Crime Scene Processing and Evidence Collection

Presented by:

Milwaukee Area Technical College

Instructor: Scott Campbell

PURPOSE STATEMENT:

Expectations of the public and the courts have risen dramatically over the last several years in the area of physical evidence collection and forensic identification. Working a crime scene is a “process” that involves a broad range of skills.

With these issues in mind, the purpose of this 3-Day course is to train Law Enforcement personnel in the skills needed to identify, process, and preserve the crime scene and items of evidence found in them. The course is intended to provide a foundation for the future development of such expertise through experience and continued training. Upon completion of this training, you should possess the fundamental skills necessary to process crime scenes and collect a variety of different types of physical evidence.

INSTRUCTOR BIO:

Scott Campbell
Milwaukee Police Department (Wisconsin) - Retired

Your instructor, retired Police Identification Supervisor Scott Campbell is a 28-year veteran of the City of Milwaukee, Wisconsin Police Department, retiring as a Shift Commander for their Identification Division. Scott started his career in uniform patrol and then was assigned to a variety of specialized units including the Tactical Enforcement Unit, or S.W.A.T., where he was utilized as one of the lead instructors.

In 1994 Scott transferred to the Identification Division where he began his crime scene, evidence photography and fingerprint identification career as an Identification Technician. In 2001 he was promoted to Supervisor and was appointed the Division’s Training Coordinator where he developed instructional programs and trained new technicians, recruit officers, detectives and supervisors for the department. In addition to his work related practical experience, Scott has received more than 500 hours of training in the fields of forensic identification, crime scene processing and management, evidence photography, and instructor development.

With more than 17 years of experience as a crime scene technician, fingerprint identification specialist and instructor, Scott has provided over 100 specialized training courses and lectures in 19 different states. He currently provides training for Ron Smith and Associates; State of Wisconsin Technical Colleges; North East Multi-Regional Training (Illinois); and The University of Arkansas – Criminal Justice Institute. He is a member of both the International Association for Identification and the Wisconsin Association for Identification. Scott has an Associate Degree in Police Science and is certified by the International Association for Identification as a Senior Crime Scene Analyst.

COURSE OVERVIEW

Evidence Collection Kits
- Suggested items to include
- Vendors for supplies & equipment

What is Physical Evidence?
- The Evidence Triangle
- Locard's Exchange Principle

Documentation of Crime Scenes
- Crime scene log
- Photography
- Searching, sketching, measurements and diagramming crime scenes

Biological Evidence – search and recovery
- DNA
- Body fluids
- Use of Luminol or similar products

Trace Evidence
- Types of evidence, collection and packaging
    - Firearms and ammunition
    - Clothing, fabrics, hairs and fibers
    - Fracture and tear matches
    - Building materials
    - Glass
    - Tool marks
    - Paints
    - Metals
    - Gunshot residue – GSR
    - Arson debris

Latent Fingerprint Development
- History behind the use of fingerprints and why they are used today
- Skin structure and secretions and how they effect latent impressions
- Types of surfaces found at a crime scene and how to best process them
    - Porous
    - Non-porous
- Dusting and lifting methods
- Collection and use of "Elimination Prints"
- Specialized techniques
    - Textured surfaces
    - Cyanoacrylate (superglue)
    - Small particle reagent – wet surfaces
    - Sticky side powder and Wetwop – adhesive tapes

- Use of chemicals for “Porous processing” – iodine, ninhydrin

Footwear and tire track impressions

- Two and three dimensional evidence
- Class characteristics and individualization
- Photographic techniques
- Collection methods
  - Casting
  - Gel lifters
  - Dusting and lifting
  - Electrostatic lifting equipment

Document (Handwriting) Evidence

Evidence Collection Kits – Suggested Items

Basic Latent Print Kit

- ☐ 1 - Jar of Conventional Black Fingerprint Powder (wide mouth jar)
- ☐ 1 - Jar of Conventional Light-colored Fingerprint Powder (wide mouth jar)
- ☐ 1 - Jar of Black Magnetic Fingerprint Powder
- ☐ 1 – Jar of White Magnetic Fingerprint Powder
- ☐ Magnetic wand (applicator)
- ☐ 1 - Fiberglass Brush per color of conventional powder
- ☐ 3 - rolls of 1 1/2" 3M Plastic Lifting Tape (#191C)
- ☐ 1 - roll of 4" Palm print Lifting Tape
- ☐ 200 - White 3"x5" Lifting Cards
- ☐ 50 - Black 3"x5" Lifting Cards
- ☐ 25 - White 5"x8" Palm print Lifting Cards
- ☐ 10 - Black 5"x8" Palm print Lifting Cards
- ☐ 1 - Pad of "Elimination Print" Sheets
- ☐ Ink Pad (ceramic type is preferred)
- ☐ 1 – Box cutter or scissors for cutting tape

Biological Collection Kit

- ☐ 1 – Small Bottle of Distilled/Sterile Water Or individual Sterile Water Ampoules
- ☐ 100 – 100% Cotton Q-Tips, Individually Packaged
  6 inches long w/wooden shaft
- ☐ Glassine Envelopes to place swabs inside
  or
  Boxes for packaging swabs
- ☐ 50 – Envelopes to package glassine or boxes containing the swabs
- ☐ Evidence sealing tape

Trace Evidence

HAIRS AND FIBERS

- ☐ 25 – Sheets of clean white paper (store in zip lock bag)
- ☐ 1 ½ ” wide fingerprint lifting tape
- ☐ 4” wide fingerprint lifting tape
- ☐ 25 – 9” x 12” paper envelopes to seal white paper in
- ☐ 12 – Disposable tweezers
- ☐ Evidence sealing tape

ARSON DEBRIS

- ☐ 6 Pint size metal paint cans w/lids
- ☐ 6 Quart size metal paint cans w/lids
- ☐ 6 Gallon size metal paint cans w/lids
- ☐ 6 Small glass jars with Teflon lids
- ☐ Small garden shovel
- ☐ Evidence sealing tape

GLASS, PAINT CHIPS & TRANSFERS

- ☐ Screwdriver or chisel
- ☐ 24 – small general evidence type containers (e.g. plastic jars)
- ☐ Cotton balls
- ☐ 1 – roll of clear 1 ½ ” fingerprint lifting tape
- ☐ 24 – paper envelopes
- ☐ Evidence sealing tape

SOIL AND PLANT MATERIAL

- ☐ 12 – small general evidence type containers (e.g. plastic jars)
- ☐ Evidence sealing tape

Ballistic and gunshot residue

- ☐ 36 – small general evidence type containers (e.g. plastic jars)
- ☐ 24 – small cardboard evidence boxes (pill boxes)
- ☐ Cotton balls
- ☐ Evidence sealing tape
- ☐ Multi-tool device (optional)
- ☐ Trajectory rods (optional)
- ☐ 6 – Gunshot residue kits

Footwear and Tire track

- ☐ 4 – zip lock bags with a 2 lb. mix of casting material
- ☐ 4 – plastic bottles with 12 – 14 oz. of water
- ☐ casting frame (optional)
- ☐ 1 – can of “Snow Print Wax” (optional)
- ☐ 1 – bottle of hair spray (non aerosol) (optional)
- ☐ 1 – “Sharpie” marker
- ☐ 6 – large white “Gelatin Lifters”
- ☐ 6 – large black “Gelatin Lifters”
- ☐ 6 – small white “Gelatin Lifters”
- ☐ 6 – small black “Gelatin Lifters”
- ☐ 1 – footwear scale (L-shaped)
- ☐ 1 – roll of 4” wide clear fingerprint lifting tape
- ☐ 6 – white palm print lift cards
- ☐ 6 – black palm print lift cards

Tool Marks

- ☐ Accutrans, Extrude, or Mikrosil casting material

General Evidence Collection Materials

- ☐ Paper evidence bags of various sizes
- ☐ Plastic evidence bags of various sizes **(never use with anything suspected of containing biological evidence)**
- ☐ Various sizes of small general evidence type containers
- ☐ Various types and sizes of ruled scales
- ☐ Tape measures or measuring wheel, size determined by your needs
- ☐ Disposable tweezers
- ☐ Latex/non-latex gloves in various sizes
- ☐ Protective dust masks
- ☐ Protective booties for shoes
- ☐ Protective outer garments w/hoods

Optional

- ☐ Blood reagents (e.g. Luminol, Bluestar Forensic, Amido black, LCV)
- ☐ Presumptive blood test supplies (biologicals)
- ☐ Small Particle Reagent (fingerprints)
- ☐ Superglue (fingerprints) and related equipment (e.g. portable chamber)
- ☐ Fluorescent fingerprint powders with light source
- ☐ Diff-Lift tape or gel glue
- ☐ Electrostatic dust lifter (two-dimensional footwear impressions)
- ☐ Elimination fingerprint supplies
- ☐ Alternate Light Source
- ☐ AC/DC Powered Black Light

Crime Scene Equipment Vendors

ADORAMA CAMERA
1-800-223-2500 Ext. 2035
www.adorama.com

ARROWHEAD FORENSICS, INC.
1-800-953-3274
www.arrowheadforensics.com

DELTA LATENT PRODUCTS
1-800-780-4561
www.deltalatentproducts.com

EVIDENT
1-800-576-7606
www.evidentcrimescene.com

FORENSICS SOURCE (A Division of Safariland)
1-800-852-0300
www.forensicssource.com

GRAINGER INDUSTRIAL SUPPLY (3M #191C clear tape)
1-800-323-0620
www.grainger.com (Check for the nearest branch)
Grainger Sourcing will provide a quote for 3M item #00-021200-00014-0

LYNN PEAVEY COMPANY
1-800-255-6499
www.peaveycorp.com

MEDTECH FORENSICS
1-800-596-6420
www.medtechforensics.com

SIRCHIE
1-800-356-7311
www.sirchie.com

TRI-TECH INC.
1-910-457-6600
www.tritechusa.com

ULTRONICS INC.
1-800-262-6262
www.ultronicsusa.com

This list was prepared in an effort to provide information to the students who participate in this class. We recognize there may be other vendors available to assist you and it was not our intention to exclude these other potential sources.

PHYSICAL EVIDENCE

“They had a good crime scene, but having one, protecting, preserving, transporting, and delivering it to a courtroom is a different matter.”

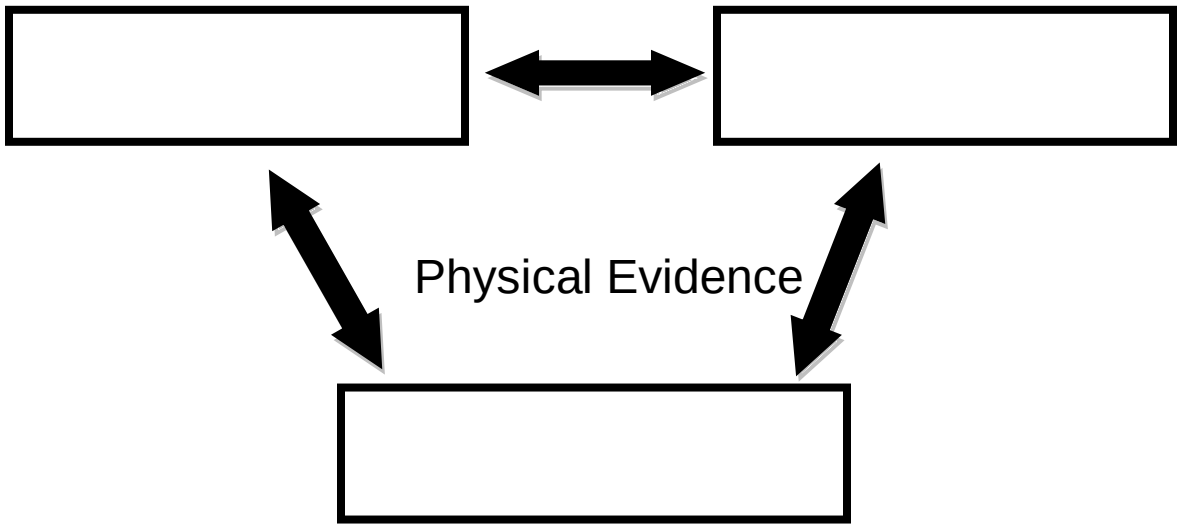
Dr. Henry Lee on the O.J. Simpson investigation
Director, Connecticut State Police Crime Laboratory (Retired)

Crime Scene Basics – What can it be used for?

One of the main goals of evidence collection is to provide a connection or linkage. By carefully examining our crime scenes, documenting and collecting the evidence we find, a linkage may be possible. When we do a good job of collecting physical evidence, and provide that linkage, we can help our case in the following six ways…….

1. Helps us to reconstruct and understand the events that took place
2. Helps us to determine whether or not a crime occurred
3. Links an individual with another individual or crime scene/location
4. Provides investigative leads to Investigators
5. Provides facts to a jury for them to consider a persons innocence or guilt
6. Provides evidence to link serial homicide or rape cases

On the "Linkage Triangle" diagram below, please fill in the boxes with the three things that you try to link together every time that you collect physical evidence!



Linkage Triangle

What Is Or Can Be Physical Evidence?

Remember, it is not always a smoking gun that becomes the critical piece of evidence that holds a man accountable for his crimes. Most times the physical evidence that is collected that night at a crime scene does not show its true value until after the suspect has been questioned and all the evidence has been looked at. Many times the evidence refutes the story or alibi that the suspect comes up with, it shows him to be less than honest and does not match the truth that the physical evidence provides.

These accounts are taken from two actual cases involving less than obvious evidence! Both articles are reprinted from the Kansas Division of the IAI Official publication "The Prairie Whorl Wind"

The Cockleburs on a Ski Mask, which Convicted a Rapist

One midnight, in midsummer, in a suburb of Chicago, a woman parked her car and walked toward her apartment building. Suddenly a man wearing a ski mask leaped from the shrubbery, attacked her, and then disappeared. The Police began to suspect a man that lived in the apartment building, and with a warrant they searched his apartment and found a ski mask. The suspect claimed he had not used the mask since the previous winter. The victim identified the man in a voice lineup, but this was not enough for a conviction. However there were two cockleburs stuck to the ski mask, and the detectives sent them to a forensic entomologist, Bernhard Greenberg for examination. Within the cockleburs were live weevil larvae. Examination of cocklebur samples taken from the crime scene proved to contain the same species of weevil as was found on the suspect's ski mask. The species was identified as *Rhodobaenus 13 punctatus Illiger*, which is also know as the billbug. This species has a one year life cycle, and the larvae pupate in the cocklebur and emerge in the latter part of the summer and then hibernate. Larva do not pupate over winter, and they would not survive the winter within a desiccated cocklebur in a heated apartment. The suspect was then caught in a lie. The court trusted this evidence, and the rapist was convicted.

The Chigger Bites that Convicted a Man for Murder

In 1982, deputies of the Ventura County Sheriff's Office noticed that a murder suspect had chigger bites similar to the ones investigators at the crime scene had on their waste line, ankles and behind the knees. Entomologist Jim Webb was contacted, and by analyzing the bites, Webb connected the suspect to the crime scene where the naked body of a 24-year old woman was found on August 5, 1982. She had been strangled with her own blouse. Several tests were conducted at different places, but the only place they found chiggers was a narrow strip near a eucalyptus tree under which the woman had been found. This meant that the suspect had to be at the crime scene at some point, which did not correlate with his testimony. The suspect claimed to have seen the woman for the last time at a bar. The suspect was convicted of first-degree murder and sentenced to life without parole.

Courts recognize the important of physical evidence

The following excerpt comes from the U.S. Supreme Court decision, Harris VS. United States, 331 U.S.145, 1947:

"Wherever he steps, Whatever he touches, Whatever he leaves, even unconsciously, will serve as a silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects – All of these and more bear mute witness against him.

