Water Drop Rebound Problem: Dynamics of Collision,”** *Journal of the Atmospheric Sciences*, Vol. 32, February 1975, pp. 390-402.

Fox, Jr., J. B., **“Kinetics and Mechanisms of the Griess Reaction,”** *Analytical Chemistry*, Vol. 51, No. 9, August 1979, pp. 1493-1502.

Fox, J. B., Zell, T. E., and Wasserman, A. E., **“Interaction between Sample Preparation Techniques and Colorimetric Reagents in Nitrite Analysis in Meat,”** *Journal of the Association of Official Analytical Chemists*, Vol. 64, No. 6, 1981, pp. 1397-1402.

Fukai, J., Shiiba, Y., Yamamoto, T., Miyatake, O., Poulikakos, D., Megaridis, C. M., and Zhao, Z., **“Wetting Effects on the Spreading of a Liquid Droplet Colliding with a Flat Surface: Experiment and Modeling,”** *The Physics of Fluids*, Vol. 7, No. 2, February 1995, pp. 236-247.

Gaennslen, R. E., *Sourcebook in Forensic Serology, Immunology, and Biochemistry*, U.S. Department of Justice, National Institute of Justice, U.S. Government Printing Office, 1983.

Geberth, V. J., *Practical Homicide Investigation: Tactics, Procedures, and Forensic Techniques*, 3<sup>rd</sup> Ed., CRC Press, Boca Raton, FL, 1996.

BIBLIOGRAPHY		
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Geberth, V. J., *Practical Homicide Investigation: Checklist and Field Guide*, CRC Press, Boca Raton, FL, 1996.

Gillies, D. A., “Scientific Evidence in the Sheppard Case,” *Police Sci. Leg. Abs. and Notes*, Vol. 4, 1956, pp. 136-142.

Glattstein, B., Vinokurov, A., Levin, N., and Zeichner, A., “Improved Method for Shooting Distance Estimation. Part I. Bullet Holes in Clothing Items,” *Journal of Forensic Sciences*, Vol. 45, No. 4, 2000, pp. 801-806.

Glattstein, B., Zeichner, A., Vinokurov, A., and Shoshani, E., “Improved Method for Shooting Distance Determination. Part II. Bullet Holes in Objects that Cannot be Processed in the Laboratory,” *Journal of Forensic Sciences*, Vol. 45, No. 5, 2000, pp. 1000-1008.

Goleb, J. A. and Midkiff, C. R., “Firearms Discharge Residue Sample Collection Techniques,” *Journal of Forensic Sciences*, Vol. 20, No. 4, 1975, pp. 701-707.

Green, A. L. and Sauve, J. P., “The Analysis of Gunshot Residue by Atomic Absorption Spectrophotometry,” *Atomic Absorption Newsletter*, Vol. 11, No. 5, September-October 1972, pp. 93-95.

Green, A. W., “An Approximation for the Shapes of Large Raindrops,” *Journal of Applied Meteorology*, Vol. 14, December 1975, pp. 1578-1583.

Gunn, R. and Kinzer, G. D., “The Terminal Velocity of Fall for Water Droplets in Stagnant Air,” *J. Meteorology*, Vol. 6, 1949, pp. 243- 248.

Haag, L. C., “Powder in a Most Peculiar Place,” *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 22, No. 2, April 1990, pp. 110-114.

Harrison, H. C. and Gilroy, R., “Firearms Discharge Residues,” *Journal of Forensic Sciences*, Vol. 4, No. 2, April 1959, pp. 184-199.

Haung, Y. C., Hammit, F. G., and Yang, W. J., “Hydrodynamic Phenomena During Highspeed Collision Between Liquid Droplet and Rigid Plane,” *J. Fluids Eng.*, 1973, pp. 276-294.

Hobbs, P. V. and Kezweeny, A. J., “Splashing of a Water Drop,” *Science*, Vol. 155, No. 3, 1967, pp. 1112-1114.

Hoffman, C. M., “Neutron Activation Analysis for the Detection of Firearm Discharge Residues Collected on Cotton Swabs,” *Journal of the Association of Official Analytical Chemists*, Vol. 56, No. 6, 1973, pp. 1388-1390.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 138 of 155

Huffman, S. W., Lukasiewicz, K. B., and Brown, C. W., **“FTIR Hyperspectral Images of Microscopic Droplets of Splattered Blood,”** *Microscopy Today*, Vol. 11, No. 3, May/June 2003, pp. 10-12.

Hurley, N. M. and Pex, J. O., **“Sequencing of Bloody Shoe Impressions by Blood Spatter and Blood Droplet Drying Times,”** *International Association of Bloodstain Pattern Analysts Newsletter*, December 1990.

Karger, B., Nüsse, R., Schroeder, G., Wüstenbecker, S., and Brinkmann, B., **“Backspatter from Experimental Close-Range Shots to the Head. I. Macrobackspatter,”** *International Journal of Legal Medicine*, Vol. 109, 1996, pp. 66-74.

Karger, B., Nüsse, R., Tröger, H. D., and Brinkmann, B., **“Backspatter from Experimental Close-Range Shots to the Head. II. Microbackspatter and the Morphology of Bloodstains,”** *International Journal of Legal Medicine*, Vol. 110, 1997, pp. 27-30.

Karger, B. and Brinkmann, B., **“Multiple Gunshot Suicides: Potential for Physical Activity and Medico-Legal Aspects,”** *International Journal of Legal Medicine*, Vol. 110, 1997, pp. 188-192.

Karger, B., Rand, S. P., and Brinkmann, R., **“Experimental Bloodstains on Fabric from Contact and from Droplets,”** *International Journal of Legal Medicine*, Vol. 111, 1998, pp. 17-21.

Karger, B., Nüsse, R., and Bajonowski, T., **“Backspatter on the Firearm and Hand in Experimental Close-Range Gunshots to the Head,”** *American Journal of Forensic Medicine and Pathology*, Vol. 23, No. 3, 2002, pp. 211-213.

Kilty, J. W., **“Activity after Shooting and its Effect on the Retention of Primer Residue,”** *Journal of Forensic Sciences*, Vol. 20, No. 2, 1975, pp. 219-230.

Kilty, J. W., **“A Review of the FBI Laboratory’s Gunshot Primer Residue Program,”** *Crime Laboratory Digest*, Vol. 13, No. 2, April 1986, pp. 54-61.

Kinnell, P. I. A., **“The Acoustic Measurement of Water-Drop Impacts,”** *Journal of Applied Meteorology*, Vol. 11, June 1972, pp. 691-694.

Kirk, P. L., *Crime Investigation: Physical Evidence and the Police Laboratory*, Interscience Publishers, Inc., New York, NY, 1953.

Kirk, P. L., **“Affidavit of Paul Leland Kirk in STATE OF OHIO vs. SAMUEL H. SHEPPARD,”** State of Ohio, Cuyahoga County, Court of Common Pleas, Criminal Branch, No. 64571, April 26, 1955, pp. 1-27.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 139 of 155

Kirk, P. L., **“Blood - a Neglected Criminalistics Research Area,”** *Law Enforcement Science and Technology*, Vol. 1, Academic Press, London, 1967, pp. 267-272.

Kleiber, M., Stiller, D., and Weigand, P., **“Assessment of Shooting Distance on the Basis of Bloodstain Analysis and Histological Examinations,”** *Forensic Science International*, Vol. 119, 2001, pp. 260-262.

Krishnan, S. S. and Nichol, R. C., **“Identification of Bullet Holes by Neutron Activation Analysis and Autoradiography,”** *Journal of Forensic Sciences*, Vol. 13, No. 4, October 1968, pp. 519-527.

Krishnan, S. S., Gillespie, K. A., and Anderson, E. J., **“Rapid Detection of Firearm Discharge Residues by Atomic Absorption and Neutron Activation Analysis,”** *Journal of Forensic Sciences*, Vol. 16, No. 2, April 1971, pp. 144-151.

Krishnan, S. S., **“Detection of Gunshot Residue on the Hands by Neutron Activation and Atomic Absorption Analysis,”** *Journal of Forensic Sciences*, Vol. 19, No. 4, 1974, pp. 789-797.

Krishnan, S. S., **“Detection of Gunshot Residues on the Hands by Trace Element Analysis,”** *Journal of Forensic Sciences*, Vol. 22, No. 2, April 1977, pp. 304-324.

Laber, T. L., **“Diameter of Bloodstains as a Function of Origin, Distance Fallen, and Volume of Drop,”** *IABPA Newsletter*, Vol. 2, No. 1, 1985, pp. 12-16.

Laber, T. L. and Epstein, B. P., *Experiments and Practical Exercises in Bloodstain Pattern Analysis*, 4th printing, Callen Publishing, Inc., Minneapolis, MN, 1994.

Lantz, P. E., Jerome, W. G., and Jaworski, J. A., **“Radiopaque Deposits Surrounding a Contact Small-Caliber Gunshot Wound,”** *American Journal of Forensic Medicine and Pathology*, Vol. 15, No. 1, 1994, pp. 10-13.

Lee, H. C., **“Identification and Grouping of Bloodstains,”** in Saferstein, R. (ed.), *Forensic Science Handbook*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1982, Chapter 7, pp. 267-337.

Lee, H. C., Gaensslen, R. E. and Pagliaro, E. M., **“Bloodstain Volume Estimation,”** *IABPA News*, Vol. 3, No. 2, 1986, pp. 47-54.

Lekstrom, J. A. and Koons, R. D., **“Copper and Nickel Detection on Gunshot Residue Targets by Dithiooxamide Test,”** *Journal of Forensic Sciences*, Vol. 31, No. 4, October 1986, pp. 1283-1291.

