San Diego Police Department
Crime Laboratory

Crime Scene Unit Evidence Processing Training Manual

Approved by: Thomas Washington, Supervising Crime Scene Specialist

March 15, 2022

CITY OF SAN DIEGO
MEMORANDUM

DATE:

TO: Shawn Montpetit, Quality Assurance Manager

FROM: Thomas Washington, Supervising Crime Scene Specialist

SUBJECT: Evidence Processing Training

Crime Scene Specialist Volunteer / Intern/ Latent Print Aide _____ completed the following basic evidence processing techniques and training:

	Trainer / ID #	Initials	Date
Photography			
Cyanoacrylate Ester			
Black Powder			
Evidence Handling & Packaging			
Evidence Report Writing			
Alternate Light Source (ALS)			
Magnetic Powder			
Fluorescent Powder			
Mikrosil			
Sticky-Side Powder (Black & White)			
Gentian Violet			
Ninhydrin (Heptane & Acetone)			
Collection of DNA / Blood / Trace			
Evidence Check-Out & Impound			
Competency Test Passed			
Supervisory Approval To Start Co-Signed Case Work			
Quality Assurance Manager			

Crime Scene Unit Training Completion Form
(Basic Fingerprint Development Techniques)

Crime Laboratory and Unit Overview

Lab Tour	☐ _____
Overview of Duties	☐ _____
Lab Safety	☐ _____
Lab Ethics	☐ _____
Manuals	☐ _____

Modules 1-4: Completion of Exercises

Photography	☐ _____
Cyanoacrylate Ester	☐ _____
Magnetic Powder	☐ _____
Black Powder	☐ _____
Evidence Handling & Packaging	☐ _____
Report Writing & Note Pages	☐ _____
Alternate Light Source (ALS)	☐ _____
Fluorescent Powder	☐ _____
Mikrosil	☐ _____
Sticky-Side Powder (Black & White)	☐ _____
Gentian Violet	☐ _____
Ninhydrin (Heptane & Acetone)	☐ _____
Blood / Trace / DNA Collection	☐ _____
Evidence Check-Out & Impound	☐ _____

Additional Exercises

Vacuum Metal Deposition	☐ _____
Rhodamine 6G Dye Stain	☐ _____
Amido Black	☐ _____
Coomassie Blue	☐ _____

_____, has successfully completed a basic training program in fingerprint development techniques and training on this _____ day of _____,_____.

Crime Scene Specialist: _____ Date: _____
Analyst: _____ Date: _____
Quality Assurance Manager: _____ Date: _____

Crime Scene Unit Training Outline

Crime Laboratory and Unit Overview

- Lab Tour
- Overview of Duties
- Lab Safety
- Lab Ethics
- Manuals

Module 1: Evidence Processing and Handling

- Barcode System
- Photography
  - Exercise #1
- Cyanoacrylate Ester (Superglue)
- Magnetic Powder
- Black Powder
- Evidence Handling & Packaging
- Note Pages
- Introduction to DNA
  - *Assignment #1*

Module 2: Evidence Processing and Handling Continued

- DNA/Blood/Trace

Module 3: Evidence Processing and Handling Continued

- Alternate Light Source (ALS)
- Fluorescent Powder
- Dye Stains
- Mikrosil
  - *Assignment #2*

Module 4: Evidence Processing and Handling Continued

- Sticky-Side Powder (SSP)
- Gentian Violet
- Ninhydrin
  - *Assignment #3*
  - *Assignment #4*

Module 5: Courtroom Testimony

- Expert Witness Testimony (etiquette, qualifications, policy and procedures)
- Demonstrate competency in all aspects of processing and handling evidence.
- Be able to clearly and professionally describe crime scene documentation.