"This is evidence that does not forget. It is not confused by the excitement of the moment. It is not absent because human witnesses are, it is factual evidence, physical evidence cannot be wrong, it cannot perjure itself, it cannot be wholly absent, only its interpretation can err. Only human failure to FIND it, STUDY and UNDERSTAND it can diminish its value."

What does this mean to personnel who investigate crime scenes?

How does physical evidence compare to a witness statement or a confession when presented to members of a jury?

Professor Edmond Locard established the world's first official police crime laboratory in Lyon, France in the early 1900's. But he best known for his articulation of the most basic forensic science principle, known as the principle of exchange. This principle is:

"EVERY CONTACT LEAVES ITS TRACE"

Locard's Principle, or as it is called today, "The Principle of Exchange" should be remembered at every crime scene, especially when there has been direct physical contact between two people, and absolutely when that contact has been of a violent nature. It simply implies that at every crime scene there will be a deposit, a removal, or both. The suspects leave something from themselves behind or take something from the scene with them when they leave. The scene has been changed from its original state. The goal is to find that "something" and connect the suspect to the crime.

Exercise using Locard's Principle

You are dispatched to an entry in progress but arrive after the burglar has been scared off. Upon your arrival you discover that someone has tried to gain entry to the dwelling by prying off the outer storm window and then breaking out the inner glass window. A painted wooden storm window is found on the south side of the house near a flowerbed that is next to some bushes. You find what appears to be blood on the windowsill. Some of the pieces of broken glass that were removed are neatly stacked up against the side of the house. A cigarette butt is found in the dirt below the window.

Other officers who respond to the area after your arrival locate a juvenile several blocks away wearing Nike Air Jordan's, baggy pants with the cuffs rolled up and a thick wool sweater. The juvenile does not live or work in the area, and the officers find a screwdriver in the juveniles back pocket. He states to the officers that he does not know anything about the attempt entry. He also said that he has never been anywhere near the house, and that he is simply walking home from his girlfriend's house. He has no explanation why he is carrying the screwdriver or why he has a fresh cut on one of his fingers. Simple enough right, but you have no confession and no witnesses can be found to put him back at the scene. Can you put him back at the scene?

PLEASE TRY TO LIST ON THE LINES BELOW AS MANY TYPES OF PHYSICAL EVIDENCE THAT YOU COULD USE TO CONECT THIS SUSPECT TO THIS CRIME

Paint on the screwdriver blade	May match paint on storm window

DOCUMENTATION OF THE CRIME SCENE



<u>Documentation of all work done at the crime scene is an absolute must!</u>

Depending on the seriousness of the incident, documentation while at the crime scene could include a combination of photography, sketches or diagrams, and field notes or written narratives. Serious cases should include all three.

1 Photography

General scene and specific evidence photos.
Videography may be used to supplement but not replace photography

2 Sketches and/or Diagrams

Diagrams require accurate measurements

3 Field Notes & Written Narratives

Scene notes and final reports

CRIME SCENE PPRCESSING AND EVIDENCE COLLECTION
Presented by Scott Campbell - MILWAUKEE AREA TECHNICAL COLLEGE

Crime Scene Entry Log Sheet

All persons entering the crime scene must sign this record sheet

AGENCY: _____

INCIDENT #: _____

DATE: _____

SCENE LOCATION: _____

NOTE: Officers assigned to maintain scene security must also log in and out and list the reason as "log officer".

NAME & TITLE	INITIALS	AGENCY	IN DATE/TIME	OUT DATE/TIME	REASON FOR ENTERING

FORMS TO HELP RECORD YOUR PHOTOS

PHOTOGRAPHIC ASSIGNMENT Page ____ Of ____

Location _____ Date _____
Type of Case _____ Time _____
Photographer _____ Employee I.D. # _____ Sq. # _____
Victim _____ Investigate Squad # _____
Vehicle #1 _____ License Plate # _____
Vehicle #2 _____ License Plate # _____
CAD # _____ Incident # _____ M # _____
Misc: _____ Camera # _____
Companion Case Location: _____ Flash Card # _____

PHOTO LAB USE ONLY:

Digital _____ 35mm _____ Other _____ **Total # Photos** _____

Photo No.	Lens Height	Film To Subject	Camera Direction	ADDRESS - DESCRIPTION - LOCATION OF EACH PHOTOGRAPH

To the left is an example of a **Photo Log**.

The purpose is to record what photos were taken and how they were taken. The images are numbered and the sequence will match your log if done properly.

The log will also help to explain what was done photographically, such as the direction in which the photo was taken.

This log will help in follow up investigations and re-construction such as arson and accident scenes.

Police Department Name
Photographic Record Sheet

LOCATION:_____

_____

DATE:____/_____/_____ TIME:_____

TYPE OF INCIDENT:_____

_____

PHOTOGRAPHER:_____

CAMERA BODY:_____FLASH CARD:_____

This is an example of a **Photo ID Card**

Suggested Photographic Equipment

1) HIGH MEGA-PIXEL (minimum of 6MP) DIGITAL SLR CAMERA or a Point & Shoot w/ *Manual* capabilities.
   A minimum of 6 mega-pixel images are needed for most comparison work and many labs will require RAW file images, the higher the better.
2) OFF CAMERA FLASH
   Without this "off camera flash", you may not properly expose many types of evidence photographs. It is much more powerful and versatile than the small built in flash on most SLR and Point and Shoot cameras.
3) SYNC CORD (remote flash cord)
   To connect the Off Camera Flash to the camera. It should be long enough to position the flash at least 4-6' away from the camera.
4) NORMAL, WIDE ANGLE and TELEPHOTO LENSES (or variable zoom)
   The wide angle for general scene photos, normal to show the perspective similar to the human eye, and telephoto for longer distances. Many types of evidence photographs require a normal perspective.
5) STURDY AND VERSITILE TRIPOD
   A tripod with horizontal center column capabilities is preferred.
6) SPECIALIZED BATTERIES and extras
   For both the camera, and the flash unit (see below comment).

Optional Equipment

1) SHUTTER RELEASE CABLE or REMOTE
   This is used to prevent camera movement while pushing the shutter button during photographs where movement could blur the photo.
2) POWER SUPPLY FOR THE FLASH
   To photograph outdoors in darkness requires the flash to fire at full power. This will drain the batteries quickly, especially in bitter cold conditions. Having a separate power supply will help.
3) HARD CAMERA CASE
   To protect your department's investment, especially when the equipment is used by many different officers on multiple shifts.

The "Rule of Three"

When you use photography to document your crime scene, use the "Rule of Three". The "Rule of Three" states that for each item of evidence that you identify at the crime scene, you must take at least three photos of that single piece of evidence. You may need to take more than that, but at a minimum should have the following:

1) Overall Photos
   These should include the overall views of the scene that show the general location and ideally some kind of a landmark such as street sign, address, business name or distinctive permanent identifier. These would allow a person to look at the photo, and if at the scene, figure out the area and the direction it was taken. It provides a general view and should include photos from several different directions. These can also include photos in all directions away from the scene.

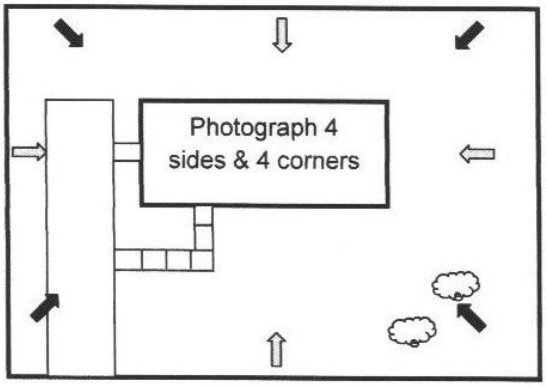
2) Midrange or Medium Photos
   These photos show more detail than the overall photos and are also used to show the "relationship" of items within the scene. At some scenes, several midrange photos may be used to show the approach towards items found at the scene.

3) Close Up Photos
   These photos show more specific detail and help to identify items of evidence such as brand names, serial and model numbers, and good quality small details. An extreme close up would be considered a "Macro" photo and would be used for very fine detail such as fingerprints, pry or bite marks, and blood spatter.

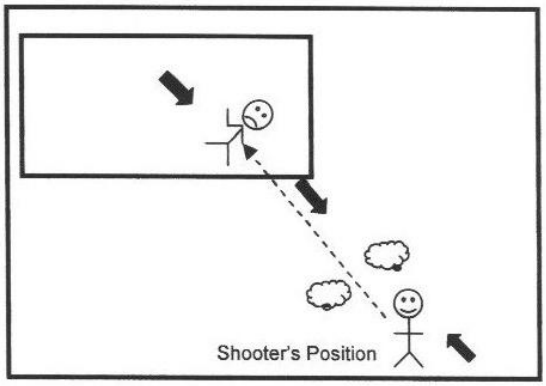
Example: A tavern is held up but before the robbery took place, the suspect sat drinking a can of beer, in a particular booth. An **overall** photo is taken to show where in the tavern the booth was located. Then take a **medium** photo of the beer can on the table. If you develop fingerprints on the beer can or collect DNA evidence, you should take a **close up** of the beer can. Additional **macro** photos of any fingerprints are also beneficial.

It is vitally important to remember to cover the entire area that makes up a crime scene, even areas where evidence was not recovered. Documenting what the scene looked like when it was found, before anything was moved or recovered is crucial. Showing the “absence of evidence”, such as the lack of forced entry to a home, can be significant in some cases. Carefully showing what the scene looked like from both outside and inside, or both towards and away from the scene is very important. Additional photographs that should be taken could be the suspect’s path of movement and any witness viewpoint. Take photos from the witness to the scene and from the scene back to the position of the witness.

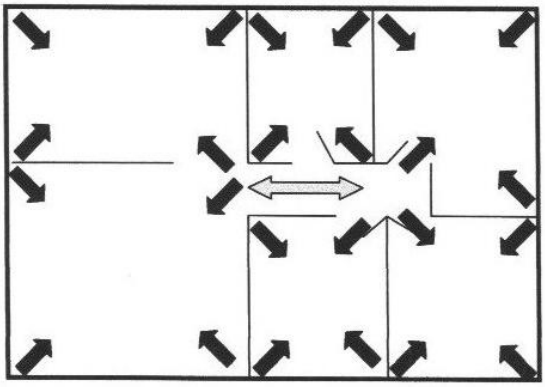
Exterior Overall Views



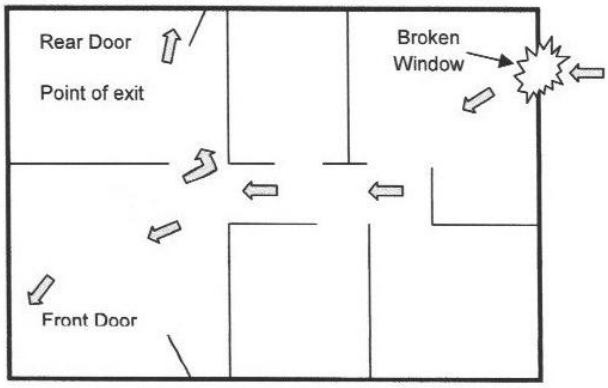
Overall Relevant Angle Views



Interior Overall Views (4 Corners)



Path of Movement Overall Views



Exposure Control

When we talk about "exposure" in photography, we are talking about the amount of brightness that the image shows. There are a number of ways to increase or decrease exposure. You can add flash, use additional lighting, paint with light, diffuse light, or even turn the power up or down on your flash itself.

When not adding a light source such as flash, the three ways that the camera and or the photographer can control exposure are adjusting the **ISO (Film Sensitivity), Shutter Speed and the Aperture**. When the camera is in the "automatic mode" the camera selects from these to properly expose the image. In most cases, the automatic settings and systems built into newer digital cameras do an excellent job of calculating proper exposure. However, if you take a photo and upon review of the image on the monitor you find that it is either too light or too dark, you should attempt to correct it. The camera does not know what is most important to you and can only do what it has been programmed to do in the factory settings.

ISO

The ISO used to be the sensitivity of film loaded into the camera and was available in various sensitivities depending on the type of lighting available to the photographer and the type of photos that were needed. Since most people are currently using digital cameras, film is no longer used in cameras. However, when digital cameras were created, they replicated most of the functions of film cameras and included the ability to change ISO sensitivity. Sensitivity is the "digital equivalent" of film speed.

Standard ISO designations would be **100, 200, 400, 800, 1600, 3200** and continue up in the same pattern as shown. These are called "full stops" or full incremental change. Each time the number doubled, and indicates that the sensitivity, or exposure has also doubled. ISO 200 would be twice as sensitive to light as ISO 100. ISO 1600 would be sixteen times as sensitive as ISO 100. If you go in the opposite direction and move to a lower number, the exposure becomes one-half of the previous setting. As an example, ISO 400 would be half as sensitive as ISO 800 and be darker. As the number gets higher, the camera's sensor is programmed to be more sensitive to light and basically brightens the image created. There is a trade-off though as the ISO is increased, the quality of the image will decrease. With film this was called graininess. Digital images will also lose quality as the ISO is moved to higher numbers. So keep in mind that the better quality images will be in the lower range of available ISO settings, but will require more light to produce a useable image.

In addition to the standard ISO designations listed above, many digital cameras will allow the user to split the ISO numbers into third increments instead of what is considered "a full stop". This will enable the photographer to add or subtract light (exposure) by smaller increments.

Shutter Speed

When light enters a camera through the lens it needs to arrive at the digital sensor which is located at the rear of the camera body. It also must be allowed to strike the sensor for a specific amount of time to have the image properly exposed. Shutter speed is the amount of time that light hits the sensor. This is normally for a fraction of a second but can be longer such as several seconds or even minutes.

The shutter itself is generally made up of thin blades of metal or plastic coated metal and form curtains, like curtains on a window. When you open a curtain on a window, light enters the room. The shutter on the camera basically does the same thing. The longer the shutter is open, more light gets to the sensor and the image will be brighter.

Standard shutter speeds are designated numerically in either fractions or in whole numbers. **Standard speeds would include fractions such as 1/2000, 1/1000, 1/500, 1/250, 1/125, 1/60, 1/30, 1/15, 1/8, 1/4, 1/2**. Each of these are fractions of a full second, meaning 1/2000 is one- two thousandths of a second. 1/60 means one-sixtieth of a second. The smaller the fraction, the faster the shutter opens and closes letting in less light or less exposure. The larger the fraction, the longer the shutter will remain open increasing the brightness. Each of the above standard shutter speeds are considered a full incremental change or "full stops", similar to a full stop change with ISO changes. When you change the shutter speed in either direction, you will either double the exposure or cut it in half. As an example, if you change the shutter speed from $1/60^{th}$ to $1/30^{th}$, you will double the exposure since $1/30^{th}$ is equal to $1/60^{th}$ + $1/60^{th}$, or 2/60ths. If you move in the opposite direction with the shutter speed such as changing from 1/125 to 1/250, you will decrease the exposure and end up with half the brightness.

Some of the cameras will show shutter speeds that are a fraction of a second as actual fractions, such as 1/60 or 1/500 and can be viewed most commonly in the viewfinder, or displayed on the Control Panel/LCD display or on the rear monitor. Other cameras due to size limitations will display $1/60^{th}$ of a second as "60" or $1/500^{th}$ of a second as "500". Don't confuse 500 as five hundred full seconds.

The camera can also keep the shutter open for full seconds, and these also would be **standard one stop increments such as 1 second, 2 seconds, 4 seconds, 8 seconds** and so on up to about 30 full seconds. As you double each shutter speed, you double the exposure such as changing from 2 seconds to 4 seconds. The 4 second shutter is open twice as long as 2 seconds, so the image will be twice as bright. Many cameras will allow you to set the shutter for between 15 and 30 full seconds, which is a long time. If you need additional time, you can select the "bulb" setting. When using "bulb", the shutter will stay open as long as you have the shutter release button pressed or locked open with a remote or cable release cord. This could be for several minutes or longer. The longer the shutter remains open, the brighter the image will become.