List, R. and Hand, M. J., **“Wakes of Freely Falling Water Drops,”** *The Physics of Fluids*, Vol. 14, No. 8, August 1971, pp. 1648-1655.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 140 of 155

List, R., Low, T. B., and McTaggart-Cowan, J. D., **“Collisions of Raindrops with Chaff,”** *Journal of Applied Meteorology*, Vol. 13, October 1974, pp. 796-799.

Lock, J. A., **“The Physics of Air Resistance,”** *The Physics Teacher*, Vol. 20, No. 3, 1982, pp. 158-160.

Loper, G. L., Calloway, A. R., O'Neill, M. A., Peak, S. A., Wolten, G. M., and Jones, P. F., **“A Field Test of Photoluminescence for Investigating Suicides by Firearms,”** Report No. ATR-77(7915)-2, The Aerospace Corporation, El Segundo, CA, November 1977.

Lloyd, J. B. F., **“Diphenylamine Traces in Handwabs and Clothing Lint: Cleanup and Liquid Chromatography with Sequential Oxidative and Reductive Electrochemical Detection,”** *Analytical Chemistry*, Vol. 59, No. 10, May 15, 1987, pp. 1401-1404.

Lucas, D. M., **“The Ethical Responsibilities of the Forensic Scientist: Exploring the Limits,”** *Journal of Forensic Sciences*, Vol. 34, No. 3, May 1989, pp. 719-729.

Lytle, L. T. and Hegecock, D. G., **“Chemiluminescence in the Visualisation of Forensic Bloodstains,”** *J. Forens. Sci.*, Vol. 23, 1978, pp. 550-552.

MacDonell, H. L. and Bialousz, L. F., *Flight Characteristics and Stain Patterns of Human Blood*, U.S. Department of Justice, Law Enforcement Assistance Administration, Washington, D.C., 1971.

MacDonell, H. L., **“Interpretation of Bloodstains: Physical Considerations,”** in Wecht, C. H. (editor), *Legal Medicine Annual 1971*, Appleton-Century-Crofts, New York, 1971, pp. 91-136.

MacDonell, H. L. and Brooks, B. A., **“Detection and Significance of Blood in Firearms,”** In Wecht, C.H. (editor), *Legal Medicine Annual 1977*, Appleton-Century-Crofts, New York, 1977, pp. 185-199.

MacDonell, H. L., **“Preserving Bloodstain Evidence at Crime Scenes,”** *Law & Order*, April 1977, pp. 66-69.

MacDonell, H. L. and Panchou, C. G., **“Bloodstain Pattern Interpretation,”** *Identification News*, Vol. 29, 1979, pp. 3-5.

MacDonell, H. L. and Panchou, C. G., **“Bloodstain Patterns on Human Skin,”** *Journal of the Canadian Society of Forensic Science*, Vol. 12, No. 3, Sept. 1979, pp. 134-141.

MacDonell, H. L., **“Criminalistics: Blood Stain Examination,”** in Wecht, C. H. (ed.), *Forensic Sciences Volume III*, Matthew Bender & Company, New York City, NY, 1981, Chapter 37, pp. 37-01 to 37-26.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 141 of 155

MacDonell, H. L., **“Criminalistics: Blood Stain Examination,”** Chapter 37 in *Forensic Sciences, Volume 2*, ed. Wecht, C., Matthew Bender & Company, Inc., NY, 1990, pp. 37(1)-37(26).

MacDonell, H. L., *Bloodstain Patterns*, Golos Printing, Inc., Elmira Heights, NY, 1993.  
Magarvey, R. H. and Taylor, B. W., **“Free-fall Breakup of Large Drops,”** *J. Applied Physics*, Vol. 27, No. 10, 1956, pp. 1129-1135.

Mach, M. H., Pallos, A., and Jones, P. F., **“Feasibility of Gunshot Residue Detection via its Organic Constituents. Part I: Analysis of Smokeless Powders by Combined Gas Chromatography-Chemical Ionization Mass Spectrometry,”** *Journal of Forensic Sciences*, Vol. 23, No. 3, July 1978, pp. 433-445.

Mach, M. H., Pallos, A., and Jones, P. F., **“Feasibility of Gunshot Residue Detection via its Organic Constituents. Part II: A Gas Chromatography-Mass Spectrometry Method,”** *Journal of Forensic Sciences*, Vol. 23, No. 3, July 1978, pp. 446-455.

Magono, C., **“On the Shape of Water Drops Falling in Stagnant Air,”** *J. Meteorology*, Vol. 11, 1954, pp. 77-79.

Maiti, P. C., **“Powder Patterns around Bullet Holes in Bloodstained Articles,”** *Journal of the Forensic Science Society*, Vol. 13, 1973, p. 197.

Maloney, R. S. and Thornton, J. I., **“Color Tests for Diphenylamine Stabilizer and Related Compounds in Smokeless Gunpowder,”** *Journal of Forensic Sciences*, Vol. 27, No. 2, April 1982, pp. 318-329.

Matricardi, V. R. and Kilby, J. W., **“Detection of Gunshot Residue Particles from the Hands of a Shooter,”** *Journal of Forensic Sciences*, Vol. 22, No. 4, 1977, pp. 725-738.

McDonald, J. E., **“The Shape and Aerodynamics of Large Raindrops,”** *Journal of Meteorology*, Vol. 11, 1954, pp. 478-494.

McTaggart-Cowan, J. D. and List, R., **“Collision and Breakup of Water Drops at Terminal Velocity,”** *Journal of the Atmospheric Sciences*, Vol. 32, July 1975, pp. 1401-1411.

Meng, H. and Caddy, B., **“Gunshot Residue Analysis – A Review,”** *Journal of Forensic Sciences*, Vol. 42, No. 4, 1997, pp. 553-570.

Midkiff, C. R., **“Detection of Gunshot Residues: Modern Solutions for an Old Problem,”** *Journal of Police Science and Administration*, Vol. 3, No. 1, March 1975, pp. 77-83.

Miller, T. E. and Meyer, W. C., **“Measurement of Dynamic Surface Tension,”** *Amer. Lab.*, Feb. 1984, pp. 91-100.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 142 of 155

Moore, C. C., **“Demonstrative Aid for Bloodstain Pattern Examiners,”** *Journal of Forensic Identification*, Vol. 53, No. 6, November/December 2003, pp. 639-646.

Nag, N. K. and Mazumdar, M., **“Detection of Firearm Discharge Residues in Blood-Stained Articles by Fluorescence,”** *Forensic Science*, Vol. 5, 1975, pp. 69-71.

Nag, N. K. and Sinha, P., **“A Note on Assessability of Firing Distance from Gunshot Residues,”** *Forensic Science International*, Vol. 56, No. 1, September 1992, pp. 1-17.

Nennstiel, R., **“Study of Bullet Ricochet on a Water Surface,”** *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 16, No. 3, 1984, pp. 88-93.

Nesbitt, R. S., Wessel, J. E., and Jones, P. F., **“Conclusive Detection of Gunshot Residue by the Use of Particle Analysis,”** Report No. ATR-75(7915)-2, The Aerospace Corporation, El Segundo, CA, December 1974.

Nesbitt, R. S., Wessel, J. E., and Jones, P. F., **“Detection of Gunshot Residue by Use of the Scanning Electron Microscope,”** *Journal of Forensic Sciences*, Vol. 21, No. 3, July 1976, pp. 595-610.

Nesbitt, R. S., Wessel, J. E., Wolten, G. M., and Jones, P. F., **“Evaluation of a Photoluminescence Technique for the Detection of Gunshot Residue,”** *Journal of Forensic Sciences*, Vol. 22, No. 2, 1977, pp. 288-303.

Nichols, C. A. and Sens, M. A., **“Cytologic Manifestations of Ballistic Injury,”** *American Journal of Clinical Pathology*, Vol. 95, 1991, pp. 660-669.

Nichols, C. A. and Sens, M. A., **“Recovery and Evaluation by Cytologic Techniques of Trace Material Retained on Bullets,”** *American Journal of Forensic Medicine and Pathology*, Vol. 11, No. 1, 1990, pp. 17-34.

Nikon Corporation, *The Nikon Guide to Digital Photography with the D100 Digital Camera*, Tokyo, Japan.

Nikon Corporation, *F3 High-eyepoint Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *F4/F4S Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *F5 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Speedlight SB-16 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Autofocus Speedlight SB-20 Instruction Manual*, Tokyo, Japan.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 143 of 155

Nikon Corporation, *Macro Speedlight SB-21 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Autofocus Speedlight SB-26 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Autofocus Speedlight SB-27 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Autofocus Speedlight SB-28 Instruction Manual*, Tokyo, Japan.

Nikon Corporation, *Macro Speedlight SB-29 Instruction Manual*, Tokyo, Japan.

Northrop, D. M. and Mac Crehan, W. A., **“Sample Collection, Preparation, and Quantitation in the Micellar Electrokinetic Capillary Electrophoresis of Gunshot Residues,”** *Journal of Liquid Chromatography*, Vol. 15, No. 6, 1992, pp. 1041-1063.

OSHA (Occupational Safety and Health Administration), *OSHA Bloodborne Pathogens Standard, Title 29, Code of Federal Regulations, Part 1919.1030*, Vol. 58, No. 235, December 6, 1991.

OSHA (Occupational Safety and Health Administration), *Occupational Exposure to Bloodborne Pathogens: Precautions for Emergency Responders*, OSHA 3130, 1992.