Miscellaneous Information:

- G Drive

Crime Laboratory and Unit Overview

1. *Department and Crime Laboratory overviews*

    - Department overview and tour
    - Crime Laboratory and tour
    - Crime Scene Unit overview and duties
    - Laboratory Safety responsibilities and procedures

2. *Crime Scene Unit Manuals*

    - Crime Scene Unit Manual
    - Crime Scene Evidence Processing Training Manual

Required Reading:

1. Crime Scene Unit Manual
2. Crime Scene Evidence Processing Training Manual

Module 1: Barcode System

1. All evidence will be checked out/in through the barcode system
2. All additional items created will be entered into the barcode system
3. Additional evidence can be:
    - DNA / blood swabs
    - Trace evidence
    - Latent print lifts / photographs

*Any additional items created will be **cross-referenced** to the item from which they were created

Named List:

Printing out a list of evidence to be checked out from the Property Room:

1. Open FileOnQ
2. Clear your worklist
3. Clear the field
4. Enter the barcode number of the item to be checked out – enter
    - File
    - Worklist
    - Add current item (shortcut on toolbar)
    - Repeat process for each item to be checked out (make sure you clear the field in between)

    You can add several items at the same time from a single incident number

5. Instead of bringing up the item by barcode, go to the Incident number field and enter in
    - the Incident number – enter
    - Click on "Browse" on the toolbar
    - Select the items to be checked out by checking the appropriate boxes on the left side
    - Click "OK" at the bottom
    - File
    - Worklist
    - Add all items to worklist (shortcut on toolbar)

Creating a new barcode entry:

1. Open the barcode system
2. Enter the barcode number for the item processed
3. This will bring up any information already entered for the case
4. Click on the **New** icon (top left corner) to create a new (blank) field
5. Any data carried over will remain the same with a few exceptions
    - Enter in the Case # if it is not there
    - Enter in the Station Impounded (Property Room – HQ)
    - Recovered By is you (search by last name in drop down menu)
    - Recovery Date will be changed to the date you collected your item
    - Enter in the collection time
    - **Recovery Address** will be **changed** to **Crime Scene Unit**
    - **Recovery Location** will be **changed** to the item and barcode from which it came
    - Example: Knife (10045896)
    - **IF** the **Transported by** field is occupied you **MUST** take out the entry
    - Click on the drop down for that field and scroll to the top where there is a blank entry and click on the blank (you can't just delete the name)
    - Then delete the transport date and time below
6. Enter in the **Evidence Hold** as **Hold for Forensic Analysis**
7. Enter in the **Category** as **Evidence Sub-item**
8. Enter in the **Item Type** as needed
    - **DNA swab** for possible DNA
    - **Blood swab** for apparent blood swabs
    - **Laboratory Evidence** for latent prints / possible hairs / possible fibers
    - **Lab item type** for latent print cards or photographs
9. Click on the **Save** icon (black floppy disc) top left corner next to the **New** icon
    (This will save your entry and assign the barcode number)

Printing a barcode:

1. Click on the **Print Barcode Label** icon
    - A new window will pop up
2. Select the label design
    - Click on the drop-down menu
    - Select **05 CSU** for all swabs/hairs
    - Select **01 Prop/Narc** for all Latent Print evidence
    - Click on the **Print** button
    - Select the printer (there are three label printers to choose from – Z1 [hallway] – Z2
    - [middle room] – Z3 [front room])
    - Click **Print**
    - Affix label to package

Additional Items – Numbering / Referencing

All additional items created will generate a new barcode in the computer
The additional items will be cross-referenced back to the item from which it was collected

Example:

1. A screwdriver is 10077280 in the barcode system
2. A DNA swab is collected from the handle and assigned 10078420 in the barcode system

In the comments field for the screwdriver you will type:

- Your initials, ID # and date of entry
- This item was processed for prints and DNA evidence
- Prints were / were not developed
- Swab collected (see 10078420)

In the Recovery Address and Location fields for the swab you will type:

- Recovery Address: Crime Scene Unit_ Screwdriver (10077280)
- Recovery Location: Surface of the screwdriver, after latent print processing

(Use additional description field or comment section for more room)

Printing a CSU Report:

1. A printout of all evidence processed and created will be included with the report for review
2. This will **NOT** be a note page
3. Bring up the case in the barcode system by typing in the Incident #
    - Click on **Browse** (top middle)
4. Select the items to be printed by checking the boxes to the left of the barcode number
    - Click **OK**
    - Click on **Reports**
    - Click on **External Reports**
    - Click on **97 CSU Property Report**
    - A pop-up window will ask to include notes?
    - Click **Yes**
    - Click **OK**
    - A print preview screen will pop up
    - Click on the printer icon
    - Click on **Print**

References:

1. Crime Scene Unit Manual Section 2.4

Module 1: Photography

Introduction to the camera:

1. Settings
    - Curved surface
    - Flat surface
    - Reflective surface
2. Digital menu training
3. TIFF / JPEG
4. Latent prints
5. Focusing / Diopter
6. Shoe prints, etc.
7. Ruler / Info
8. When to photograph evidence
9. Downloading to the computer
10. Computer overview
11. Enhancing photos
12. Burning discs
13. Lighting techniques
14. Labeling evidence for photographs ("A" through "Z")
15. Relationship of multiple prints on evidence

D5/D810 part one:

1. Make sure the camera is ON
2. Make sure you are in TIFF
3. Open **Computer D: drive** on desktop
    - Create a case file (My Documents – Your Name) using the Incident or Case number
    - Create a **Master** and **Working** folder within the case file
    - Close screen
4. Open **Camera Control Pro 2** on desktop
    - **Tools**
    - **Download options**
    - **Browse** to locate Master folder in case file
    - **Prefix:** Image #_
    - **Suffix:** _Item Description_Barcode #
    - **Edit** to change the image start #
    - **OK**
    - **(Example:** Image_01_Knife_10234567)
5. Take picture (automatically saves to Master file)
6. A new box will open where you will preview the images
7. Make the image 1:1 (see instructions on page 11)
8. Save the 1:1 image to the **Working** folder
9. Save as "Image #_description of item_Barcode #_1-1"

- **Example:** Image_01_Knife_10095594_1-1

10. If you make any enhancements to the image, it must be done **after** the 1:1 conversion
    - Save to the **Working** folder
    - Save as "Image #_description of item_Barcode #_1-1_Processed"
    - **Example:** Image_01_Knife_10095594_1-1_Processed
11. Always check to ensure the image is 1000ppi or greater

D5/D810 taking photographs part two continued:

1. Place the evidence onto a piece of clean butcher paper
2. Place the evidence under the camera lens
3. Label the area to be photographed with brackets and a letter of the alphabet
4. Place a ruler next to the area being photographed
    - The ruler must be flat and on the same plane as the print
    - Ruler must have **Initials, Date** and **Barcode** written on it
    - The ruler must be completely horizontal or vertical in the photograph
    - Get the lens as close to the print and ruler as possible
    - **Image must be captured at 1000 dpi or greater**
    - Capture / save image as listed above

Saving images to DVD / CD:

1. Open **Nero Start Smart** icon from the desktop screen
2. Place mouse over the paper icon **(Data)**
3. Scroll down to **make data CD or DVD**
    - Click to select which type of disc
    - New window will open (Disc content)
    - Click on **Add** on the right side (opens another window)
    - Click on **My Computer** on the left side
    - Locate the **case file**
    - Open the **Master** file
    - Highlight all images
    - Click **Add**
    - Close the window
    - Click **Next**
    - Type **Case #** or **Incident #** in the Disc **Name** field
    - Click on the **Burn** symbol at the bottom
    - Fill-out necessary information on your disc
4. Repeat above instructions for the **Working Copy / 1:1** disc

Keeping the gray ruler from turning black during photo enhancements in Photoshop:

1. Select the **Lasso** tool
    - Right click on the tool to select **Poly Lasso**
    - Click the lasso around the ruler (corner to corner… to make a rectangle)
    - Click on **Select**
    - Click on **Inverse**
    - Make the enhancements to the image
    - When complete hit **Ctrl-D** to de-select the ruler
    - Save as instructed