If you use slower shutter speeds, generally below or slower than 1/60 of a second, blurring of the image can occur if you hand hold the camera. At slower speeds, you should immobilize the camera by using a tripod, or placing the camera on a sturdy surface such as a table top, hood or roof a vehicle, a fence post or even against a vertical wall. If any movement

occurs while the shutter is open blurring of the image occurs. Technically speaking, you should never hand hold less than the inverse of the focal length of the lens on the camera. This means that if you are using a 300mm lens, you should not hand hold the camera at less than 1/300th of a second. You should use a shutter speed of 1/500 but not 1/250.

The other problem with a slow shutter speed occurs when the object you a photographing is moving, even if the camera is stationary. If the shutter opens while the object is at a particular position but then moves even slightly, such as a person running or a car driving by, before the shutter closes, the image will be blurred. In the case of objects that are moving, you will need to use faster shutter speeds such as 1/250 of a second or even 1/2000 of a second. The problem with the faster shutter can then become a darker image since a shorter amount of time is available for the sensor to capture your image.

Keep in mind that longer durations of time/slower shutter speeds will add exposure and lighten the image, and faster shutter speeds will darken the image.

Many cameras will also have what is called “Shutter Priority”, indicated by the letter “S”, “T” or “TV”. When placed in this mode, the operator selects the shutter of their choice and the camera will select the aperture to balance the exposure level.

Just like with ISO settings, shutter speeds on digital cameras can be adjusted by third increments instead of what is considered “a full stop”. As an example, between full stops of 1/60 and 1/30 of a second, you will find 1/50 and 1/40 of a second. This will enable the photographer to add or subtract light (exposure) by smaller increments.

Aperture

Inside the lens of the camera is a round diaphragm made up of very thin metal leaves that overlap each other similar to petals of a flower. These form the “Aperture”, which is the opening in the lens. The aperture works similar to the pupil of the human eye. The larger opening in the lens or eye, the more light passes through resulting in more exposure. The smaller the opening, the less light passes through resulting in less exposure.

The size of the opening is assigned what is called an “**F-Stop**” number. This number generally falls between 1.4 and 32 but can go slightly beyond that range. Standard f-stop numbers would be as follows: 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22 and 32. As you can see, there is a pattern here just like ISO and shutter speed settings. Every other number doubles numerically. Many digital cameras will allow you to split each full stop into third stop increments. As an example, instead of going from F4 to F5.6, which is one full stop, your camera may go from F4, to F4.5, then F5.0, then F5.6. Each of these small steps is making the opening slightly smaller which decreases exposure by one-third of a stop. The difficult part of understanding F-stops is that as the number becomes higher, the opening gets smaller. The easiest way to explain this is that the numbers should be considered fractions. Just change the “F” to the number “1”. When you see the number F2 think of it as 1/2 and the number F4 as 1/4. Now, think of the size of the aperture, which is larger, 1/2 (one half) of something or 1/4 (one quarter) of something? Obviously half is bigger than a quarter, whether we are talking about inches or

measuring a half cup verses a quarter cup. So as the number gets larger, it's actually a smaller fraction and the opening is smaller, which lets in less light.

Similar to ISO and shutter speeds, each full stop change will either let in double the amount of light or half the amount. If you change from F8 to F5.6, you will double the size of the aperture which doubles the exposure creating a brighter image. If you change from F8 to F11, the opening of the aperture becomes half the size and the exposure becomes half as much. As mentioned before, your camera may have additional F-stop numbers that will allow minor adjustments instead of a full stop. It depends on the type of camera and lens.

Summary

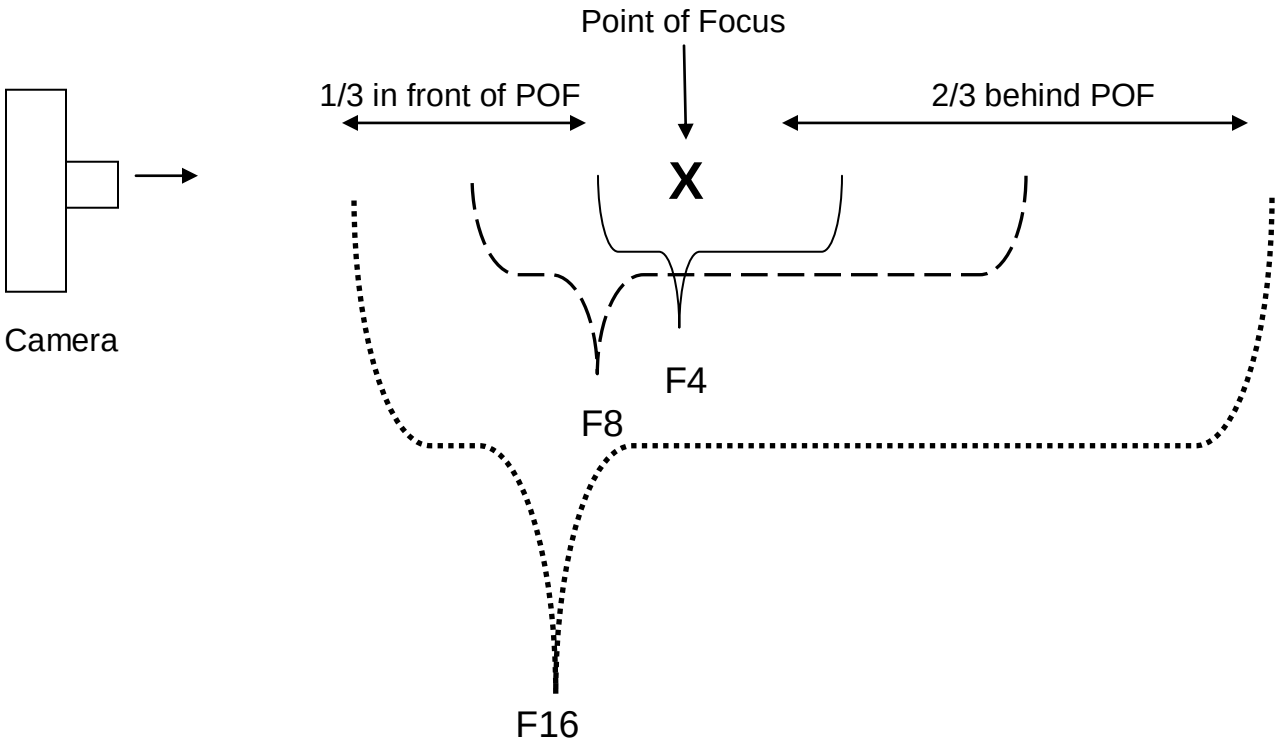
It is the combination of the three controls mentioned above that control proper exposure. You can change any one or a combination of all three to change exposure for your specific needs. If you change shutter speed or F-Stops, you don't affect the actual quality, but a change in ISO to a higher number will lower image quality. But keep in mind that a slightly lower quality image is better than one that is so dark that it has little value, so changing to a higher ISO may be necessary.

Depth of Field

Depth of field is described as the area of an image that is in focus or can be seen clearly, both in front of, and behind the object that we are focusing on. Just like the human eye, the camera lens can only see a given amount of distance. You generally can't see clearly 6 inches in front of your eyes and at the same time see items 6 feet and 60 away. The camera lens has the same difficulty. In order to obtain a clear image over a larger distance, the aperture of the lens can be adjusted.

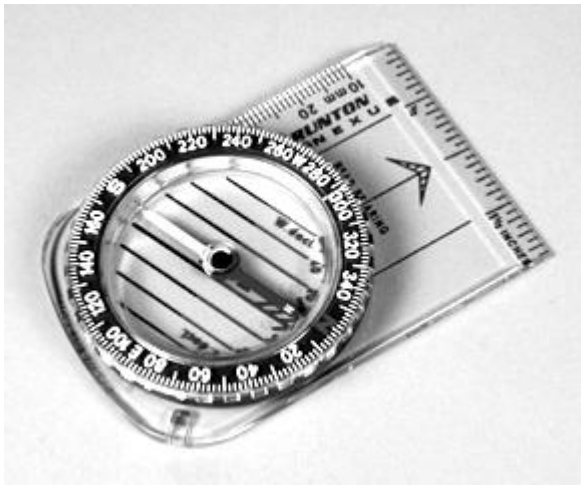
As the aperture or F-Stop is adjusted to a smaller opening, less light enters the lens but the depth of field will increase. The larger the aperture, more light enters the lens but depth of field will decrease. There are variables, but in general you will have acceptable sharpness 1/3 (one-third) in front of your point of focus, and 2/3 (two-thirds) beyond the point of focus. This is called the "Rule of Thirds".

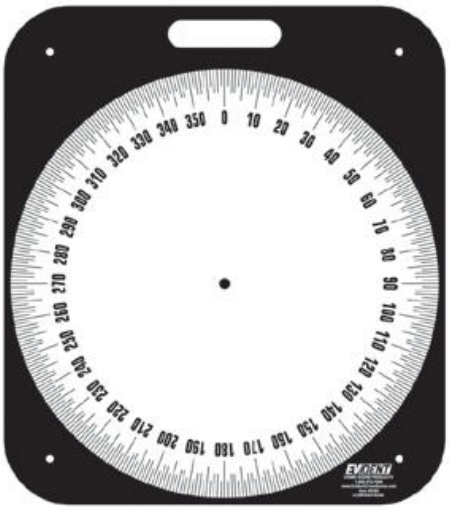
See the example below. When the camera is kept in the same position and focused on point "X", adjusting the F-Stop from F4 to F8 and then F16 will increase the area that is sharp in the image.



In addition, the closer the camera is to the object or point of focus, the depth of field will decrease. If you are farther away, depth of field will increase.

Searching, sketching, measurements and documenting scenes and evidence





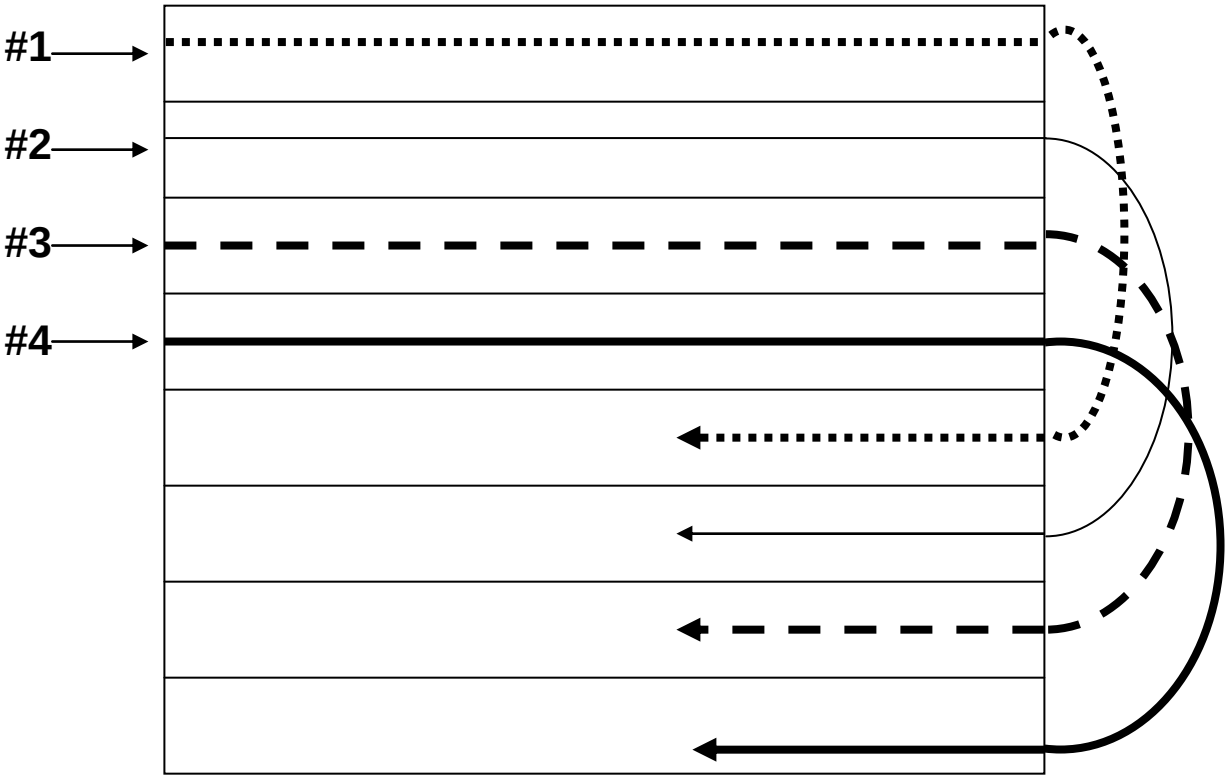
Using graph paper can be one of the best and easiest ways to make your rough sketch.

Think about putting some in your kit or on your clipboard

Search Methods

Several ways exist that efficiently and effectively allow investigators to search crime scenes. The method of choice will depend on conditions including the number of personnel available, size of scene, indoor or outdoor scene, lighting and weather conditions, what type of evidence the search will include, and the time frame allowed to complete the search.

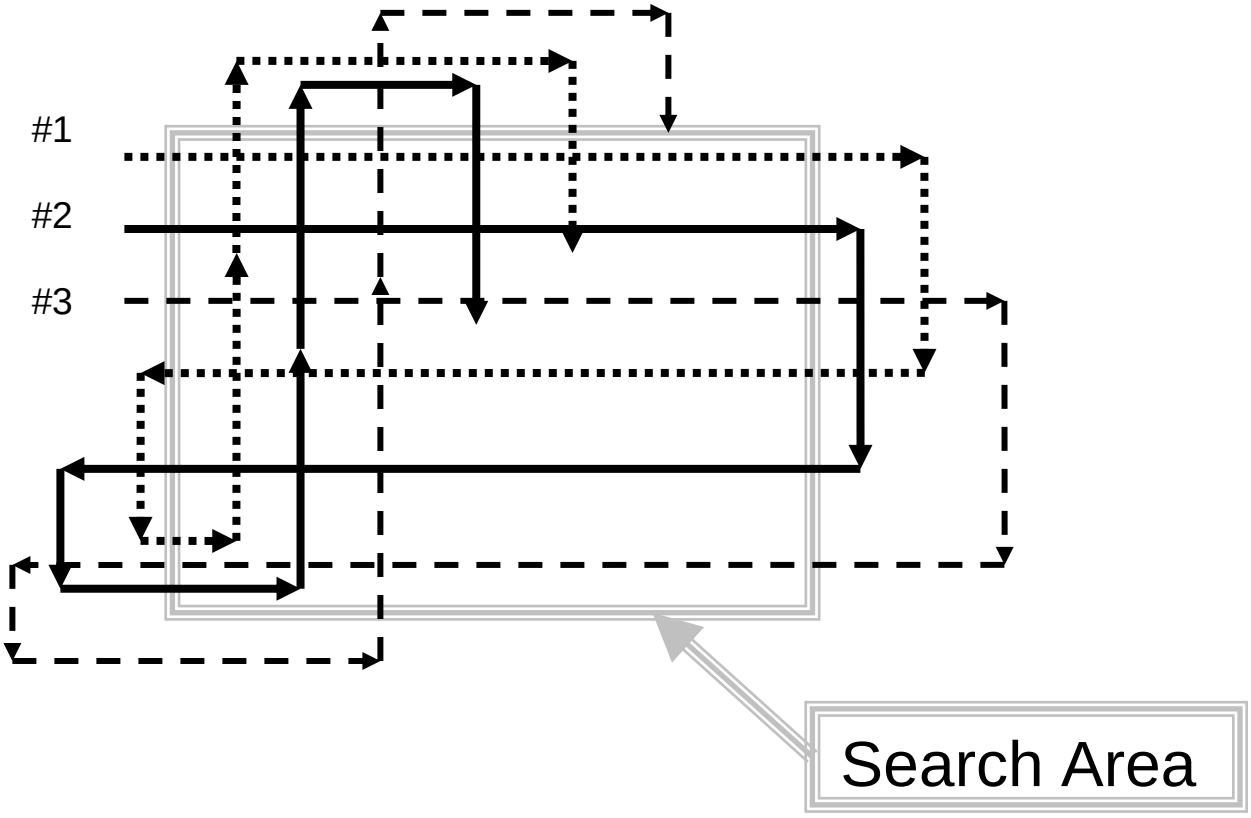
Strip Method



The strip method works well for outdoor scenes or large indoor scenes. Lanes are set up and marked by placing stakes at each end and using a line or crime scene tape to designate the lane responsibility and avoid missing areas. The side of a building or other barrier also works as a starting edge. Personnel assigned scan their assigned lane/area thoroughly as they walk side by side. The lanes/search area should be narrow, about arms length apart. When personnel reach the end of the lane, the lanes are repositioned and personnel shift and continue in the opposite direction.