Petraco, N., Yander, M., and Sardone, J., **“A Method for the Quantitative Determination of Nitrites in Gunshot Residue Cases,”** *Forensic Science International*, Vol. 18, 1981, pp. 85-92.

Petraco, N., Resua, R., and Hart, H., **“A Rapid Method for the Preparation of Transparent Footwear Test Prints,”** *Journal of Forensic Sciences*, Vol. 27, No. 4, July 1982, pp. 935-937.

Petraco, N. and De Forest, P. R., **“Trajectory Reconstructions I: Trace Evidence in Flight,”** *Journal of Forensic Sciences*, Vol. 35, No. 6, November 1990, pp. 1284-1296.

Pex, J. O. and Vaughan, C. H., **“Observations of High Velocity Bloodspatter on Adjacent Objects,”** *Journal of Forensic Sciences*, Vol. 32, No. 6, Nov. 1987, pp. 1587-1594.

Pillay, K. K. S., Jester, W. A., and Fox, H. A., **“New Method for the Collection and Analysis of Gunshot Residues as Forensic Evidence,”** *Journal of Forensic Sciences*, Vol. 19, No. 1, 1974, pp. 768-783.

Pizzola, P. A., *Blood Droplet Dynamics and their Implication for Bloodstain Pattern Interpretation at Crime Scenes*, M.S. Thesis, John Jay College of Criminal Justice/City University of New York, June 1984.

Pizzola, P. A., Roth, S., and De Forest, P. R., **“Blood Droplet Dynamics - I,”** *Journal of Forensic Sciences*, Vol. 31, No. 1, January 1986, pp. 36-49.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 144 of 155

Pizzola, P. A., Roth, S., and De Forest, P. R., **“Blood Droplet Dynamics - II,”** *Journal of Forensic Sciences*, Vol. 31, No. 1, January 1986, pp. 50-64.

Pizzuto, J. J., *Fabric Science*, fourth edition (revised by Price, A. and Cohen, A. C.), Fairchild Publications, New York City, NY, 1985.

Price, G., **“Firearms Discharge Residues on Hands,”** *Journal of the Forensic Science Society*, Vol. 5, 1965, pp. 199-200.

Proescher, F. and Moody, A. M., **“Detection of Blood by Means of Chemiluminescence,”** *Journal of Laboratory and Clinical Medicine*, Vol. 24, No. 11, August 1939, pp. 1183-1189.

Raymond, M. A. and Hall, R. L., **“An Interesting Application of Infra-red Reflection Photography to Bloodsplash Pattern Interpretation,”** *Forensic Science International*, Vol. 31, 1986, pp. 189-194.

Raymond, M. A., Smith, E. R., and Liesegang, J., **“The Physical Properties of Blood - Forensic Considerations,”** *Science & Justice*, Vol. 36, No. 3, 1996, pp. 153-160.

Raymond, M. A., Smith, E. R., and Liesegang, J., **“Oscillating Blood Droplets - Implications for Crime Scene Reconstruction,”** *Science & Justice*, Vol. 36, No. 3, 1996, pp. 161-171.

Renshaw, G. D., **“The Quantitative Estimation of Lead, Antimony, and Barium in Gunshot Residues by Non-Flame Atomic Absorption Spectrophotometry,”** *Atomic Absorption Newsletter*, Vol. 12, No. 2, March-April 1973, pp. 55-56.

Renshaw, G. D., **“The Determination of Barium by Flameless Atomic Absorption Spectrophotometry using a Modified Graphite Tube Atomizer,”** *Atomic Absorption Newsletter*, Vol. 12, No. 6, November-December 1973, pp. 158-160.

Rowe, W. F., **“Firearms Identification,”** in Saferstein, R. (ed.), *Forensic Science Handbook Volume II*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1988, Chapter 8, pp. 393-461.

Rudzitis, E., Kopina, M., and Wahlgren, M., **“Optimization of Firearm Residue Detection by Neutron Activation Analysis,”** *Journal of Forensic Sciences*, Vol. 18, No. 2, April 1973, pp. 93-100.

Rudzitis, E., **“Analysis of the Results of Gunshot Residue Detection in Casework,”** *Journal of Forensic Sciences*, Vol. 25, No. 4, October 1980, pp. 839-846.

Ryan, R. T., **“The Behaviour of Large, Low-Surface-Tension Water Drops Falling at Terminal Velocity in Air,”** *Journal of Applied Meteorology*, Vol. 15, February 1976, pp. 157-165.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 145 of 155

Shem, R. J., **“Bleeding as a Source of Lead Particulates on Clothing,”** *American Journal of Forensic Medicine and Pathology*, Vol. 16, No. 2, 1995, pp. 127-131.

Sherfinski, J. H., **“A Graphite Tube Degradation Study of Barium at Gunshot Residue Levels,”** *Atomic Absorption Newsletter*, Vol. 14, No. 1, January-February 1975, pp. 26-28.

Sinha, J. K. and Misra, G. J., **“Detection of Powder Particles at the Crime Scene,”** *Journal of Forensic Sciences*, Vol. 16, No. 1, January 1971, pp. 109-111.

Sinha, J. K., **“Time of Firing of Shot Shells,”** *Journal of Forensic Sciences*, Vol. 21, No. 1, January 1976, pp. 171-175.

Smith, C., **“Spherical Coordinates for Plotting the Positions of Powder Residues,”** *Journal of Forensic Sciences*, Vol. 18, No. 2, April 1973, pp. 101-109.

Smith, O. C. and Harruff, R. C., **“Evidentiary Value of the Contents of Hollow-Point Bullets,”** *Journal of Forensic Sciences*, Vol. 33, No. 4, July 1988, pp. 1052-1057.

Spengler, J. D. and Gokhale, N. R., **“Drop Impactions,”** *Journal of Applied Meteorology*, Vol. 12, March 1973, pp. 316-321.

Spilhaus, A. F., **“Raindrop Size, Shape and Falling Speed,”** *J. Meteorology*, Vol. 5, 1948, pp. 108-110.

Steinberg, M., Leist, Y., and Tassa, M., **“A New Field Kit for Bullet Hole Identification,”** *Journal of Forensic Sciences*, Vol. 29, No. 1, January 1984, pp. 169-176.

Steinberg, M., Leist, Y., Goldschmidt, P., and Tassa, M., **“Spectrophotometric Determination of Nitrites in Gunpowder Residue on Shooter’s Hands,”** *Journal of Forensic Sciences*, Vol. 29, No. 2, April 1984, pp. 464-470.

Stephens, B. G. and Allen, T. B., **“Back Spatter of Blood from Gunshot Wounds - Observations and Experimental Simulation,”** *Journal of Forensic Sciences*, Vol. 28, No. 2, April 1983, pp. 437-439.

Stone, I. C. and Petty, C. S., **“Examination of Gunshot Residues,”** *Journal of Forensic Sciences*, Vol. 19, No. 4, October 1974, pp. 784-788.

Stow, C. D. and Hadfield, M. G., **“An Experimental Investigation of Fluid Flow Resulting from the Impact of a Water Drop with an Unyielding Dry Surface,”** *Proceedings of the Royal Society of London*, A373, 1981, pp. 419-441.

## BIBLIOGRAPHY

DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 146 of 155
--------------------------------	----------------	-------------------------

Sweet, M. J., **“Velocity Measurements of Projected Bloodstains from a Medium Velocity Impact Source,”** *Can. Soc. For. Sci. J.*, Vol. 26, No. 3, 1993, pp. 103-110.

Technical Working Group on Crime Scene Investigation, **“Crime Scene Investigation: A Guide for Law Enforcement,”** U.S. Department of Justice, Office of Justice Programs, National Institute of Justice, Washington, D. C., January 2000.

Templeman, H., **“Errors in Blood Droplet Impact Angle Reconstruction Using a Protractor,”** *J. Forens. Ident.*, Vol. 40, No. 1, 1990, pp. 15-22.

Thornton, J. I., **“Close Proximity Gunshot Residues,”** *Journal of Forensic Sciences*, Vol. 31, No. 2, April 1986, pp. 756-757.

Thorwald, J., *Crime and Science: The New Frontier in Criminology*, Harcourt, Brace & World, Inc., New York, NY, 1966.

Ukpabi, P. and Pelton, W., **“Using the Scanning Electron Microscope to Identify the Cause of Fibre Damage Part I: A Review of Related Literature,”** *Canadian Society of Forensic Society Journal*, Vol. 28, No. 3, 1995, pp. 181-187.

Verhoff, M. A. and Karger, B., **“Atypical Gunshot Entrance Wound and Extensive Backspatter,”** *Int. J. Legal Med.*, Vol. 117, 2003, pp. 229-231.

Walker, J. T., **“Bullet Holes and Chemical Residues in Shooting Cases,”** *Journal of Criminal Law, Criminology, and Police Science*, Vol. 31, 1940, pp. 497-521.

Wallace, J. S., **“Chemical Aspects of Firearms Ammunition,”** *AFTE (Association of Firearm and Tool Mark Examiners) Journal*, Vol. 22, No. 4, October 1990, pp. 364-388.

Weber, K., **“Die Anwendung der Chemilumineszenz des Luminols in der gerichtlichen Medizin und Toxicologie. I. Der Nachweis von Blutspuren,”** *Dtsch. Z. Gesamte Gerichtl. Med.*, Vol. 57, 1966, pp. 410-423.

White, B., **“Bloodstain Patterns on Fabrics: The Effect of Drop Volume, Dropping Height and Impact Angle,”** *Journal of the Canadian Society of Forensic Science*, Vol. 19, No. 1, 1986, pp. 3-36.