Grid Method

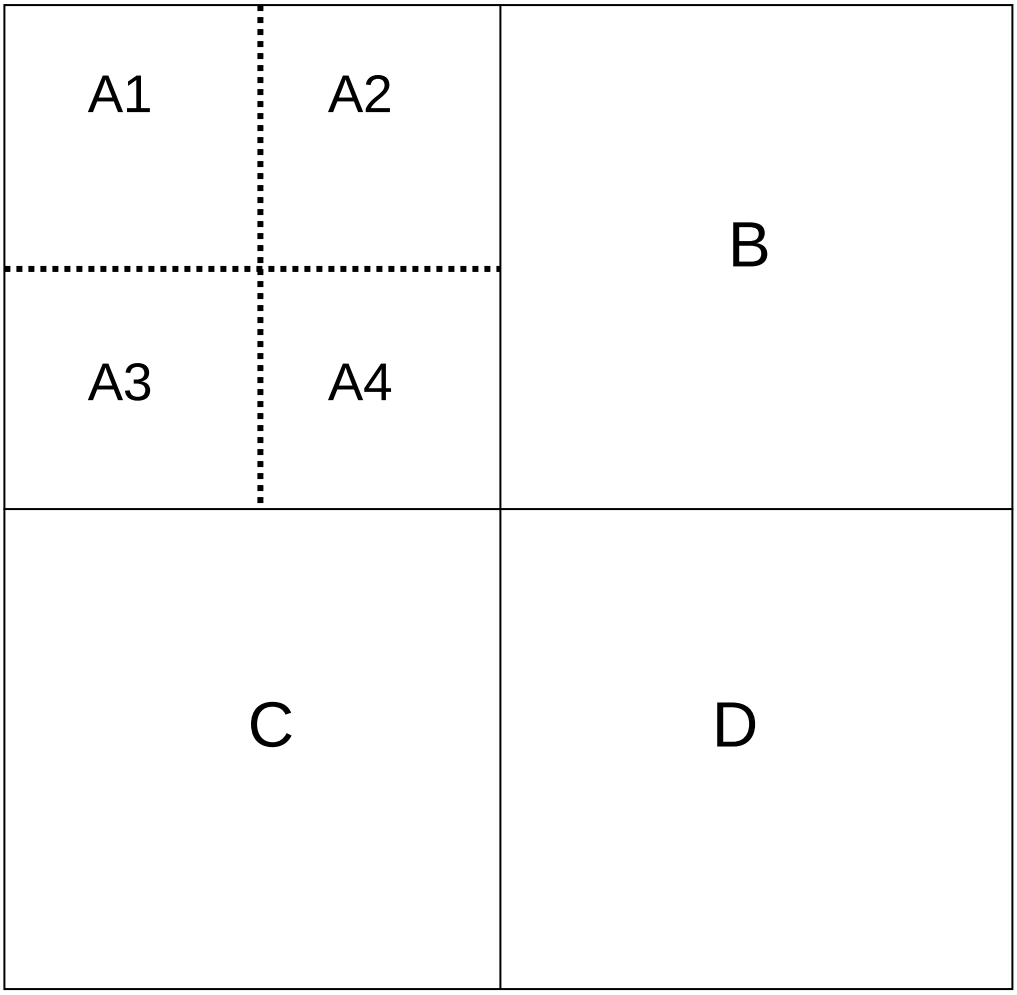
This method is similar to the strip method in that is starts the same way, however, after all lanes have been searched horizontally, personnel search the lanes again but at a 90 degree angle to the first search. This takes more time, but creates a more thorough search.



The main thing to remember is that **every lane** must be checked both horizontally and vertically.

Zone or Sector Method

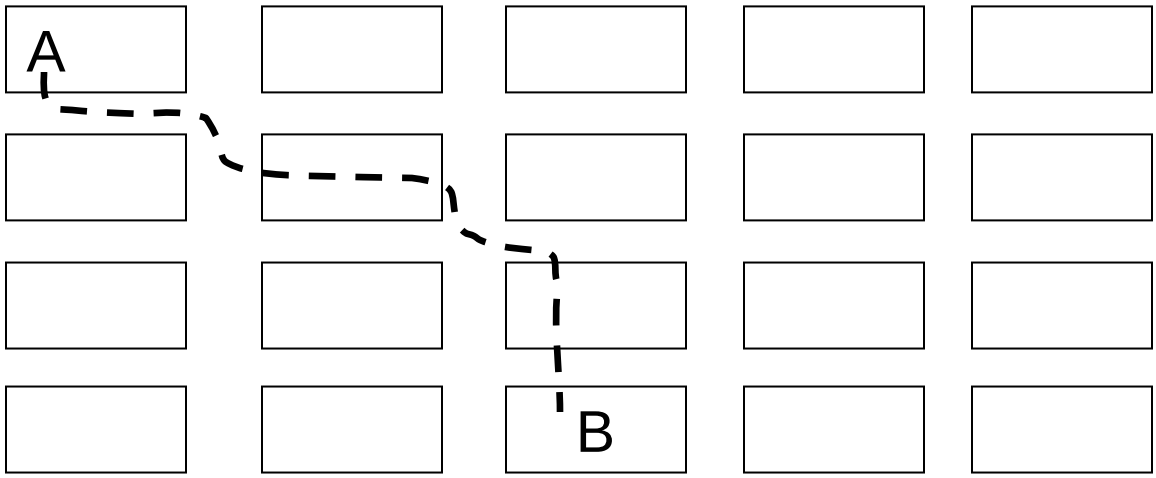
In order to use this method, the area is divided into zones or sectors. Each zone can then be divided again, into smaller more manageable zones if a scene dictates. Teams can be assigned a large zone and sub-divide their area among its members.



Point to Point Method

This method would be used to follow the path of the suspect and search along the route for evidence that could have been dropped or thrown. It can work well in cases such as a vehicle chase where suspects throw evidence or contraband out the car window during the pursuit or when a suspect is chased on foot. It can also be used when you can determine the suspect's route due to blood drops from an injury or even footwear impressions in snow.

In the example below, each rectangle represents a city block. If the suspect was injured while at a house indicated by a starting location of "A" and ended up at location "B", you wouldn't need to search every block shown. Instead follow the blood drops and search the area along the path for dropped items.

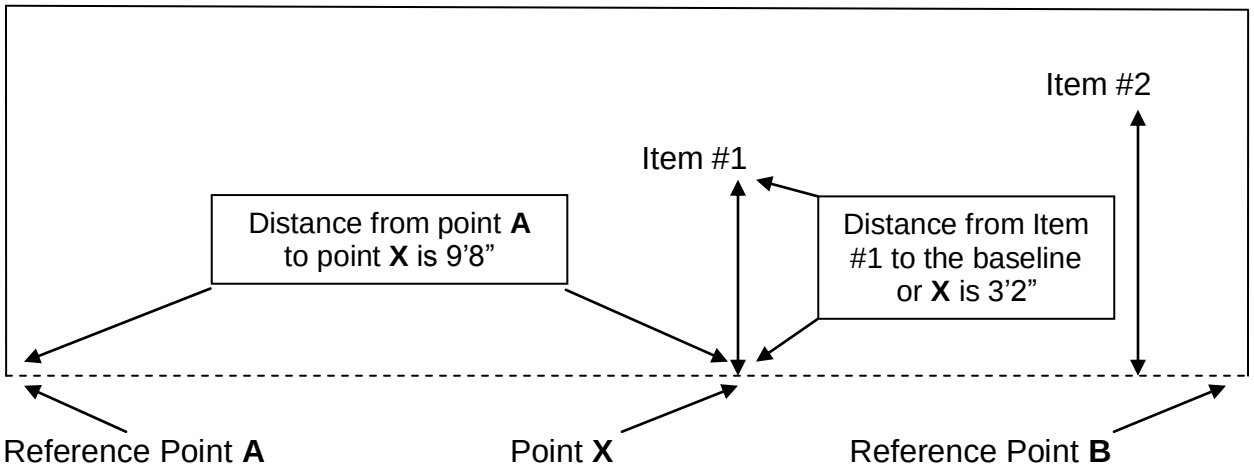


Measurements & Sketching

In addition to documenting crime scenes by using photography, sketching or diagrams will help with the investigation and reconstruction of the scene. The initial sketch or "rough draft" is not drawn to scale but used to document the scene and designate specific locations, areas or items or importance. A scaled "final" diagram can be produce later using the rough draft and your notes to place items in their proper relationship to each other. Two simple methods of obtaining measurements and producing the initial sketch are the **Baseline** and **Triangulation** methods.

Baseline Method

When using the baseline method, two reference points must be established. These points should be permanent locations (or as permanent as possible) that can be located again if you returned to the scene. Good locations could be the corner of a building, curb line of the street, corner of an intersection, doorway of a building, etc. Document these specific reference point locations and it's always good to obtain the measurement between them. As you can see in the diagram below, the reference points are designated as "A" and "B", which are the corners of a room. A tape measure is place between these two points and become the "baseline". A second tape measure is used to measure the shortest distance from an item of evidence to the baseline. These two measurements will allow you to place items back in the same position as when the diagram was created.



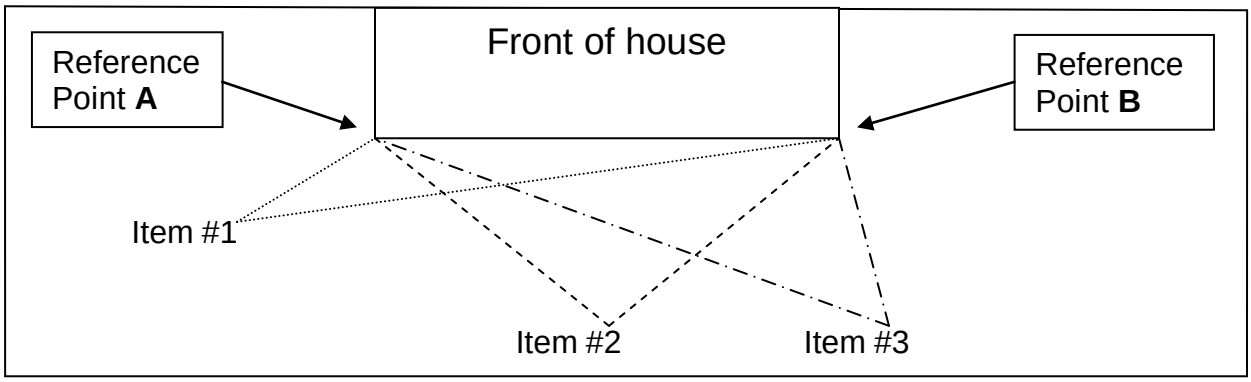
Point **X** is the shortest distance from the item to the baseline tape measure. A separate log as shown below is used to document each item, along with the measurement along the baseline from reference point **A** toward reference point **B** and the shortest distance from each item to the baseline.

#	Item	Distance from "A"	Distance from baseline
1	Bloody Knife	9'8"	3'2"
2	Spent 9mm casing	12'4"	5'3"

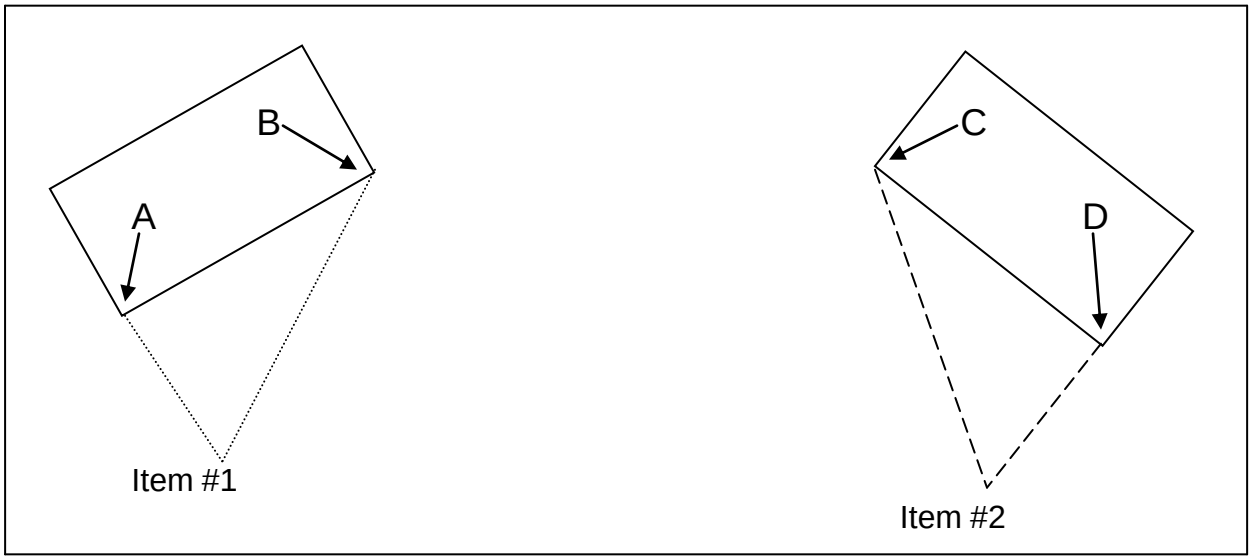
Continue listing items and measurements as needed.

Triangulation Method

This method is similar to the "baseline method" in that you establish two permanent reference points. The triangulation method is helpful when straight lines for a baseline are not available or several sets of reference points are needed over a longer distance or larger scene. It is also usually more accurate since you don't have to approximate a right angle coming off the baseline as in the "baseline method". Document your reference points "A" and "B" and the distance between them and then measure from each point to each piece of evidence. If it is necessary to establish additional reference points due to the type of scene, document those just like "A" and "B" but use different designations such as "C" and "D".



Due to the distance between Items #1 and #2, you may need to establish reference points A and B on one building for item #1, and a separate set of reference points such as C & D for additional items as shown below.



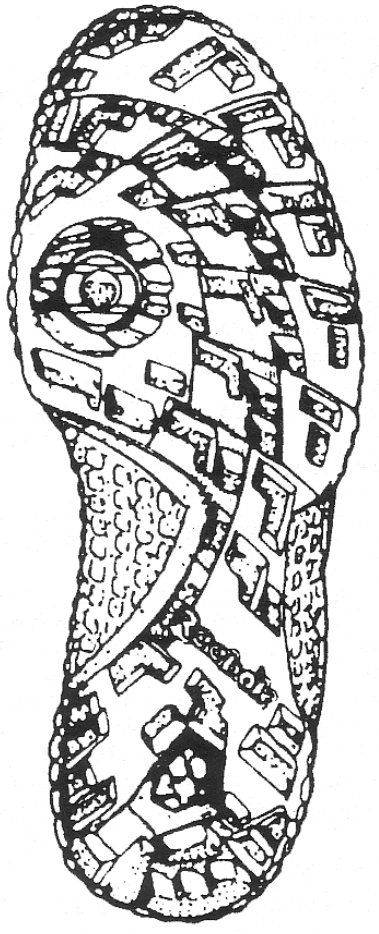
Final sketch or diagram

The final sketch will usually be drawn as close to scale as possible, but indicate that the measurements in the diagram are approximate. The measurements collected at the scene are accurate, but the diagram may not depict every item in the exact position. Over the past several years, more software programs have become available to assist with drawing and diagraming using computers. The diagram can be drawn showing the items, or item numbers, without the lines and dimensions to make it easier to understand and not cover items. The separate log can present the distances that correlate the proper positions.

Remember to include critical information on the diagrams. This should include a description of the location such as address, specific room (Ex: northeast bedroom), type of case and department case number, date of occurrence and date the diagram was created, names of who took measurements and who created the diagram, a key that would list the item number, what the item is and measurements or other important information. Indicate the compass direction and the scale that the diagram was drawn in, such as ¼" equals approximately 1'.

Have someone else look it over before the final sketch is presented to see if it is easy to understand so the prosecuting and defense attorneys, jury, judge and witnesses will not have difficulty.

FOOTWEAR AND TIRETRACK EVIDENCE



FOOTWEAR AND TIRE IMPRESSIONS

- **TYPES OF IMPRESSIONS**
  DUST IMPRESSION
  IMPRESSIONS IN FOREIGN MATERIAL
  IMPRESSIONS IN DIRT, SAND, MUD, ETC…
  IMPRESSIONS IN SNOW

- **PHOTOGRAPHY**
  MUST HAVE PROPER SET UP TO BE REPLICATED AS HIGH QUALITY 1:1

- **DUST IMPRESSIONS**
  RECORD DIRECTION
  RECORD INSIDE & OUTSIDE
  PHOTOGRAPH
  RECOVER ITEMS
  ENHANCE IMPRESSIONS
  LIFT IMPRESSIONS

- **IMPRESSIONS IN FOREIGN MATERIALS**
  RECORD DIRECTION
  RECORD INSIDE & OUTSIDE
  PHOTOGRAPH
  RECOVER ITEMS
  ENHANCE IMPRESSIONS
  LIFT IMPRESSIONS

- **EXAMINATIONS & COMPARISONS**
  CLASS CHARACTERISTICS
    TREAD DESIGN
    SIZE
    AREAS OF WEAR
    MOLD DEFECTS
  INDIVIDUAL CHARACTERISTICS
    CUTS
    MARKS
    MISSING TREAD, ETC…

- **POSSIBLE CONCLUSIONS OF EXAMINATION**
  ELIMINATE THE SUBJECT
  CONSISTANT IN SIZE & TREAD DESIGN (class characteristics)
  POSITIVE IDENTIFICATION (this shoe made the impressions found at the crime scene)

PHOTOGRAPHS MUST BE TAKEN BEFORE CASTING ANY FOOTWEAR OR TIRE TRACK IMPRESSION

The camera must be on a tripod and the flash must be off the camera. The camera itself must be directly over the impression and parallel to the tread for either two dimensional or three dimensional impressions. An accurate footwear scale should be place next to and at the same depth as the tread pattern. A normal lens such as a 50mm on a full frame camera is preferred.

Notice how the camera is on the tripod directly over the impression with the flash unit off the camera. For two dimensional impressions the flash is used at a very low or flat angle and for three dimensional impressions it is raised up from about 10 to 45 degrees. This is done to create shadows and show detail.

The placement of the camera body and “film plane” directly over the impression and as parallel to the position of the tread is absolutely critical. If the camera is not parallel to the impression, distortion will occur in the actual size of the impression’s image especially when enlarged. This will possibly cause the details of the impression to change their actual dimensions and make accurate comparison of the impression difficult.

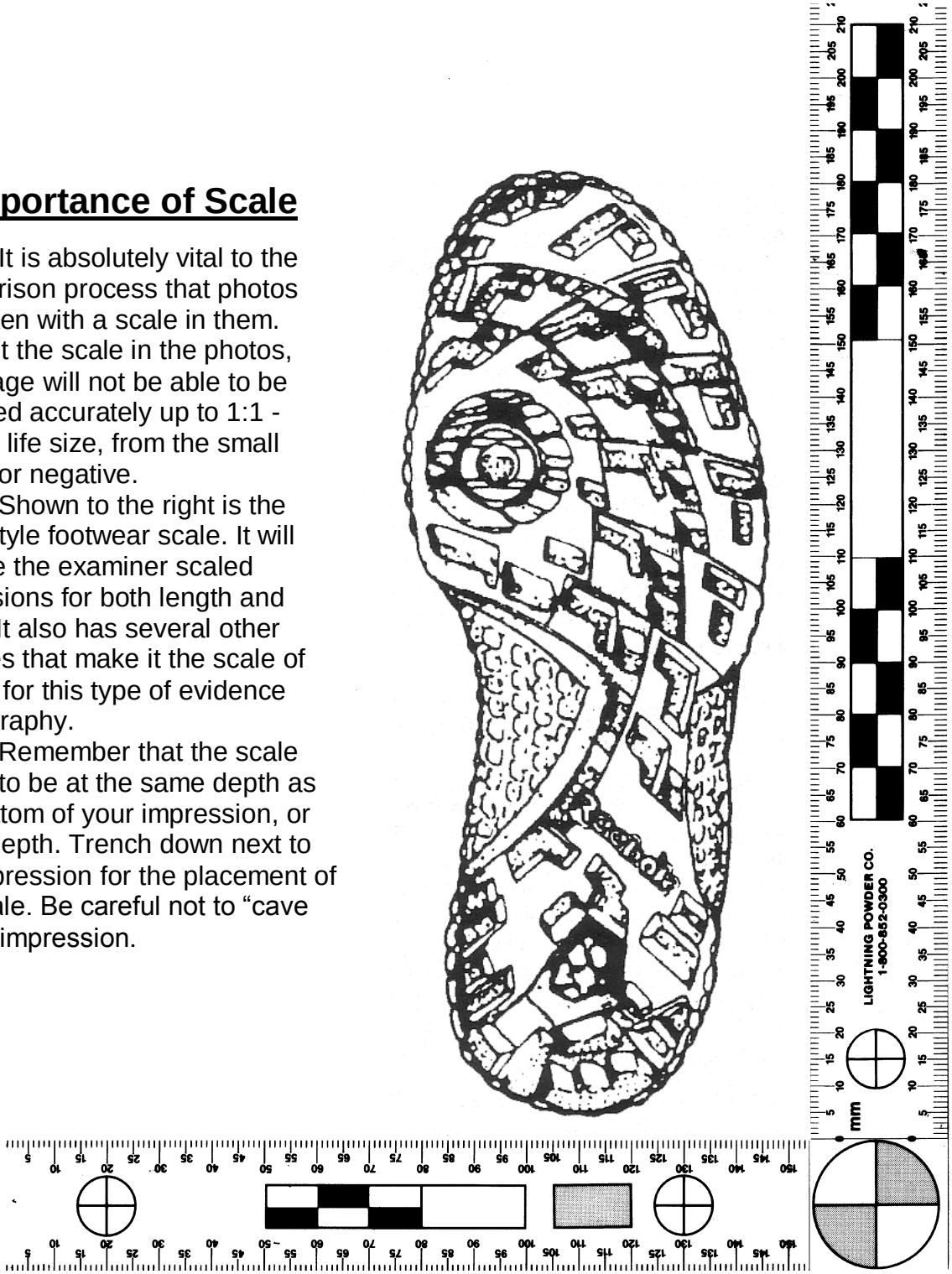
You should position the camera close to the impression to allow you to “fill the frame” with the impression. This will allow better quality enlargements for later 1:1 comparisons. When looking through the viewfinder, you should see the impression, the accurate scale and an indicator documenting the impression such as footwear impression number, date, case number, your name, etc.

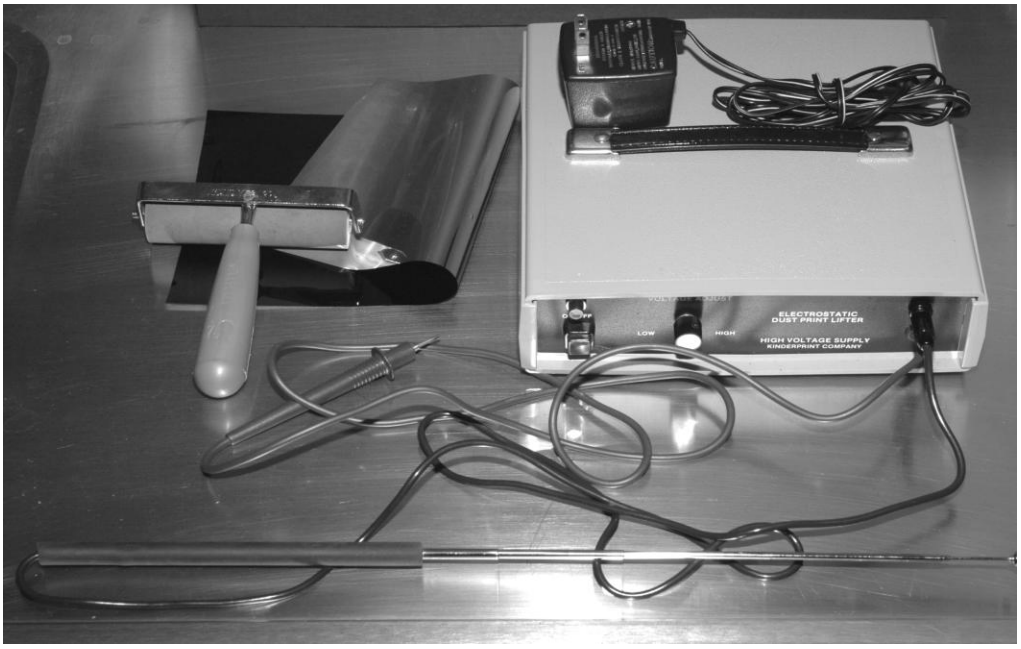
Importance of Scale

It is absolutely vital to the comparison process that photos are taken with a scale in them. Without the scale in the photos, the image will not be able to be enlarged accurately up to 1:1 - natural life size, from the small image or negative.

Shown to the right is the "FBI" style footwear scale. It will provide the examiner scaled dimensions for both length and width. It also has several other features that make it the scale of choice for this type of evidence photography.

Remember that the scale needs to be at the same depth as the bottom of your impression, or tread depth. Trench down next to the impression for the placement of the scale. Be careful not to "cave in" the impression.





LIFTING A ***DUST*** PRINT AFTER PHOTOGRAPHING

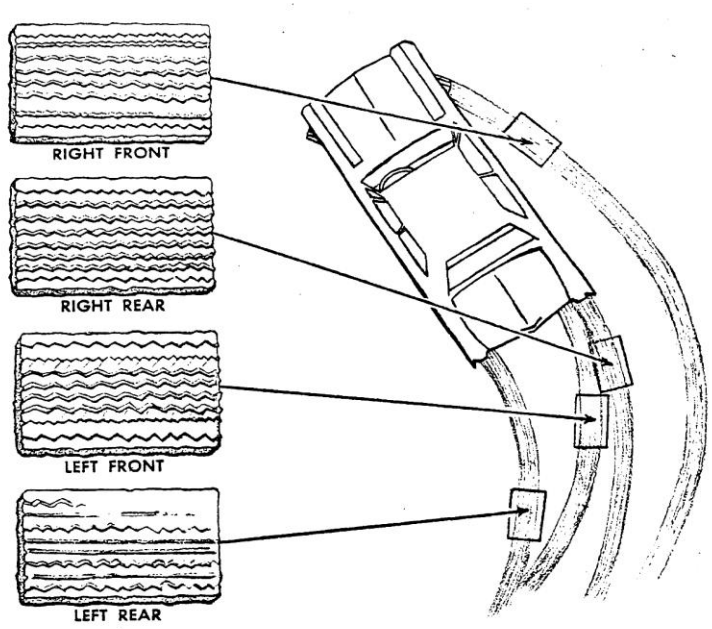
When you have completely photographed a dust footwear impression, it is time to recover or "*lift*" the print to help preserve it and to make it available to the footwear examiner for comparison.

There are several techniques for the *lifting* of dust prints off of surfaces like a floor, counter top or door. You can use 4" wide fingerprint lifting tape and smooth it out carefully over the area containing the print and then place it onto a contrasting color card or piece of paper. Be careful to avoid creases and air bubbles.

You could use "Mikorsil", a product normally associated with tool and bite marks. Mix up the two components and spread it out over the area containing the print. Once applied, allow to dry and remove it from the surface. Be careful to photograph the lift and preserve it somehow that will keep the transfer of dust from being disturbed.

You could use a "*Gelatin*" lifter to transfer the impression onto the surface of the contrasting colored lifter. Simply lay the lifter over the area of the print and press a roller across the back of the lifter ior use the side of your hand. Great care should be taken with these lifters after being removed from the surface as they are extremely fragile. Photograph the print after it has been transferred onto the lifter. Remember to use oblique lighting with the lights out for best results.

When conditions are favorable, one of the best methods to successfully lift a "Dust Print" is an "*ELECTROSTATIC DUST PRINT LIFTER*". The surface must be dry for the electrostatic lifter to work. It simply uses static electricity to transfer the print onto a special lifting film. It is very safe and easy to use. The picture above shows one of the two types of electrostatic lifters presently being marketed. It is portable, re-chargeable and lifts off of a wide variety of surfaces, such as paper, wood, metal, carpet, drywall and cardboard. Simply apply the special film over the surface suspected to contain the print and electro statically charge the film using the device and a ground. There is also an electrostatic lifter that is powered by a simple 9 volt battery and it works just as well as the one pictured above.



Tire Impressions

When a vehicle has been used to commit a crime, but it has not been left behind at the scene, your best chance to put the suspect's car back at the scene is probably the tire tracks. Both unique features and class characteristics can be recovered from these impressions by photographing and casting them.

Tire track casts can be positively identified or matched by crime lab examiners. However, if the suspect vehicle is unknown, the class characteristics of the tires can be used to tell investigators many features of the vehicle in question. By documenting the width, tread pattern and other features of the impression, various databases can be searched for the make and model of the suspect's auto.

Because each tire on a vehicle is unique onto itself an effort should be made to collect casts of each of the tires when available. If you collect a cast of only one tire, when the vehicle is recovered and that tire has been replaced or the tread wear pattern has changed, the ability to match the tire might be lost.

Tires have 360 degrees of information that can be left behind at the crime scene. An effort should be made to collect 360 degrees worth of castings from each track left behind. If you only collect one portion of the impression and changes take place before the vehicle can be recovered, the match could be lost. One revolution of a 15 inch tire is approximately 7 ½ feet long. You may have to cast it in two or three sections.

BIOLOGICAL EVIDENCE



DNA

DNA is similar to fingerprint analysis in how matches are determined. When using either DNA or a fingerprint to identify a suspect, the evidence collected from the scene is compared to a known sample or print. If there are enough of the same features or characteristics, a match, or identification can be made. But like fingerprints, if even one characteristic does not match, it will be determined that the DNA does not match.

What is DNA?

DNA, or **deoxyribonucleic acid**, is the fundamental building block for an individual's entire genetic makeup. It is a component of virtually every cell in the human body. Further, a person's DNA is the same in every cell. For example, the DNA in a man's blood is the same as the DNA in the skin cells, saliva, or semen.