Willis, C., Piranian, A. K., Donaggio, J. R., Barnett, R. J., and Rowe, W. F., **“Errors in the Estimation of the Distance of Fall and Angles of Impact Blood Drops,”** *Forensic Science International*, Vol. 123, 2001, pp. 1-4.

Wolson, T. L., **“Documentation of Bloodstain Pattern Evidence,”** *J. For. Ident.*, Vol. 45, No. 4, 1995, pp. 396-408.

BIBLIOGRAPHY		
DATE EFFECTIVE May 18, 2005	VERSION 2.0	PAGE Page 147 of 155

Wolten, G. M., Nesbitt, R. A., Calloway, A. R., Loper, G. L., and Jones, P. F., **“Particle Analysis for the Detection of Gunshot Residue. I: Scanning Electron Microscopy/Energy Dispersive X-Ray Characterization of Hand Deposits from Firing,”** *Journal of Forensic Sciences*, Vol. 24, No. 2, April 1979, pp. 409-422.

Wolten, G. M., Nesbitt, R. A., Calloway, A. R., and Loper, G. L., **“Particle Analysis for the Detection of Gunshot Residue. II: Occupational and Environmental Particles,”** *Journal of Forensic Sciences*, Vol. 24, No. 2, April 1979, pp. 423-430.

Wolten, G. M., Nesbitt, R. A., and Calloway, A. R., **“Particle Analysis for the Detection of Gunshot Residue. III: The Case Record,”** *Journal of Forensic Sciences*, Vol. 24, No. 4, 1979, pp. 864-869.

Wolten, G. M. and Nesbitt, R. S., **“On the Formation of Gunshot Residue Particle Formation,”** *Journal of Forensic Sciences*, Vol. 25, No. 3, July 1980, pp. 533-545.  
Wonder, A. Y., **“Fact or Fiction in Bloodstain Pattern Evidence,”** *Science & Justice*, Vol. 43, No. 3, 2003, pp. 166-168.

Worthington, A. M., *A Study of Splashes*, McMillan and Co., NY, 1963.

Wrobal, H. A., Millar, J. J., and Kijek, M., **“Comparison of Properties of Adhesive Tapes, Tabs, and Liquids Used for the Collection of Gunshot Residue and Other Trace Materials for SEM Analysis,”** *Journal of Forensic Sciences*, Vol. 43, No. 1, 1998, pp. 178-181.

Wrobal, H. A., Millar, J. J., and Kijek, M., **“Identification of Ammunition from Gunshot Residues and Other Cartridge Related Materials – A Preliminary Model Using .22 Caliber Rimfire Ammunition,”** *Journal of Forensic Sciences*, Vol. 43, No. 2, 1998, pp. 324-328.

Yen, K., Thali, M. J., Kneubuehl, B. P., Peschel, O., Zollinger, U., and Dirnhofer, R., **“Blood-Spatter Patterns: Hands Hold Clues for the Forensic Reconstruction of the Sequence of Events,”** *American Journal of Forensic Medicine and Pathology*, Vol. 24, No. 2, June 2003, pp. 132-140.

Zeichner, A., Levin, N., and Springer, E., **“Gunshot Residue Particles Formed by using Different Types of Ammunition in the Same Firearm,”** *Journal of Forensic Sciences*, Vol. 36, No. 4, July 1991, pp. 1020-1026.

Zeichner, A. and Levin, N., **“More on the Uniqueness of Gunshot Residue (GSR) Particles,”** *Journal of Forensic Sciences*, Vol. 42, No. 6, 1997, pp. 1027-1028.

GLOSSARY		
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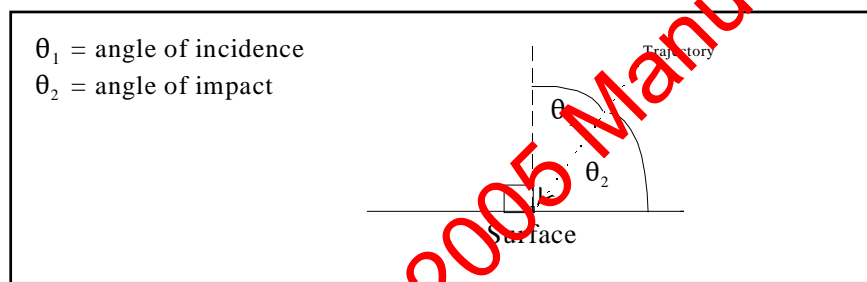
## XI. Glossary

### Angle of impact

The angle between the trajectory of a blood drop and the target surface. Calculated by subtracting the arcsine ( $\sin^{-1}$ ) of (d/D) from  $90^\circ$ . See diagram below.

### Angle of incidence

The angle between the trajectory of a blood drop and the normal (perpendicular) to the target surface. Calculated from the arccosine ( $\cos^{-1}$ ) of (d/D). See diagram below.



### Arc pattern

A pattern produced when blood on a weapon or other object is thrown off due to centrifugal force as the weapon or object is swung in an arc. Also called *cast-off* or *throw-off*.

### Area of convergence

The area in three dimensional space to which individual bloodstains within a *blood spatter pattern* can be back-projected to (a calculated or projected *area of origin* or *impact site*).

### Area of origin

The area from which blood is projected upon impact by a weapon. Also called *impact site*.

### Arterial spurt/spray

Blood projected from a breached or severed artery under the fluctuating pressure caused by the rhythmic contractions of the heart.

### Aspirated blood

Blood that is drawn into the lungs with the breath.

GLOSSARY		
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**Back spatter**

Blood projected from the site of a gunshot entrance wound back toward the weapon and shooter (opposite the direction of the fired projectile). Also called *blowback spatter*.

**Blood spatter pattern**

A pattern produced by a source of blood that has been acted upon in such a way as to cause a dispersal of the blood through the air.

**Blowback spatter**

See *back spatter*.

**Cast-off**

See *arc pattern*.

**Class characteristic**

A feature of an item that is unique to a group of items in a non-individual context. Evidence that belongs to a class of items/objects and is not considered unique.

**Contact transfer**

A stain produced by a blood covered object coming into physical contact with another object or surface. At least one of the surfaces must contain blood in order for a transfer to occur.

**Drip pattern**

See *trail pattern*.

**Drying time**

The amount of time required for wet blood to dry completely.

**Expired blood**

Blood that exits the mouth and/or nose with the breath.

**Flow pattern**

A stream or rivulet of blood that flows under the influence of gravity.

**Forward spatter**

Blood that leaves a gunshot exit wound and is projected forward in the direction of the fired projectile (away from the weapon and shooter).

**Gunshot residue**

The powder or soot emanating from a firearm as it is fired. Its detection is generally based on the identification of chemical compounds and elements present in the gunpowder, primer, and metal from bullets, casings, and/or the barrel of the firearm.

GLOSSARY		
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**Impact site**

See *point of origin*.

**Impact spatter**

See *radial spatter*.

**Individual characteristic**

A feature that is unique to a specific item/object. The combination of several individual characteristics common to a questioned item and its suspected source are used to show that the items are uniquely related.

**Major axis**

The length (D) of an ovate (oblong) blood droplet stain, not including any *tail*.

**Minor axis**

The width (d) of an ovate (oblong) blood droplet stain.

**Parent drop**

The drop of blood from which a *satellite spatter* or *tail* originates.

**Radial spatter**

A pattern produced when a weapon strikes pooled blood causing it to radiate outward from the *impact site*. Also called *impact spatter*.

**Rivulet**

A small stream of liquid blood. See *flow pattern*.

**Satellite spatter**

Very small droplets of blood that are projected radially from the *parent drop* upon impact with a surface.

**Secondary spatter**

Small droplets generated as a result of blood dripping into a developing pool or an existing source of liquid blood. These small droplets are projected radially from the site of dripping.

**Secondary splash pattern**

A pattern that forms from a large volume of blood that impacts a surface and is then deflected onto a secondary surface.

**Smear**

A transfer of blood from a blood covered object to a clean object or surface by contact. A type of *contact transfer*.

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**Spine**

A pointed projection that radiates from the circumference of a blood droplet stain in a sunburst effect.

**Splash pattern**

A pattern that forms when either a large volume of blood impacts a surface or an object with relatively low energy impacts on a large source of blood.

**Tail**

The end of a blood droplet stain that indicates the direction of travel of the droplet. Generated as a result of a droplet striking a surface with enough velocity to form an involution (depression), coalescence (retraction), and forward progression into a secondary (smaller) droplet that may separate from the *parent drop*.

**Terminal velocity**

The maximum speed of a falling drop of blood (~25 feet/second for a 50µL drop).

**Throw-off**

See *arc pattern*.

**Trail pattern**

A pattern produced when blood continuously drips from a moving object or person (*e.g.*, walking, running, *etc.*). Also called *drip pattern*.

**Transfer pattern**

A *contact transfer* that contains enough class characteristics to enable an identification of the object that produced the stain. A transfer pattern may also contain enough individual characteristics to enable a conclusive match to the object.

**Wipe**

A pattern created when an object makes contact and is then moved through wet blood on a surface, simultaneously removing blood from the surface and altering the stain.