DNA is a powerful took because each person's DNA is different from every other individual's, **except for identical twins**. Because of that difference, DNA collected from a crime scene can either link a suspect to the evidence or eliminate a suspect. This is similar to fingerprints. It can also identify a victim through DNA from relatives, even when no body can be found. When evidence from one crime scene is compared with evidence from other scenes, those scenes can be linked throughout the nation.

Forensically valuable DNA can be found on evidence that is decades old. Several factors can affect the DNA that remains at a crime scene. Environmental factors such as heat, sunlight, moisture, and bacteria can ruin the evidence. Due to these factors, DNA can be ruined and not lead to an identification. Just like fingerprints, DNA can't determine when the suspect was at the crime scene or for how long. It is just another investigative tool, but like fingerprints, a powerful one.

Contamination

Contamination must be of a great concern because only a small sample is needed when collecting DNA as evidence. The evidence can be contaminated with another source and mixed together. This can occur when someone touches the area to be sampled or by talking, coughing or sneezing over the area. With this in mind, always remember to do the following.

- Wear gloves and change them between each sample. It can be a good idea to wear a first pair to protect you and wear a second pair over them for each sample. Then when you remove a pair between samples, you are still protected.
- Clean instruments between uses or use disposable instruments.
- Don't touch items are areas that will be sampled. Even if you have gloves on, be careful not to scratch or touch yourself as you can then transfer your DNA to the item.
- Place DNA samples or items in paper bags, boxes or envelopes, do not seal in plastic as it can destroy your samples.
- All samples and items should be thoroughly air dried to preserve a quality sample.

Where to collect possible DNA samples

Evidence that could have DNA from the suspect, the victim or both should be collected and packaged, or items and areas can be swabbed. The best rule would be to collect the entire item but that can take up storage space and many labs would prefer to have officers collect samples and submit just the swabs. You may even want to collect samples from items that will be retained as evidence to prevent cross-contamination. If blood or body fluid can be seen, collect samples from those areas first. Remember, in many cases you won't be able to see the sample but that doesn't mean DNA is not there. If you can't see the sample and are swabbing for touch or other DNA, below are examples of types of evidence that could have DNA on them and where to check.

- A pipe, baseball bat or other blunt object should have the handle and striking end each swabbed separately. If the object does not have a handle or obvious end such as a rock, swab the entire item.
- Cap, ski-mask or item wrapped around the face or head, collect the entire item and submit to your lab where they can extract sweat, hair or skin cells from the inside.
- Sunglasses or eyeglasses. Swab the areas that contact the face such as nose and around the ears.
- Clothing such as shirts, undergarments, dirty laundry or even towels should be placed in paper bags, thoroughly dried and submitted to the lab.
- Items that the suspect may have had in, or made contact with their mouth could include cigarettes, toothpicks, chewing gum, stamps and envelops. Collect the item and submit to the lab.
- Glassware, bottles and cans can be swabbed. Collect DNA from areas where the mouth makes contact and the rest of the item could be checked for fingerprints.
- Bite marks either from the suspect or victim. Swab the area of the bite for saliva.
- Tape, rope, belts or anything used to tie someone up can be submitted and checked for skin cells and sweat.

- Fingernails may have scrapings of tissue, blood or sweat and can be collected or swabbed and submitted to the lab.
- Front of the barrel, trigger guard or cylinder of a firearm may have minor blood spatter from the victim. It can be swabbed or submit the entire firearm as is.

Procedure for Collecting Condoms

Condoms have become more common at the scene of sexual assaults. Many are still full of fluid from the assault. It is important that this fluid does not dilute the secretions on the exterior of the condom. It is possible with DNA typing to determine who the victim (exterior) was and who the semen source (interior) or suspect was.

Alternative One

- If the condom is dry and does not have fluid inside, seal the condom in a paper package.
- If the condom contains a fluid, use a sterile cotton tipped swab to collect the fluid from the interior of the condom. Be careful not to touch or contaminate the exterior surface of the condom.
- Using a separate sterile cotton tipped swab collect a sample from the exterior surface of the condom. If the exterior surface is dry, moisten the swab with distilled water first. Package both samples in separate paper packages.
- Dry the condom and seal in a paper package.

Alternative Two

- Collect the condom by placing it into a leak proof container and seal. Store frozen until it can be taken to the crime lab. If you cannot freeze it, the condom should be brought to the crime lab as soon as possible.

Alternative Three

- Dry condom thoroughly. Seal in a paper package.

Collection of Oral Swab Samples

If you are going to collect swabs from anyone, suspect or victim, it would be a good idea to include a fingerprint (usually the right index) on either the evidence envelope or you can create a label to attach to the shaft of the swab itself. By doing this, you can always verify later who the sample came from. To create a label to attach to the shaft of the swab, purchase printer labels a little larger than 1inch by 4 inches. You can attach the label by folding it in half at the end of the shaft of the swab and sticking it to itself, similar to a miniature flag. On the label, list information such as suspect's name, DOB, identification number, date of collection and place a fingerprint on the label itself.

HAIRS, FIBERS, AND OTHER TRACE EVIDENCE

Clothing and Fabrics

Pieces of clothing or fibers from the cloth can be found at various crime scenes such as burglaries, assaults and accidents. Other trace evidence can also become attached to the clothing such as foreign fibers, paint chips, soil, wood, metal, glass and other materials.

Collection Procedure

Recover the clothing item carefully so you don't lose any trace evidence attached. Do not cut through any holes, tears or stains if possible. Do not clean any items, collect them as found and package each item separately preferably in paper bags or cardboard boxes to allow item to dry is moisture is present. If item is obviously moist with blood or body fluids, always thoroughly air dry before packaging and sealing. Do not package in plastic bags. Do not mark directly on the item, attach an evidence tag or mark the packaging appropriately.

Hairs and Fibers

Hairs and fibers can be transferred from one person to another person, item or area as contact occurs between the two, especially in assault cases. This transfer can help link a suspect or the victim to the location of the crime or each other. Fibers can later be compared to determine their make-up and source of origin. If hair is recovered, a possible DNA match may be found if the root is present. Even if the root is not attached to the hair, some DNA testing may still be possible.

Collection Procedure

Known Hairs and Fibers – Submit the item or items believed to be the possible source which may include clothing, carpeting, furniture fabric, car upholstery fabric, or even human hair. Place items in clean properly labeled bags. If you are not able to submit the entire item such as a large carpet or large piece of furniture, a small but sufficient quantity should be recovered being careful to obtain each type and color of fiber. These can be placed in clean envelopes, paper folds, or other suitable containers and properly labeled. Folded clean paper works well since it does not have small openings at the corners like envelopes have which could allow small evidence to fall out. If using folded paper, place that paper inside and envelope, seal and label. If human hair is being collected, it is suggested that at least 50 head hairs cut close to the scalp be collected from various areas. If pubic hairs are needed, collect at least 20 cut close to the skin. When collecting any evidence, especially human hairs, follow legal and possible

search warrant procedures and in the case of sexual assault, medical staff may be available to perform the collection.

Questioned Hairs and Fibers – Always collect and package hairs and fibers from different locations separately and document properly. Use clean or disposable utensils for each sample location. Hairs and fibers can be packaged in clean envelopes or folded paper. If the hairs are easily seen they can be collected using tweezers. If a larger area needs to be checked or hairs are difficult to see, you can use adhesive type tape to rub onto the surface and pick up the hairs or fibers similar to using a lint roller. The tape can be placed in a plastic zip lock bag, attached to clear acetate material or if clear tape is used, attached to clean white paper. It depends on what your specific lab prefers.
Another method that can be used on larger areas would be using an evidence vacuum. If using a vacuum, remember to use a new filter/collection container for each separate location or area checked and clean the nozzle between samples to prevent cross-contamination.

Fracture and Tear Matches

When an item is broken, torn or fractured into pieces, it may create a random unique shape. These pieces can be examined to see if they can be placed back together into its original continuous form. These fractures can occur in various types of material including glass, metal, wood, plastics, paper, paint chips, tools, duct tape, etc.

Collection Procedure

When collecting, all pieces of the broken item(s) must be collected. As an example, if a window is broken at a scene, collect all pieces of glass from the ground and place in one container, then collect the glass remaining in the broken window itself and package separately documenting where it came from. Place items in the appropriate sized rigid container. If a tool type item such as a pry bar is recovered and a piece is missing, protect the end of the tool by wrapping cardboard around it so additional damage does not occur.

Building Materials

In addition to matching materials such as glass, metal, wood, plastics, paint chips, etc. by fractures or a tear, they may be identified to their original source due to their physical and chemical properties. These materials can be similar to hairs and fibers as they can become attached to a suspect's clothing or tools used.

Collection Procedure

Collect samples of each type of material and each location separately. Do not cut through any tool marks if you have to cut a section out of a large item. Select an appropriate container to prevent additional damage to the sample or injury to anyone who may handle the packaging. If small amounts of trace evidence of the building materials could be on clothing or shoes of the suspect, collect the entire item and package in paper bags and document properly.

If a tool is recovered and may have trace evidence on it such as paint transfer, package it in a box and secure it from sliding around or the paint may be dislodged.

Paints – May be matched by fractures is a chip of paint is removed from one source and attached to or left behind at a scene such as paint transfer in a hit and run accident or when a pry tool is used on a door at a burglary. It can also be matched chemically. A magnification can reveal multiple layers of different colors which can add uniqueness to the sample.

Recover paint samples that have transferred onto an area or item along with a known sample adjacent to this sample. If the entire item can be collected, it is best to submit the entire item. In cases where this is not possible such as with a car or a door frame, a sample can be collected. If a paint chip can be collected as one piece and has a unique shape, attempt to collect the entire sample as one piece as it may be compared as a fracture match. Place it in a rigid container that will prevent the chip from being crushed or broken. If it is a smudge transfer, you can scrape the sample using a sharpened clean chisel or screwdriver. Scrap the entire sample down to the base surface collecting all layers and place the sample in a paper fold or other appropriate container. Do not use adhesive tape to collect samples due to chemical interference.

Tool Marks

Tool marks may consist of impressions where the tool is press into another surface, striated marks caused when the tool drags across a surface or a shear mark caused when the tool cuts into by compression. Look for tool impressions at points of entry or attack and may include doors, windows, the frames, cabinets, lock boxes, vending machines, etc.

Collection Procedure

If possible, submit the entire item. If you can't do this, remove a section of the object and submit that being careful not to get too close to the tool marks or damage them. Properly document where the section came from and its original position. If a section or portion can't be obtained, a cast can be made. There are a few silicone based products available. The brown or darker colors available work well. Don't use clear and also don't use silicone caulking. Use material specifically formulated for tool impressions.

If a tool is recovered, do not place it in contact with the item's surface and protect the tool surface itself to prevent damage or a change to it's contact points.

Gunshot Residue

When a firearm is discharged, besides the projectile exiting the barrel, primer and gunpowder gases also exit from the barrel and other openings in the weapon. These gases may contain minute particles of Barium, Antimony and Lead which may attach to anything in close proximity such as the shooter's hands. When these three elements can be found on a single particle of sample collected, it can be determined that the person whose hands had the sample, either fired or came in contact with a firearm. Not all ammunition contains the

previously mentioned elements. These may include imported, newer “lead free” and non-center fire primer cartridges.

This evidence is very fragile and can be washed or wiped away and will diminish through normal activities. Generally samples should be collected as soon as possible and will not be of much use past six hours after the incident unless the residue is from a dead person such as a suicide. The suspect should not be allowed to wash their hands and if you can collect the sample before prisoner transport and booking procedures a better sample will be obtained.

There are two common types of testing available called Atomic Absorption and Scanning Electron Microscopy. It is best to contact the specific lab that you would use and find out their preference. Some labs only will only perform one of the two tests or may not conduct testing at all. If your state lab does not perform the testing, private labs may be available for a fee.

If you are going to collect samples, always thoroughly clean your hands before contact with the suspected shooter to prevent cross-contamination and wear gloves. Some GSR kits even require you to use their specific supplied gloves or the test may not work properly. Whichever kit you use, read and follow the included instructions as the procedures vary slightly between manufacturers.

FIREARMS AND AMMUNITION

FIREARMS

It is recommended that all firearms be made safe by unloading them prior to submission to lab or other personnel who will be conducting examinations. You may lose some evidence such as fingerprints but safety should be most important. Handle the weapon as little as possible while making it safe. Placing the firearm in a box and securing it with either twist ties, wire ties or string through small holes in the bottom of the box works well to prevent possible fingerprints from being wiped away. Placing evidence that may have fingerprints on it in paper or plastic bags risks prints being wiped off by contact with the bag. It only takes a minimal amount of friction to destroy a usable fingerprint.

If firearms or metal objects have been recovered in water such as in a pond or sewer and will not be dried immediately and examined, they should be placed in a suitable container with the same liquid covering the item. This will keep the oxidation to a minimum.

When marking firearms, or for that matter almost all evidence, do not mark on the item itself. Instead, use a reinforced identification tag or mark the packaging. Include information that is appropriate for your department or lab on the tag and document information such as type of firearm, manufacturer, model, serial number, caliber, barrel length, capacity, etc. Seal all packaging according to your department standard operating procedures. A usual procedure would be to seal the package with evidence tape and initial or sign over the tape starting on the package and writing over the tape and back onto the package. You can also include other information such as the date, case number, item number, etc.

RECOVERY INSTRUCTIONS AND LABORATORY DETERMINATIONS

Firearms – Make the weapon safe by removing the magazine and any ammunition in the chamber or cylinder. Don't clean or fire it and do not operate mechanisms except to make it safe. If it is a revolver, use a permanent marker to show the position of the cylinder by marking a line on each side of the front face of the cylinder next to the barrel. The weapon should be checked for fingerprint and DNA evidence. It can then be checked by the lab for proper functioning and comparisons can be made to bullets recovered from the crime scene. It is also possible to restore serial numbers when they have been altered or an attempt has been made to remove them.

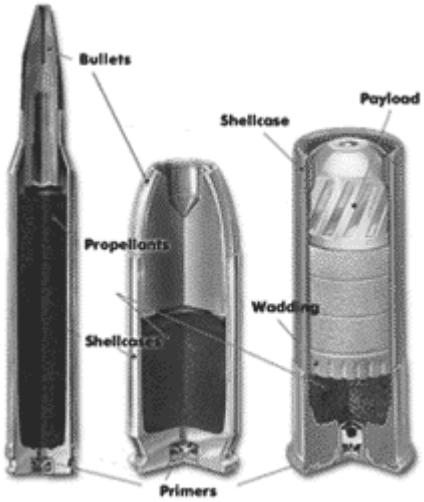
Fired Bullet – Be careful to prevent damage to any markings from the barrel or trace evidence on the bullet itself such as blood or tissue. Do not clean the bullet and package each recovered bullet separately in a cardboard slide box or other small rigid container. Mark the container, never the bullet itself. The bullet can be examined to determine the type of weapon that fired it including make and caliber. The lab may be able to determine the manufacturer of the bullet, caliber, style or type, type of propellant, etc.

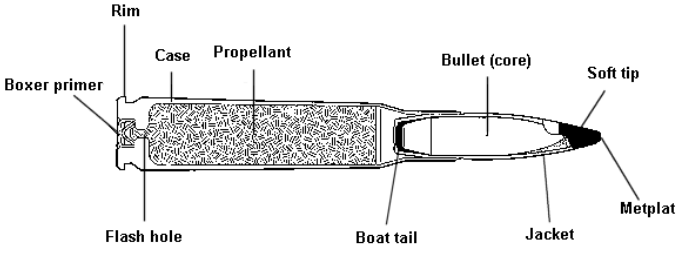
Fired Cartridge Case or Shot Shells - Be careful to prevent damage to the any markings made by the firearm such as extractor or ejector marks. Do not mark the case itself, only the packaging. Package each recovered casing separately in a cardboard slide box or other small rigid container. The casing can be examined to determine the type of weapon that fired it including make and caliber. The lab may be able to determine the manufacturer, caliber, style or type, type of propellant, etc.

Shot Pellets and Wads – Recovery as many as possible and if it's small shot pellets, they can be packaged together in one container. The lab may be able to determine size of shot, gauge of weapon, and ammunition manufacturer.

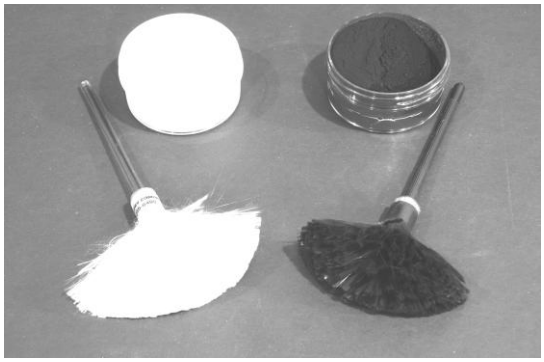
Multiple Fired Casings or Shot Shells at Separate Scenes – Follow instructions listed above. The lab may be able to determine if the same weapon(s) were used at each scene even without the weapon recovered. This can help in the investigation to tie multiple crime scenes together.

Bullet verses Cartridge – For clarification purposes, a "Bullet" is the projectile and come in various types such as round nose, hollow-point, soft tip, semi-wadcutter, etc. A "Cartridge", sometimes called a "Round", is made up of the bullet, case, primer and powder, before it is fired.





LATENT FINGERPRINT DEVELOPMENT



What are the two main reasons that fingerprints are used as a means of positive identification?

1. They are <u>Unique!</u>

The fingerprints of no two individuals are alike. By this it means that every finger, of every person, bears a ridge arrangement which is unique. (This is also true of the palms, toes and the bottoms of your feet).

2. They are <u>Permanent!!</u>

Barring accidental or surgical removal of the finger itself, the ridge arrangement is permanent for the life of the individual and will endure until after decomposition of the body long after death.

Both of these factors have to be true for us to use fingerprints as an absolute and positive means of identification. You can not have one of these be true and not the other and still use a print for identification. If they were permanent, but more than one person could have the same ridge arrangement – they would be useless. If they were unique but changed over time – they would also be useless.

However, they are both permanent and unique and therefore, we have the best form of positive human identification that exists today. There are more fingerprints on file and available for comparison and identification than any other form of identification. With **A.F.I.S.** technology, the time it takes to search these files has shrunk to minutes and even seconds. Even DNA is not totally unique to just one person. Identical twins have the same DNA.

Just How Long Can Latents Last???

Reprinted from the IDENTIFICATION NEWS – October 1984

By Nick F. Stames Assistant Director Federal Bureau of Investigation
Identification Division Washington D.C.

On August 13, 1984, Valerian Trifa, the former Archbishop of the Romanian Orthodox Church of America, departed the United States for Portugal. His departure culminated more than nine years of litigation to strip Trifa of his U.S. citizenship and deport him from this country. His fate was brought about by sophisticated laser technology utilized by the FBI.

Trifa was born on June 28, 1914, in Campeni, Romania. He entered the United States on July 17, 1950 from Italy. In 1952 he was consecrated as Bishop of the Romanian Orthodox Church of the United States, and in 1957 he was naturalized as a U.S. citizen.

In 1975, the U.S. Department of Justice instituted naturalization proceedings against Trifa, alleging that he concealed material facts in obtaining his U.S. Citizenship. It was alleged that in 1941, while in Romania, Trifa was a major figure in the violent fascist and anti-Semitic Romanian Iron Guard, and that he was responsible for the deaths of thousands of Jews in Romania. He reportedly received protection from the Nazis from 1941 to 1944.

In May 1982, at the request of the U.S. Government, the West German Government through its embassy in Washington, D.C., made available to the FBI's Identification Division certain documents for latent fingerprint examination. One such document was a postcard dated ***June 14, 1942***, and allegedly authored by Trifa and addressed Heinrich Himmler, one of Hitler's close associates. Trifa emphatically denied authoring the document. The West German Government requested that the examination of the document not in any way deface or alter its condition. By using laser technology, a latent impression of a left thumbprint was developed on the postcard and subsequently identified as placed there by Trifa.

Based on this information, Trifa was deported to Portugal on August 13, 1984. Thus, through the use of laser technology, FBI fingerprint experts were able to detect and identify a latent fingerprint that was ***over 40 years old***, a remarkable accomplishment in the pursuit of justice.

AGE DETERMINTATION – CASE REPORT

Reprinted from Fingerprint Whorld, April 1992

SGT. DEAN GREENLEES
South Australian Fingerprint Bureau, Adelaide

On Saturday, the 20th of August, one of our Crime Scene Examiners attended the scene of a breaking at a home unit in the Adelaide suburb of Woodville. An examination was made at three possible points of entry, with the development of two full hand prints on the outside glass surface of an aluminum sliding window. These impressions were photographed at the scene by the Crime Scene technician.

The negatives of these impressions were packaged and submitted to the Fingerprint Bureau, where they were subjected to a search on the Automated Fingerprint Identification System. As a result of the search the impressions were positively identified as belonging to a Police Officer. The necessary paper work was prepared and dispatched to the appropriate authority for investigation.

During the following investigation, the Officer concerned stated he had never been to the premises leaving him a suspect for the unit break in and larceny. Sometime over the next couple of days, the Officer stated that he recalled attending at the unit some two years ago, in response to a call. The elderly owner had inadvertently locked himself out of the premises. The Officer stated that he had pushed against all the windows of the unit in an attempt to gain entry for the owner. This response required further investigation from the Departments Internal Investigation Branch. The owner of the unit, who was then residing at a Nursing Home, was contacted and stated that he had never cleaned the windows.

On Monday, the 28th of September, 1992, three members of the South Australian Fingerprint Bureau attended the unit. A request had been made to attempt to age the fingerprint impressions left on the glass. An examination of the impressions, which still had not been cleaned since the breaking, was conducted and observations were also made of the position of the window in relation to the outside elements. The impressions that had been developed were as the photographs had depicted. Good quality for powder development, showing no signs of fragmentation of ridge detail, indicating little or no breakdown of the matter deposited on the pane of glass upon contact with the fingers.

The position under an open ended car-port was exposed to all the weather elements including hot northerly winds, except for rain or moisture from dew. Where the glass had not been powdered, it showed signs of a dirty film over the outside surface consistent with it not being cleaned for some time.

All observations made at the scene, led to the belief that the fingerprints were unlikely to have been left there for an extended period of time, although it was impossible to know whether the original deposit on the window was purely perspiration or contaminated with other oils making the breakdown process longer.

Photographs of the developed impressions were also shown to a scientist from the South Australian Forensic Science Centre who has had considerable research experience in latent fingerprints. He came to the same conclusions as the fingerprint experts, that it was unlikely the deposit was two years old as there was no sign of break down or fragmentation of the ridges.

Whilst further investigations were being carried out by Internal Investigation the pane of glass was removed from the window by fingerprint experts and taken to the Bureau for further examination. The entire pane of glass was dusted with powder and a number of other fingerprint impressions were located. Internal Investigation advised that they had ascertained from records that the officer did attend the unit in August, 1990 to assist the owner in gaining entry. The records showed that the Officer was accompanied at the time by a cadet, who when questioned could remember the incident and stated that he also tried all the windows in an attempt to gain entry.

With this information all the fingerprint impressions now developed on the pane of glass were examined with more impressions of the Officer concerned being identified and to our surprise fingerprint impressions on the pane of glass were also identified as the cadet. These fingerprints showed the same quality and powder adherence as those developed at the scene.

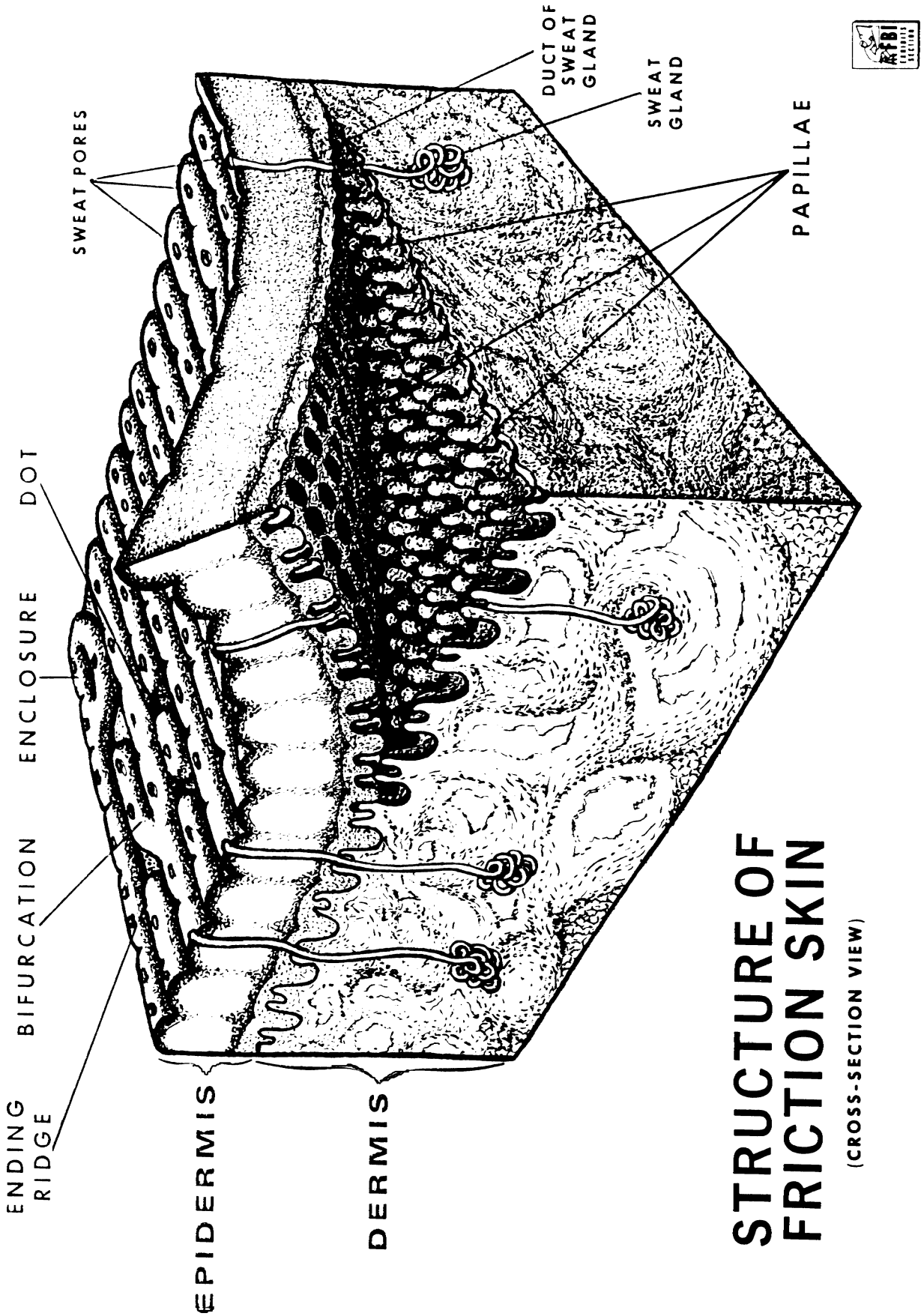
Both the Officer and the cadet have not worked together since that event drawing the conclusion that the impressions were deposited on the window in August, 1990. There they remained, undisturbed and undetected for a period of two years (through two summers with temperatures of 40 degrees C and two winters with temperatures dropping to 1 or 2 degrees C; high humidity and low humidity) retaining sufficient moisture and form to be developed in August, 1992, without any tell tale signs of their age.

The question of “age determination” in latent prints is one that will be talked about for many years and I agree with the concluding statement in Charles MIDKIFF’s article, that speculation of the time a latent print was placed is fraught with danger.

How many “ridge characteristics” or “points of identification” are on an average fingerprint?

When the tip joint of a finger is “fully rolled” from nail to nail, the average fingerprint has between 70 and 125 “points of identification” present, from the tip of the finger to the crease at the base of the first joint. Some have fewer and some have more. The fingerprint above has 50 ridge characteristics marked to help you find these *points of identification*. The finger however was not rolled completely from nail to nail, so all the ridge characteristics present were not recorded. If you look closely at the base of the finger you can start to see the crease forming.

**** NOT ALL THE POINTS PRESENT WERE MARKED ****


FEDERAL BUREAU OF INVESTIGATION
UNITED STATES DEPARTMENT OF JUSTICE
ENDING RIDGE
BIFURCATION
ENCLOSURE
DOT
SWEAT PORES
DUCT OF SWEAT GLAND
SWEAT GLAND
PAPILLAE
EPIDERMIS
DERMIS
STRUCTURE OF FRICTION SKIN
(CROSS-SECTION VIEW)

Fingerprint Residue and How It Affects Latent Print Development

Most prints are developed because the suspect touches something with their fingers or palms, and one of the following four things happens:

1. *Moisture* on the fingers or palm, in the form of *perspiration*, is deposited on the surface when touched, leaving an invisible print behind (the word "***Latent***" means hidden or invisible).
2. *Oils and grease* from the hair or face is transferred onto the fingers or palm and then deposited onto the surface, also producing a ***"Latent"*** or invisible print.
3. Some form of *contaminant,* such as blood or motor oil is present on the fingers or palms and is deposited onto the surface, leaving a reproduction of the print. These prints are known as "***Patent"*** prints – meaning they are visible to the eye without any development process.
4. The finger or palm is *impressed down into a soft material* such as window glazing or putty. The impression will make a reproduction of the print into that softer material. This produces an impression known as a "***Plastic***" print.

On rare occasions a ***contamination print*** or ***plastic print*** will occur, thus making the print visible. Most often however, the chance impression left behind at a crime scene will be hidden or invisible. The perspiration or oils that have accumulated on the fingers and palms are deposited on the surface, leaving behind invisible prints. These prints must be made visible by getting fingerprint powder, chemicals or something such as superglue fumes to adhere to the moisture or oils that have been left behind on or in the surface.

As you can see n the chart below, overwhelmingly perspiration is made up of water (98.5%) and the rest is a mixture various "chemicals". Both the water and the chemicals will become very important in their own way, in the process of making latent prints visible.

Secretions from the sweat glands found on the hand

98.5% is Water

1.5% are Solids

1% are organic materials

fatty acids and lipids, formic acid, acetic acid, butyric acid, amino acids, peptides, albumin, other proteins, vitamins, riboflavins, pyridoxine, urea, ammonia isoagglutinogens

0.5% inorganic materials

K+ (potassium), Na+(sodium), Cl – (chloride), Ca++ (calcium), PO4 3 – (sulfate), SO4=(phosphate), CO3=(carbonate)

Porous and Non-Porous Surfaces

No matter which type of surface you will be processing for latent impressions, **always put on a pair of gloves before** you begin to handle anything at the crime scene. Gloves help to protect you from potential health risks and reduce the possibility of your fingerprints being placed on the objects. Keep in mind that even with gloves on, you can still wipe latent impressions away and lose your evidence.