## APPENDICES

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## XII. Appendices

### A. Arccosine ( $\cos^{-1}$ ) table

Width/Length Ratio d/D ( $\cos \theta_{\text{incidence}}$ )	Angle of Incidence $\theta_1$ (arccosine d/D)	Width/Length Ratio d/D ( $\cos \theta_{\text{incidence}}$ )	Angle of Incidence $\theta_1$ (arccosine d/D)
1.00	0°	0.71	45°
0.99	5°	0.64	50°
0.98	10°	0.57	55°
0.97	15°	0.50	60°
0.94	20°	0.42	65°
0.91	25°	0.34	70°
0.87	30°	0.26	75°
0.82	35°	0.17	80°
0.77	40°	0.09	85°

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**B. Common conversions**

## Mass

1mg	= 0.001g	= 0.000001kg
1,000mg	= 1g	= 0.001kg
1,000,000mg	= 1,000g	= 1kg

## Length

1mm	= 0.1 m	= 0.001m	= 0.000001km
10mm	= 1cm	= 0.01m	= 0.00001km
1,000mm	= 100cm	= 1m	= 0.001km
1,000,000mm	= 100,000cm	= 1,000m	= 1km

## Volume

1 $\mu$ L	= 0.001mL	= 0.000001L
1,000 $\mu$ L	= 1mL (1cm <sup>3</sup> )	= 0.001L
1,000,000 $\mu$ L	= 1,000mL	= 1L

TO CHANGE:	TO:	MULTIPLY BY:
millimeters	Inches	0.0394
centimeters	Inches	0.3937
meters	Feet	3.2808
meters	Yards	1.0936
kilometers	Miles	0.6214
inches	millimeters	25.3807
inches	centimeters	2.5381
feet	Meters	0.3048
yards	Meters	0.9144
miles	kilometers	1.6093
liters	Pints	2.1134
liters	Quarts	1.0567
liters	Gallons	0.2642
pints	Liters	0.4732
quarts	Liters	0.9463
gallons	Liters	3.7853
kilograms	Pounds	2.2046
pounds	kilograms	0.4536

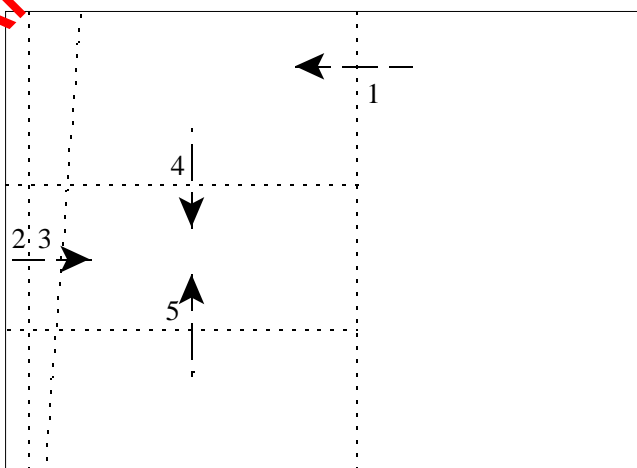
## APPENDICES

DATE EFFECTIVE  
May 18, 2005VERSION  
2.0PAGE  
Page 154 of 155**C. Druggist fold**

The druggist fold is a paper pouch into which physical evidence can be placed. Typically, this includes smaller items (pills, blood scrapings, bullets, glass chips, paint chips, hair, fibers, *etc.*). It is simple to make and convenient to use.

**METHOD:**

1. Take a sheet of 8½ x 11 inch white paper and fold it roughly in half across its width. Be sure to leave one half of the folded sheet approximately ½ inch shorter than the other.
2. Take the longer half of the sheet of paper and fold the ½ inch flap from Step 1 over the shorter half of the sheet of paper.
3. Take this newly generated folded edge and fold this onto the sheet of paper at an angle, roughly 1-2 inches at the widest end and ½ inch at the narrowest end.
4. The sheet of paper then gets folded into thirds lengthwise. The smallest width third is folded toward the center of the sheet (toward the center third).
5. The widest third will have an opening on its side. Evidence is put into this opening. The smallest width third is folded toward the wide side opening and placed directly into it. The completely folded paper is sealed with tape and initialed by the collector.



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## D. Forms

The following forms are available:

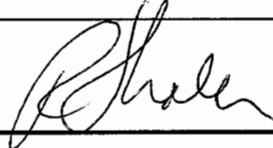
[Scene Response Log](#)  
[Vehicle Processing Worksheet](#)  
[Photography Log](#)  
[Sketch Worksheet](#)  
[Evidence Log](#)  
[Case Contact Log](#)  
[Chain of Custody Log](#)  
[FARU Request Worksheet](#)  
[Report Distribution Sheet](#)  
[Scheduled Examination and Analysis](#)

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**CRIME SCENE INVESTIGATION  
AND RECONSTRUCTION MANUAL  
VERSION 2.0**

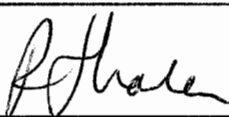
Effective date: May 18, 2005

REVIEWED/APPROVED BY			
Title	Print Name	Signature	Date
Director	Robert C. Shaler, Ph.D.		May 17, 2005



**CRIME SCENE INVESTIGATION  
TRAINING MANUAL  
VERSION 1.0**

Effective date: May 18, 2005

REVIEWED/APPROVED BY			
Title	Print Name	Signature	Date
Director	Robert C. Shaler, Ph.D.		May 18, 2005

# Forensic Analysis & Reconstruction Unit Crime Scene Investigation Training Manual

V 1.0

## Table of Contents

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## **I. Crime Scene Approach**

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## **I. Crime Scene Approach**

### **Suggested Readings:**

1. Fisher, Barry A. J., Techniques of Crime Scene Investigation, Fifth Edition, CRC Press 1993, Chapter 5
2. James, S., Nordby, J. - Forensic Science: An Introduction to Scientific & Investigative techniques, chapter 8, CRC Press 2003
3. Saferstein, R., Criminalistics – An Introduction to Forensic Science, chapters 1 and 2, seventh edition, Prentice-Hall, Inc. 2000.

### **Required Knowledge:**

1. Dynamics of crime scene formation.
2. Philosophy and methods of the crime scene approach.
3. Chain of evidence considerations.
4. Terms and definitions.

### **Required Skills:**

1. Proper documentation methods and note taking.
2. Sketching methods.
3. Triangulation.

### **Course of Instruction:**

1. Complete the crime scene sketching training exercise
2. Observation of crime scene approach during the processing of crime scenes.

### **Evaluation of Trainee:**

1. Assist in a minimum of five (5) external crime scenes in a support role.
2. Be observed and evaluated by a qualified response team member and/or supervisor.

**Crime Scene Training**  
**Crime Scene Approach:**  
**Sketching Training Exercise**

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

**Practice / Competency**

**Instruction:**

1. On a piece of graph paper, sketch your office area in plan. Show detailed measurements and relative position of items in the room using baseline, rectangular coordinates, and/or triangulation measurements.
2. Prepare an elevation sketch of a wall in a room providing detailed measurements and the relative distances between objects on the wall or against the wall (eg. distance from the copy machine to punch clock). Show measurements using the baseline method. Label items in the sketch and provide the dimensions of the object as well (eg. Item 1: cabinet Height x Width x Depth).
3. Sketch a room using the cross-projection method with detailed measurements. Identify items of evidence and document their position in the sketch by using baseline, rectangular coordinates, and/or triangulation measurements.

**For Competency Test Review Purposes Only**

<b>Sketch neatness</b>	<b>Pass/Fail</b>	_____
<b>Measurements present</b>	<b>Pass/Fail</b>	_____
<b>Triangulation</b>	<b>Pass/Fail</b>	_____
<b>Baselines</b>	<b>Pass/Fail</b>	_____

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## **II. Photography**

## **II. Photography**

### **Suggested Readings:**

1. FBI Academy Photography reference materials.
2. Equipment operation manuals.

### **Required Knowledge:**

1. General Photographic Terms & Techniques
2. Proper operation of equipment
3. Film
4. How to properly document a scene and any evidence contained within.
  - a) establishing photography
  - b) close-up & macro photography
5. Special Documentation Techniques
  - a) sectoring
  - b) photographing Luminol
  - c) photographing impression evidence
  - d) photography using the alternate light source

### **Required Skills:**

1. Pass competency test.
2. Demonstrate the proper operation of photographic equipment.
3. Using the appropriate techniques for documentation purposes.

### **Course of Instruction:**

1. Lecture and demonstrations by experienced photographers.

2. Read and understand the photography section of the Crime Scene Investigation Manual.

## **II. Photography**

### **Evaluation of Trainee:**

1. Pass competency test.
2. Successfully complete competency test documenting a mock crime scene and evidence contained within, demonstrating appropriate equipment operation and photographic techniques.
3. Final photographic results are to be reviewed by the unit supervisor.

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## Crime Scene Training

### Photography Competency Test Worksheet

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

Please record your photographs in the next section. Be sure to include what you have shot, and the settings. Follow the first example.

0) overall of room, 50mm, Nominal ( +/-, stops)	comments	20)	
1)		21)	
2)		22)	
3)		23)	
4)		24)	
5)		25)	
6)		26)	
7)		27)	
8)		28)	
9)		29)	
10)		30)	
11)		31)	
12)		32)	
13)		33)	
14)		34)	
15)		35)	
16)		36)	
17)		37)	
18)		38)	
19)			

**For Competency Test Review Purposes Only:**

Photographs show: <input type="checkbox"/> proper documentation of scene <input type="checkbox"/> proper documentation of all evidence <input type="checkbox"/> proper exposure/bracketing <input type="checkbox"/> proper magnification <input type="checkbox"/> proper lighting	Comments:     Pass / Fail   date_____ instructor_____
--	--

**Crime Scene Training**  
**Photography Competency Test**

**Photography Competency Test**

Perform the following experiments outlined below. Utilize any camera equipment (Nikon F4, N90s, F5, F100 or D100 as well as flashes, diffusers, filters, etc.) that will provide optimal photographic results. Follow the general photographic instructions outlined in the 35mm Photography training lecture. You must show knowledge of your camera system of choice and knowledge of advance photography through adequate photographs to pass the competency test.