POROUS

Paper, cardboard, untreated wood and cloth are porous surfaces. These surfaces will actually absorb the latent fingerprint residue that was placed on the top layer, into the lower layers or substrates. Therefore, the fingerprint residue may no longer be detected and developed by methods that react to residue on the top surface. Fingerprint powders may work with fresh prints that are only a few hours old, but after a short time, chemical methods such as ninhydrin, iodine and silver nitrate will be needed to make the impressions visible. These chemicals react to different components found in the latent fingerprint residue and produce a visible color change. As an example, ninhydrin reacts with the amino acids found in the residue of a latent impression and will turn the impression purple allowing you to then photograph it.

You generally will not damage the impression once it is absorbed into an item such as paper, but if handled without gloves, you could have your own fingerprint impression end up on top of the suspect's prints making it difficult or impossible for a latent examiner to positively identify. Even if your print doesn't end up right on top of a suspect's print, it will create extra work and wasted time for the examiner who will have to identify extra impressions.

NON-POROUS

These surfaces or items do not absorb residues and are the most common that you will process at crime scenes. Typical items would be window glass, autos, cans, bottles, counter tops, painted or finished wood, guns, etc. The latent impression residue will remain on the top surface and cannot penetrate the item. Therefore, the residue is available for fingerprint powers or cyanoacrylate fumes to adhere making the latent impression visible.

While this makes it easy to process non-porous items, it also makes it very easy to destroy the latent evidence. Simply by touching the surface having the impression, you can wipe it away either partially or completely, or smear it making it useless. Most latent impressions, or fingerprints, are only "partial print", not fully rolled like an inked impression. Damaging even a small portion of the print may make it impossible to compare and identify. Extreme caution must be exercised prior to, during and after processing for fingerprints. In addition, anything that reduces the residue or moisture content of the latent impression, such as exposure to sunlight, wind, heat or other weather conditions can also diminish the chances of developing identifiable prints. Once impressions are developed, care must be taken to preserve this evidence, which is still very fragile.

If processing will take place at another location such as in a crime laboratory or at your local department, care must be taken in packaging the evidence so the least amount of damage to the possible impressions occurs.

Latent Print Development with Powders

The determination of whether to process an article of evidence for latent fingerprints at the crime scene or to package that article and submit it to the laboratory is largely dependent on the surface involved. If it is a porous surface, the laboratory (or back at your own department) is better equipped to process it with chemical methods. As such, the article should be packaged and submitted accordingly. However, if it is a smooth, non-porous surface, fingerprint powder will adhere to the perspiration and oils left by the pores found on the friction ridges of the fingers. This operation is easily performed at the crime scene.

Choose a fingerprint powder of a contrasting color to the surface being processed, i.e., silver, gray or white powder for dark colored surfaces, and black powder for light colored surfaces or chrome. Pour a small amount of the powder that you have chosen onto a piece of paper to keep the jar of powder from becoming contaminated by the various objects dusted.

Using a fiberglass brush, dip the brush into the powder and be careful to remove all excess powder. Remember, too much powder applied to the surface containing the latent prints will overdevelop and ruin your latents. Lightly and carefully apply the powder to the surface with the brush, in a sweeping or circular motion. When you start to see latent prints developing, slow down and watch so you don't start to wipe a print away or fill in spaces between the ridges.

Photos should be taken of the latents before any attempt is made to lift them. If training, equipment, and time permit, a scaled close up or macro photograph should be taken. Overall photographs to show the location of the prints on the object and its relationship to the crime scene should always be taken.

Number each latent lift in sequence on the back of the lift card as well as recording the location of the fingerprint and other pertinent information regarding the crime scene. This should include a small sketch of the object and the location of the lift on the object. This will serve two purposes. It helps to prevent mistakes in the proper recording and documentation of your work, and second it will prepare you to testify more accurately and confidently when this case goes to court. This should also be recorded in your scene notes and documented in your report.

Lift the fingerprint by carefully placing transparent fingerprint tape (3M Plastic tape works best on most surfaces) over the latent fingerprint developed with the powder and carefully remove the tape from the surface. Place the tape onto a contrasting colored fingerprint lift card. Black powder prints onto a white lift card and light colored powder prints onto a black lift card. If you are using a "dual use or bi-chromatic powder" it is best to mount these lifts on white card stock. If you are using any other type or color of fingerprint powder such as a fluorescent powder, you should first experiment with practice lifts and see which offers the best contrast. This allows you to see which card gives you the best contrast for that type or color of powder.

The size of your lift card can also be an important decision. If you try to mount a latent palm impression onto a standard 3"x 5" lift card, you will miss a good portion as it will not fit onto that card. Palm prints and "simultaneous impressions" (which are those lifts that contain several

fingerprints deposited at the same time, close together) should be mounted onto larger card stock, such as 5" x 8" palm print cards.

Many times a second lift of the same print produces a better quality lift. The first lift removes most of the foreign material on the surface that will also hold fingerprint powders and cause a fuzzy or poor quality lift. By lifting the print a second time, you only develop the latent print and not the background.

Evidence to be processed at the laboratory or back at your department should be handled and packaged in a manner which avoids contact with the print-bearing surface of the item to be processed. It is advisable to avoid simply placing the article in a plastic bag as this can also be a source of friction. The key to handling this kind of evidence is to immobilize the article in a fashion that allows transportation.

Additional considerations for Powder and Brush Development

1. **Do Not** dust a visible/patent print such as those in paint, grease or blood. It will not make them any clearer and most of the time will make them worse in quality. However, **always** photograph them and transport the whole article to the lab if possible.

2. **Do Not** use the side of the dusting brush as it will smear the latent print. However, **always** use the tips of the bristles.

3. **Do Not** dip the brush directly into the jar containing the fingerprint powder, especially if it has a narrow opening. This can damage to the ends of the fiberglass brush and may contaminate your whole jar of powder with debris. However, use of a "Wide Mouth" jar makes it easier to apply powder to the fiberglass brush without damaging the bristles. Most times it is best to just pour a small amount powder on a sheet of paper and dip the brush into the powder. Use as little powder as possible to avoid overdeveloping the latent impressions.

4. **Do Not** ever process wet items with powders. Let them air dry naturally before processing with powders. **Do Not** apply hot air to the item to speed up the drying process. If the item to be processed is a non-porous surface, and it is still wet or was originally wet, you should consider using “small particle reagent. If the item is a porous surface such as paper, you should consider using chemicals such as iodine, ninhydrin or physical developer.

5. **Do allow** items that have been exposed to freezing temperatures to warm up before attempting to process them if possible. If you allow the item to warm up you should consider using the "hot breath" method to re-moisturize the prints before applying the powder. Simply puff the hot moist air from your lungs over the surface suspected of containing the latent prints, allow the fog to dissipate, then apply your powder.

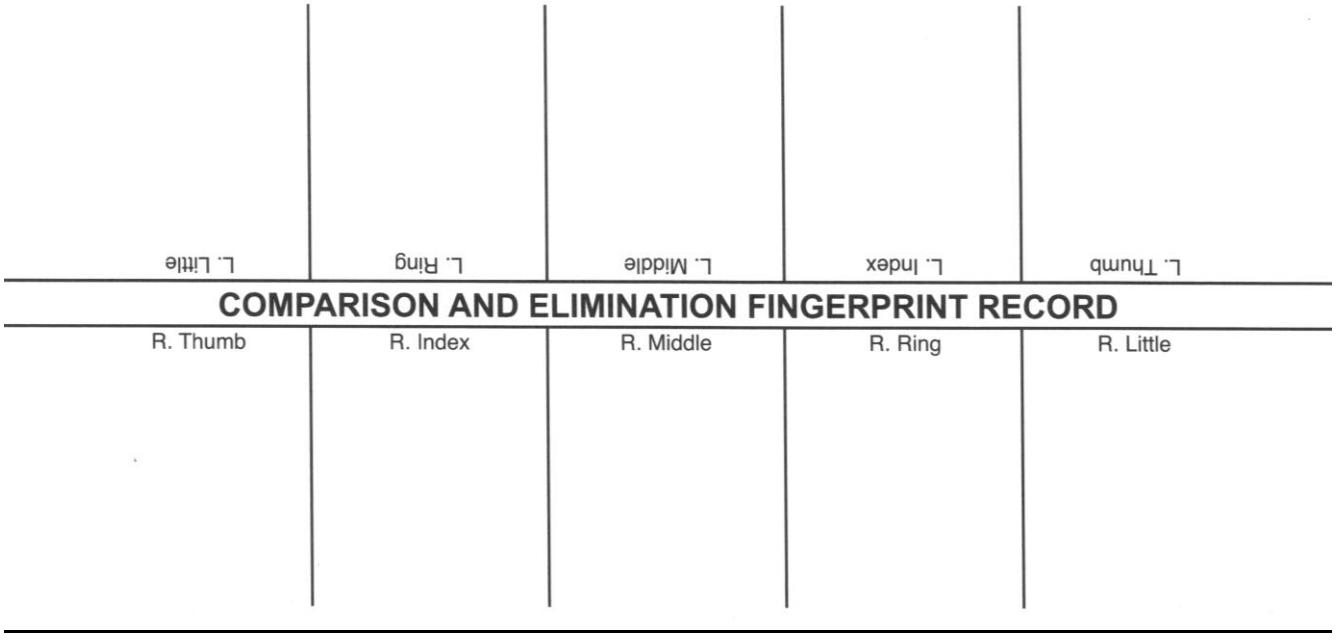
Elimination Prints

Elimination prints are inked prints obtained from individuals, usually victims at the scene of the crime, for comparison to any latent impressions recovered. As an example, in the case of a recovered stolen auto or a residential burglary, most of the prints developed on objects should be from the owner of the property or other individuals who would have legitimate access. These prints could be from family members or friends. In order to save time in entering all the recovered "lifts" into an AFIS, or possibly never making an identification at all, elimination sets should be collected. Many victims of crime do not have fingerprint sets on file. Without an elimination set, an identification may never be made and juries may wonder if the "real suspect" was not found.

Elimination sets should be collected after having the individual wash and thoroughly dry their hands. Fully rolled prints of each finger, placed in the correct space on readily available elimination pads should be obtained from all persons who have contact with the item(s) within reason. If an elimination pad is not available, clean white paper can be substituted. If an item could have been handled by a dozen different people and most are not available, it's not necessary to obtain all of the sets. Use common sense and get the sets that are needed. If either palm prints or second and third joint impressions are developed on evidence, those areas should be collected as elimination prints too.

Remember, the better the quality of the elimination prints that you collect, the easier it will be for the latent print examiner to move on to the possible suspect's prints.

The following sample of an elimination set is available from various suppliers or you can copy the page and make your own.

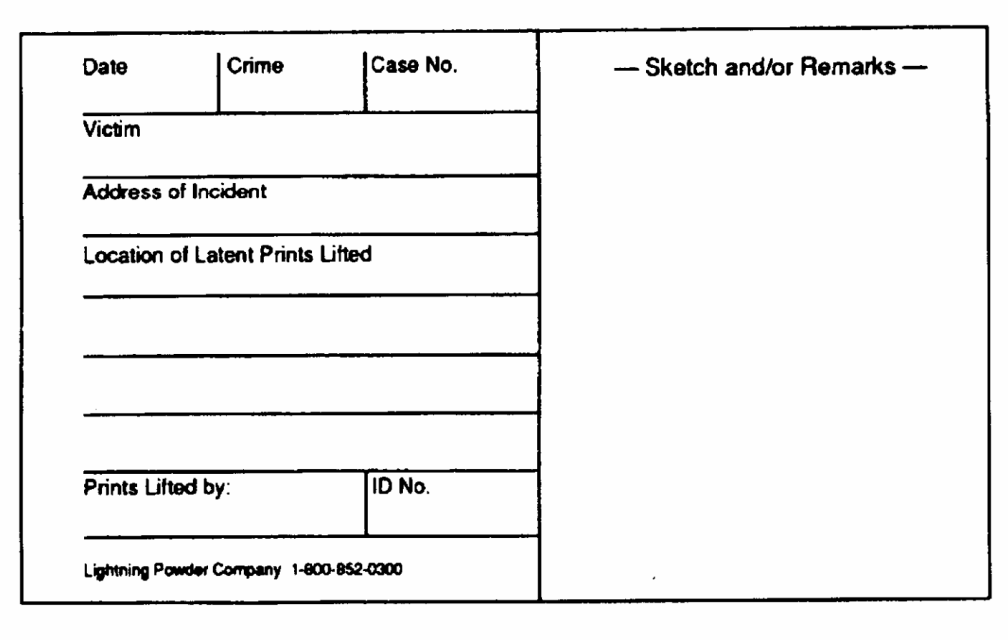


Textured vs. Smooth Surfaces

Smooth, flat surfaces are ideal for the powder development and lifting of latent fingerprints. As long as you are careful not to allow creases and air bubbles to ruin your lifts once you apply the fingerprint lifting tape, it is relatively easy to process these surfaces for latents. Creases, air pockets and bubbles are the enemy of fingerprint lifts. They can occur very easily, but they also are easy to prevent with a little bit of practice and effort. When you trap air between the sticky side of the tape and the surface of an object containing the fingerprint powder, no powder transfers onto the tape and you end up with empty or vacant spots on your latent lift. These vacant spots can prevent continuous ridge detail in the lift and might make the lift un-identifiable. So always be careful to use the proper techniques when spreading the tape over the print and to be just as careful when mounting the tape onto a lift card.

However, not all surfaces are flat or smooth. For non-porous surfaces that have some type of texture to them such as painted wood or a pebbled plastic, you should first consider processing these surfaces with "Super Glue" fumes. If you are unable to use Super Glue, or it's not practical for your situation, you can use powders but should modify the lifting process. The main problem is getting the lift tape to make contact with the powder deep in the crevices. Sometimes using a soft pencil eraser to press the lift tape firmly into the powdered surface can capture all or most of the powder on the tape.

Other options for textured surfaces is to process with powder and then lift by using a casting silicone type product such as AccuTrans, gel glue, gel lifters, or gel type tapes. These products have a much better chance of getting into the low spots and attaching to the powder. Even the use of "3M Plastic Tape" has been found to improve your chance of making a quality lift off of a textured surface. By carefully working this tape over the powdered latent, this tape molds down into the texture of the surface and pulls the powder out. It’s best to photograph first, just in case your attempt to lift these sometimes difficult latent impressions fails.



MOUNTING THE FINGERPRINT LIFT ON A CARD

The first thing you must remember when you chose a "lift" card is that the "Rule of Contrast" applies to this decision. Therefore, if you used a black or other dark colored powder to develop your latent print, then you must use the **opposite** color lift card, white in this case to mount your latent fingerprint lift. The opposite is true if you use a white, gray or silver colored powder to make a latent print visible. You would use a black lift card instead. The better the contrast, the better it is for the Latent Print Examiner or "A.F.I.S." entry. If you are using a "dual contrast powder", sometimes referred to as “Bi-chromatic” or Dual-Use**,** then it is best to mount these lifts on white card stock. If you are using any other type or color of fingerprint powder, such as a “fluorescent powder”**,** you should first experiment by making practice lifts with the powder onto both black and white colored cards. This allows you to see which card gives you the best contrast for that type or color of powder.

The size of your lift card can also be important. If you try to mount a latent palm print onto a standard 3"x 5" lift card, you will lose a good portion of that palm print as it will not fit onto that card. Palm prints and "simultaneous impressions" (which are those lifts that contain several fingerprints deposited at the same time, close together) should be mounted onto larger card stock, such as 5" x 8" palm print cards.

Just as important as the color and the size of the card is the back of the card. As pictured above, the card should have some type of pre-printed format on the back of the card. This should include a space were you can sketch or draw out the exact location on a specific object that you originally developed the latent fingerprint. The information contained and now recorded here should be specific to this case and this lift. This will serve two purposes. First it helps to prevent mistakes in the proper documentation of your work. Second it will prepare you to testify more accurately and others to understand your evidence. In the post-O.J. environment that we now process our crime scenes, this is critical for a successful prosecution.