**Photograph each of the following:**

1. Take a number of establishing photographs of a mock crime scene. Take close up photographs of one or two items of physical evidence. Photograph these items in detail.
2. Produce a 1:1 photograph of a fingerprint or any other small object.
3. Obtain a set of NYPD crime scene photographs and produce a duplicate set.
4. a) Obtain a piece of glass. Using a transfer pipet positioned approximately 3 feet above the piece of glass, drop one droplet of blood on to the glass plate.  
 b) On a clean section of the glass plate, drop several drops of blood, from approximately 3 feet above, until secondary spatter has formed.  
 c) Photograph the two stains showing detail.

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### **III. Forensic Biology**

### III. Forensic Biology

#### **Suggested Readings:**

1. *The Effect of Luminol on the Serological Analysis of Dried Human Bloodstains*, Crime Laboratory Digest, Vol. 17, No. 1, Jan. 1990.
2. Fisher, B.A.J., *Techniques of Crime Scene Investigation*, Sixth Edition, CRC Press, 2000, Chapters 8 & 3.
3. DeForest, P.R., Gaensslen, R.E., & Lee, H.C., *Forensic Science: An Introduction to Criminalistics*, , McGraw – Hill, 1983, Chapter 9, pp.230-246.
4. Saferstein, R., editor, *Handbook of Forensic Science, Volume II*, Prentice Hall, 1988, Chapter 7, pp.348-382.
5. Crimescope CS-16 Forensic Light Source Operation and Maintenance Instructions, Applications Manual, Spex.
7. “Comparison of Light Sources for the Detection of Body Secretions and Blood”, M.A.F.S. Newsletter, July 1989.
8. James, S., Nordby, J. - *Forensic Science: An Introduction to Scientific & Investigative techniques*, chapter 11,12, & 13, CRC Press 2003

#### **Required Knowledge:**

1. Reaction mechanisms of the presumptive tests for blood and semen.
2. Sensitivity and specificity of the presumptive tests for blood and semen.
3. False positives and negatives associated with the presumptive tests for blood and semen.
4. Use and understanding of the principles of the use of a high-intensity, tunable wavelength light source for the recognition of possible biological fluids.
5. Use of appropriate wavelengths for the detection of specific substances.

### **III. Forensic Biology**

#### **Required Skills:**

1. Preparation of reagents:
  - a) Kastle-Meyer Test
  - b) luminol
  - c) acid phosphatase
  - d) LMG
2. Performance of test protocols for Kastle-Meyer, luminol, and acid phosphatase.
3. Interpretation of test results.
4. Operation of the high-intensity, tunable wavelength light source.
5. Maintenance of the high-intensity, tunable wavelength light source.
6. Interpretation of results using the high-intensity, tunable wavelength light source.

#### **Course of Instruction:**

Module 1 - Biology lecture and demonstration of presumptive blood testing reagents and procedures, and results interpretation.

Module 2 - Biology lecture and demonstration of presumptive semen testing reagents and procedures, and results interpretation.

Module 3 - Biology lecture and demonstration of the use of the alternate light source.

#### **Evaluation of Trainee:**

1. Pass written competency test.
2. Successfully complete competency test for the presence of acid phosphatase on questioned stains.
3. Successfully complete competency test for the identification of blood on questioned stains.
4. Successfully complete of competency test for the detection of physiological stains using the alternate light source.

### **Crime Scene Training**

### **Forensic Biology**

### **Competency Test Worksheet/Review Sheet**

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

#### **High-Intensity tunable wavelength light source**

- 1) Carefully examine the piece of evidence you received for physiological fluids using the high-intensity tunable wavelength light source. Be sure to sketch the stains that you visualize below indicating their location. Also include at which wavelength you visualized these stains. Once you've finished sketching, test the stains with its appropriate presumptive test by swabbing the stain. Remember to moisten the swab with a minimal amount dH<sub>2</sub>O and swab only one area of the stain since you do not want to consume the whole stain. DO NOT mark the piece of evidence. Record results next to stain.

**Crime Scene Training**  
**Forensic Biology**  
**Competency Test Worksheet/Review Sheet**

**Blood**

Obtain 5 questioned stains from the instructor. Test these stains with the appropriate presumptive test. Record the results below.

Stain 1 \_\_\_\_\_

Stain 2 \_\_\_\_\_

Stain 3 \_\_\_\_\_

Stain 4 \_\_\_\_\_

Stain 5 \_\_\_\_\_

---

**Semen**

Obtain 5 questioned stains from the instructor. Test these stains with the appropriate presumptive test. Record the results below.

Stain 1 \_\_\_\_\_

Stain 2 \_\_\_\_\_

Stain 3 \_\_\_\_\_

Stain 4 \_\_\_\_\_

Stain 5 \_\_\_\_\_

---

---

**For Competency Test Review Purposes Only**

- |      |                                 |                |
|------|---------------------------------|----------------|
| I.   | Alternate Light Source (HITWLS) | Pass/Fail_____ |
| II.  | Blood                           | Pass/Fail_____ |
| III. | Semen                           | Pass/Fail_____ |

## **IV. Gunshot Residue & Bullet Trajectory Analysis**

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#### IV. Gunshot Residue & Bullet Trajectory Analysis

##### Suggested Readings:

1. Di Maio, Vincent J.M., Gunshot Wounds Practical Aspects of Firearms, Ballistics, and Forensic Techniques, Second Edition, CRC Press LLC, Boca Raton, FL, 1999. Chs. 1, 2, 4 – 8, 10, 13 and 14.
2. Geberth, Vernon J., Practical Homicide Investigation Tactics, Procedures, and Forensic Techniques, Third Edition, CRC Press LLC, Boca Raton, FL, 1996. Ch. 12, pp. 283 – 294 and Ch. 17, pp. 513 – 522.
3. Haag, Lucian C., Forensic Firearms Evidence: Elements of Shooting Incident Investigation (Video & Handbook), Forensic Science Services Inc.
4. James, S., Nordby, J., Forensic Science: An Introduction to Scientific & Investigative techniques, chapter 18, CRC Press 2003
5. Saferstein, R., editor, Handbook of Forensic Science, Volume II, Prentice Hall, 1988, Chapter 8, pp.348-382

##### Required Knowledge:

1. Mechanics of production of gunshot residues.
2. Terms and definitions.

##### Required Skills:

1. Identification of bullet holes.
2. Chemical tests for nitrites, lead, and copper.
3. Collection and preservation of evidence with possible gunshot residue.
4. Determination of bullet trajectories.

**Course of Instruction:**

Module 1 – Mechanics of gunshot residue production

Module 2 – Collection and field testing of gunshot residue

Module 3 – Bullet trajectory

**IV. Gunshot Residue & Bullet Trajectory Analysis****Evaluation of Trainee:**

1. Pass written competency test.
2. Successfully complete proficiency in the sodium rhodizonate chemical test for lead, including proper use of controls.

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**Crime Scene Training**  
**Gunshot Residue & Bullet Trajectory Analysis**

**Module I** – Mechanics of Gunshot Residue Production

**Required Knowledge:**

1. Construction of rifle, handgun and shotgun ammunition.
2. Mechanics of how a bullet is fired.
3. Production of gunshot residues.

**Required Skills:**

1. Identify parts of ammunition

**Course of Instruction:**

1. Sections of suggested readings covering firearms and ammunition.
2. Lecture and demonstration.

**Crime Scene Training**  
**Gunshot Residue & Bullet Trajectory Analysis**

**Module II** – Collection and Testing of Gunshot Residues

**Required Knowledge:**

1. Collection procedures for evidence containing gunshot residue.
2. Use of chemical tests for gunshot residue.

**Required Skills:**

1. Identification of bullet holes.
2. Documentation of bullet holes in evidence that can not be collected.
3. Identification of possible gunshot residue.

**Course of Instruction:**

1. Sections of suggested readings covering chemical testing of gunshot residues.
2. Lecture and demonstration with practical exercises.

**Crime Scene Training**  
**Gunshot Residue & Bullet Trajectory Analysis**

**Module III** – Bullet Trajectory

**Required Knowledge:**

1. Basic physics of ballistics and travel of a projectile.
2. Various types of glass, and their behavior when struck by a projectile.

**Required Skills:**

1. Use of various tools for bullet trajectory determination (rods, string, and laser).
2. Recognition of glass from area around the point of impact from a projectile.

**Course of Instruction:**

1. Suggested reading – Saferstein, Richard, editor, Forensic Science Handbook, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1982. Chapter 4 – Forensic Glass Comparisons.
2. Lecture and demonstration with practical exercises.

**Crime Scene Training**  
**Sodium Rhodizonate**  
**Competency Test Worksheet/Review sheet**

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

You have received three pieces of filter paper. Each one has a gray smudge on it. One is marked "Positive control". This is your known lead standard. Test this smudge first. If the positive control works properly, then test the two unknowns and record the results below. (Positive or negative)

Positive control \_\_\_\_\_

Negative control \_\_\_\_\_

Unknown #1 \_\_\_\_\_

Unknown #2 \_\_\_\_\_

---

**For Competency Test Review Purposes Only**

Unknown #1 Pass/Fail \_\_\_\_\_

Unknown #2 Pass/Fail \_\_\_\_\_

## **V. Bloodstain Pattern Analysis**

## V. Bloodstain Pattern Analysis

### Suggested Reading:

1. MacDonell, H.L., and Bialouz, L.F., *Flight Characteristics and Stain Patterns of Human Blood*, Washington, U.S. Department of Justice, Law Enforcement Assistance Administration, Washington D.C., 1971.
2. Bevel, T., and Gardner, R.M., *Bloodstain Pattern Analysis – With an Introduction to Crime Scene Reconstruction*, CRC Press, 1997.
3. Eckert, W.G., and James, S.H., *Interpretation of Bloodstain Evidence at Crime Scenes*, Elsevier Science Publishing Co., Inc., 1989.
4. James, S., Nordby, J., *Forensic Science: An Introduction to Scientific & Investigative techniques*, chapter 9, CRC Press 2003
5. Pizzola, P.A., Roth, S., and DeForest, P.R., “Blood Droplet Dynamics – I”, *Journal of Forensic Sciences*, Vol. 31, No. 1, January 1986, pp.36-49.
6. Pizzola, P.A., Roth, S., and DeForest, P.R., “Blood Droplet Dynamics – II”, *Journal of Forensic Sciences*, Vol. 31, No. 1, January 1986, pp.50-64.
7. Balthazard, V., Piedelievre, R., Desoille, H., and Derobert, L., “Etudes des Gouttes de Sang Projete”, *Annales de Medecine Legale de Criminologie, Police Scientifique, Medecine Sociale, et Toxicologie*, Vol. 19, 1939, pp.265-323.

### Required Knowledge:

1. Production mechanisms of bloodstain patterns.
2. Possible reconstruction implications for bloodstain patterns.
3. Identification and evaluation of possible bloodstain patterns.
4. Documentation of bloodstain patterns.

5. Terms and definitions.

**Required Skills:**

1. Pattern identification.
2. Directionality determination.
3. Impact angle calculations.
4. Determination of area of origin of radial spatter patterns.

**V. Bloodstain Pattern Analysis**

**Course of Instruction:**

Basic Bloodstain Pattern Analysis Lecture

Module 1 – Pattern production mechanisms, identification and evaluation of possible bloodstain patterns, documentation of bloodstain patterns.

Module 2 - Directionality determinations and impact angle calculations.

Module 3 – Determining area of origin of radial spatter patterns

**Evaluation of Trainee:**

1. Pass written competency test.
2. Successfully complete competency test in pattern identification, stain directionality determinations, and impact angle calculations.
3. Successfully complete of radial spatter pattern area of origin determination competency test on a known bloodstain pattern.

**Crime Scene Training**  
**Bloodstain Pattern Analysis**  
**Competency Test Worksheet/Review Sheet**

Analyst: \_\_\_\_\_

Issued on: \_\_\_\_\_

Issued by: \_\_\_\_\_

**Pattern Identification**

Carefully examine the series of photographs provided. In the spaces below identify the bloodstain pattern(s) depicted in each of the photographs.

2) \_\_\_\_\_

3) \_\_\_\_\_

4) \_\_\_\_\_

5) \_\_\_\_\_

**Stain Directionality**

Carefully examine the bloodstain figure depicted below. In the space provided indicate which area of the bloodstain represents the main body of the stain and the wave cast-off (tail) of the stain. Indicate the direction in which this stain was

moving in relation to the plane of the paper. Briefly describe how you arrived at this conclusion.



**Crime Scene Training**  
**Bloodstain Pattern Analysis**  
**Competency Test Worksheet/Review Sheet**

**Impact Angle Calculations**

Carefully examine the photographs provided. For each stain measure the long (major) axis and short (minor) axis. Calculate the approximate angle of impact for each stain. Remember, each calculated value is rounded to the nearest 5 degrees. Be sure to write down the formula used in the space below.

**Angle of Impact =**

Stain	Long (L) axis length in mm.	Short (l) axis length in mm.	Impact Angle (to nearest 5°)

--	--	--	--

**Crime Scene Training**  
**Bloodstain Pattern Analysis**  
**Competency Test Worksheet/Review Sheet**

**Area of origin determination for Bloodstain Spatter Patterns**

Obtain a prepared spatter pattern from the instructor. In the presence of the instructor demonstrate the appropriate evaluation and selection of stains for stringing purposes. Calculate the impact angles for the selected stains and demonstrate the stringing process using these values. Provide an estimate as to the spatial positioning (in inches) of the blood source in relation to the pattern examined. Record these values below.

Approximate distance from rear wall \_\_\_\_\_

Approximate distance from right wall \_\_\_\_\_

Approximate distance from left wall \_\_\_\_\_

Approximate height off the floor \_\_\_\_\_

---

**For Competency Test Review Purposes Only**

- |      |                        |           |       |
|------|------------------------|-----------|-------|
| I.   | Pattern Identification | Pass/Fail | _____ |
| II.  | Directionality         | Pass/Fail | _____ |
| III. | Angle of Impact        | Pass/Fail | _____ |
| IV.  | Area of Origin         | Pass/Fail | _____ |

**VI. Evidence Recovery  
&  
Packaging**

## VI. Evidence Recovery & Packaging

### Suggested Readings:

#### General:

1. Crimescope CS-16 Forensic Light Source Operation and Maintenance
2. Instructions, Applications Manual, Spex
3. F.A.R.U. Crime Scene Investigation Manual

#### Footwear Impressions:

1. Bodziak, William J., Footwear Impression Evidence: Detection, Recovery and Examination, Second Edition, CRC Press 2000, Chapter 4.
2. Electrostatic dust print lifter instructions manual

#### Fibers:

1. DeForest, Peter R., Gaensslen, R.E., and Lee, Henry C., Forensic Science: An Introduction to Criminalistics, McGraw-Hill, 1983, pp. 209-211.
2. James, S., Nordby, J. - Forensic Science: An Introduction to Scientific & Investigative techniques, chapter 14, CRC Press 2003
3. Saferstein, Richard, Forensic Science Hand Book Volume II, Prentice Hall 1988, Chapter 5.

#### Hairs:

1. DeForest, Peter R., Gaensslen, R.E., and Lee, Henry C., Forensic Science: An Introduction to Criminalistics, McGraw-Hill, 1983, pp. 209-211.
2. James, S., Nordby, J. - Forensic Science: An Introduction to Scientific & Investigative techniques, chapter 14, CRC Press 2003
3. Saferstein, Richard, Criminalistics: An Introduction to Forensic Science, 4<sup>th</sup> ed., Prentice-Hall, Inc., 1990, pp. 187-188.

## **VI. Evidence Recovery & Packaging**

### **Paint:**

1. DeForest, Peter R., Gaensslen, R.E., and Lee, Henry C., Forensic Science: An Introduction to Criminalistics, McGraw-Hill, 1983, p. 163.
2. James, S., Nordby, J. - Forensic Science: An Introduction to Scientific & Investigative techniques, chapter 14, CRC Press 2003
3. Saferstein, Richard, Criminalistics: An Introduction to Forensic Science, 4<sup>th</sup> ed., Prentice-Hall, Inc., 1990, pp. 212-213.

### **Required Knowledge:**

1. Awareness of trace evidence
2. Awareness of contamination issues
3. Collection and packaging techniques
4. Importance of Physical Matches
5. Documentation

### **Required Skills:**

1. Collection and packaging of blood evidence by swabbing and scraping
2. Collection and packaging of trace evidence using GelLifters
3. Creation of paper fold
4. Use of electrostatic dust print lifter

## **VI. Evidence Recovery & Packaging**

### **Course of Instruction:**

1. Observation of crime scene evidence collection
2. Biological Evidence collection & packaging lecture
3. Completion of the following Modules:
  - Module 1 - Bloodstain evidence collection & packaging
  - Module 2 - Trace evidence collection & packaging
  - Module 3 - Dust print recovery

### **Evaluation of Trainee:**

Pass competency tests

**Crime Scene Training**  
**Evidence Recovery Module I:**  
**Bloodstain Evidence Collection**

**Analyst:** \_\_\_\_\_  
**Issued on:** \_\_\_\_\_  
**Issued by:** \_\_\_\_\_

**Practice / Competency**

**Requirements:**

1. Study the Bloodstain Evidence Collection and Packaging Lecture
2. Read the section of the Crime Scene Manual pertaining to bloodstain evidence collection

**Procedure:**

1. Obtain a bloodstained item containing:
  - a. droplet stains
  - b. flaked blood
3. Document your bloodstain using notes and photography prior to collection
4. Use the appropriate presumptive test
5. Collect the bloodstains provided using the appropriate collection method

6. Package the collected stains using the appropriate packaging method

**For Competency Test Review Purposes Only**

- |      |                   |                |
|------|-------------------|----------------|
| I.   | Documentation     | Pass/Fail_____ |
| II.  | Collection method | Pass/Fail_____ |
| III. | Packaging method  | Pass/Fail_____ |

**Crime Scene Training**

**Evidence Recovery Module II:**

**Trace Evidence Collection and Packaging**

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

**Practical / Competency**

**Requirements:**

Read the section of the Crime Scene Manual pertaining to the collection of trace evidence.

**Procedure:**

1. Obtain an item containing mock trace evidence.
2. Identify and document the trace evidence observed.
3. Recover the trace evidence and package it using the appropriate method.

**For Competency Test Review Purposes Only**

- |      |                            |                 |
|------|----------------------------|-----------------|
| I.   | Identified trace materials | Pass/Fail _____ |
| II.  | Proper documentation       | Pass/Fail _____ |
| III. | Proper Collection          | Pass/Fail _____ |

**Crime Scene Training  
Evidence Recovery Module III:  
Electro Static Lifting Training Exercise**

**Analyst:** \_\_\_\_\_

**Issued on:** \_\_\_\_\_

**Issued by:** \_\_\_\_\_

**Practice / Competency**

**Required Reading**

1. Read lecture notes on electro static lifting.
3. Read lecture notes on 35mm photography.
2. Read all instruction manuals that accompany the electro static lifter.

**Practical procedure**

1. Create a footwear impression in dust on a surface of choice.
2. Document the surface on which the footwear impression was created using detailed 35mm or digital photography.
3. Lift the footwear impression on to a sheet of mylar using the electrostatic lifter.

4. Document the footwear impression obtained using detailed 35mm Photography.
5. Store the recovered dust print using the appropriate method

**For Competency Test Review Purposes Only**

I.	Documentation	Pass/Fail _____
II.	Dust print lifter operation	Pass/Fail _____
III.	Storage	Pass/Fail _____

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## EVIDENCE LOG

<b>FARU CASE No.</b>	<b>DATE</b>	<b>CRIMINALIST</b>
----------------------	-------------	--------------------

**EVIDENCE COLLECTED**

SAMPLE ID	ITEM	LOCATION	COLLECTION METHOD	TIME

<b>EVIDENCE TRANSFERRED TO:</b>				
<b>NAME AND SHIELD # (PRINT)</b>	<b>SIGNATURE</b>	<b>COMMAND</b>	<b>DATE</b>	<b>TIME</b>



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## PHOTOGRAPHY LOG

FARU CASE NO.	DATE	CRIMINALIST	ROLL NO.	FILM TYPE
EXP. NO.	DESCRIPTION			
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## FARU REQUEST WORKSHEET

<b>DATE</b>	<b>TIME</b>	<b>CRIMINALIST</b>
<b>CONTACT NAME</b>	<b>CONTACT AGENCY</b>	<b>CONTACT PHONE #</b>
<b>VICTIM NAME(S)</b>	<b>M.E. NUMBER(S)</b>	<b>PRECINCT</b>
<b>SCENE ADDRESS/LOCATION</b>		
<b>TYPE OF CASE (CHECK ONE)</b> <input type="checkbox"/> HOMICIDE <input type="checkbox"/> MISSING PERSON(S) <input type="checkbox"/> SEXUAL ASSAULT <input type="checkbox"/> MOTOR VEHICLE ACCIDENT <input type="checkbox"/> UNDETERMINED MANNER OF DEATH <input type="checkbox"/> OTHER _____	<b>SCENE AVAILABILITY (CHECK ONE)</b> <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> STATUS UNKNOWN	<b>SCENE SECURE? (CHECK ONE)</b> <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> STATUS UNKNOWN
<b>ADDITIONAL CASE INFORMATION:</b>		
		<b>FARU CASE NO. (IF ACCEPTED)</b>

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## REPORT DISTRIBUTION SHEET

<b>FARU CASE NO.</b>	<b>VICTIM NAME(S)</b>	<b>M.E. NUMBER(S)</b>

Please forward a copy of this report to the following:

1. **OCME Records Unit**

2. **DA's Office**                      Bx                      K                      M                      Q                      R

ADA \_\_\_\_\_

FAX # \_\_\_\_\_

3. **NYPD**    Precinct/Command: \_\_\_\_\_

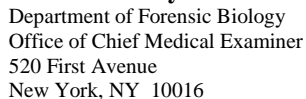
Det. \_\_\_\_\_

FAX # \_\_\_\_\_

4. **Other** \_\_\_\_\_

\_\_\_\_\_

**Comments:**



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## SCHEDULED EXAMINATION AND ANALYSIS

<b>FARU CASE NO.</b>	<b>ASSIGNED CRIMINALIST</b>
<b>EXAMINATION AND/OR ANALYSIS</b>	

Additional Comments:

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Technical review by: \_\_\_\_\_  
\_\_\_\_\_

Date \_\_\_\_\_  
Date \_\_\_\_\_

Administrative review by: \_\_\_\_\_  
\_\_\_\_\_

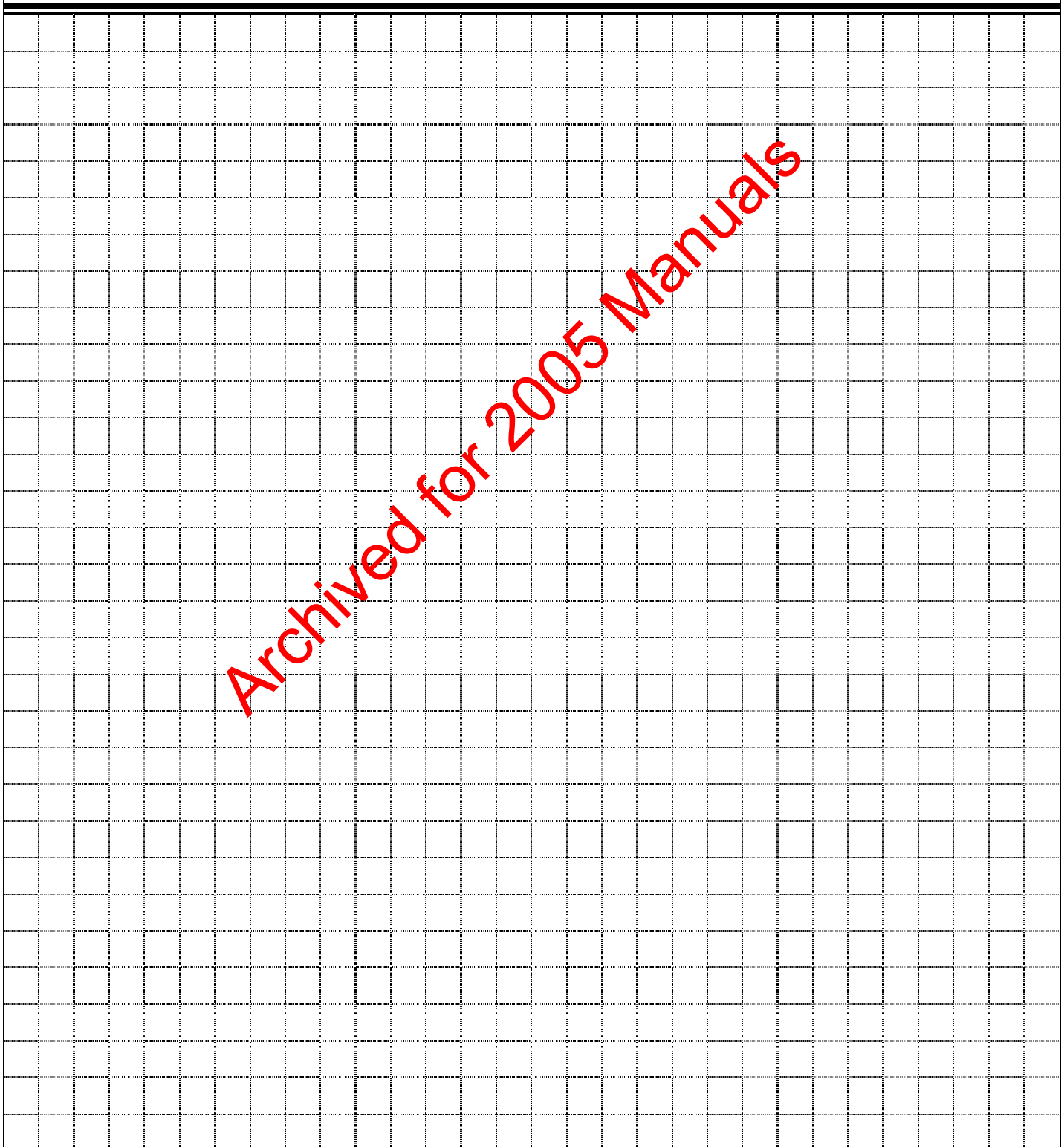
Date \_\_\_\_\_  
Date \_\_\_\_\_



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# SKETCH WORKSHEET

FARU CASE No.	DATE	CRIMINALIST			
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## VEHICLE PROCESSING WORKSHEET

<b>FARU CASE NO.</b>	<b>DATE</b>	<b>ARRIVAL TIME</b>	<b>DEPARTURE TIME</b>
<b>VEHICLE ADDRESS/LOCATION</b>		<b>VEHICLE (INDOOR/OUTDOOR)</b>	<b>VEHICLE SECURED (YES/NO)</b>
		<b>WEATHER CONDITIONS (IF APPLICABLE)</b>	

### VEHICLE INFORMATION

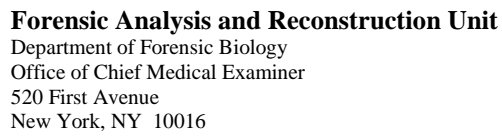
<b>VEHICLE MANUFACTURER</b>	<b>VEHICLE MODEL</b>
<b>YEAR OF MANUFACTURE</b>	<b>COLOR OF VEHICLE</b>
<b>VIN</b>	<b>LICENSE PLATE NO./STATE OF REGISTRATION</b>
<b>ODOMETER READING</b>	<b>LICENSE PLATES (<i>FRONT &amp; REAR</i> OR <i>REAR ONLY</i>)</b>

**ADDITIONAL OBSERVATIONS/COMMENTS**

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# CHAIN OF CUSTODY LOG

[illegible]

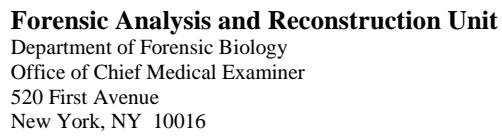
# ~~TRANSFER LOG~~

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# CASE CONTACT LOG

[illegible]

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