Scans:

1. Bleach scanner and use butcher paper to place over item
2. Place evidence onto scanner
3. Make sure there is a ruler in the area to be scanned
4. Open **Adobe Photoshop CS5**
5. Create a case file (refer to page 8) with Master and Working Copy folders
6. Click on
    - File
    - Import
    - EPSON Perfection V700/V750…
7. Click on **Preview**
8. Preview screen will open with the image
    - Make sure the scanner is at **1000 dpi**
9. A moving rectangle will appear on the image
10. Move the rectangle (click and drag) to the area you want scanned
    - Click on **Scan**
    - When the new scanned image appears, close out the scan capture box and preview screen
    - (you won't be able to save the image until you do)
11. Save this image to the **Master** folder
    - Save image as "Scan #_Description_Barcode #"
    - **Example:** Scan_01_Demand Note_10045978
    - Save the image again to the **Working** folder
    - If enhancements are made, save the enhanced image **in addition to** the Working image
    - Scan 01_Demand Note_10045978_Processed

Converting Photographs to 1:1:

This technique is most accurate when the ruler is placed either horizontally or vertically in the image. (**NOT** at an obscure angle)

1. Open the image in Photoshop
2. Use the **crop** tool to select the largest known measurement on the ruler (ex. 40mm), press **Enter**

3. The image will reduce to the selected ruler size
4. From the **Image** menu, choose **Image size**
5. **Uncheck** the **Resample Image** box (if checked)
    - This links the three document size fields together
6. In the **Width** field (if the ruler is horizontal), enter the measurement that corresponds with the cropped ruler and select the unit of measure (i.e. 40 mm)
    - A new **Height** and **Resolution** is automatically calculated
7. If the ruler is vertical you will enter the measurement in the **Height** field
    - **Copy (Ctrl-C)** the new **Resolution** and click **Cancel** to exit
    - Hold the **Ctrl-Alt-Z** keys at the same time to step back to the original image
    - From the **Image** menu, choose **Image size**
    - The **Resolution** field displays the document's current resolution
    - Verify that the **Resample Image** box is still **unchecked**
    - **Paste (Ctrl-V)** the new resolution into the **Resolution** field and click **OK**
    - The **Width** and **Height** fields adjust automatically to the image's actual size
    - The image is now **1:1**
    - **Save** the resized image

Discussion Topics:

1. PPE
2. Receiving Evidence (sealed / write on packaging)
3. How to fill out note pages
4. Sequential Processing (1958)

References:

1. Crime Scene Unit Manual Section 3.0
2. National Institute of Justice, et al. *The fingerprint sourcebook.* July 2011
3. Police Scientific Development Branch (London). *Scene of Crime Handbook of FingerprintDevelopment Techniques.* 1993.

Module 1: Photography

Exercise #1

Use the DCS5 system for the following exercises. Include overall/orientation view and close-up view of latent print. Use a scale.

1. **Exercise 1:** Photograph a visible print (ink or powder) on a latent print card. Mark the print A.

2. **Exercise 2:** Photograph a visible print on a curved surface (can or bottle). Mark the print B.

3. **Exercise 3:** Photograph a latent print developed with fluorescent powder (red or green) on any surface. Mark the print C.

4. **Exercise 4:** Photograph a latent print on plastic using reflected UV light. Mark print D.

5. **Exercise 5:** Photograph a latent print developed on duct tape with polarizing filter. Mark the print E.

6. **Exercise 6:** Burn Exercises 1-5 to a CD with using the proper folder configuration.

11.2.5 Cameras

Any type of camera that has accessories for close-up work can be used in fingerprint and palmprint photography (Moenssens, 1971, p 151). However, a camera system with a lens for macrophotography works best. Photographic flood lights or an off-camera flash system for lighting is necessary. These, in combination, form a system that can be used to photograph evidence in the laboratory or in the field. The press or view camera using 4" x 5" sheet film was the most commonly used camera until it was replaced by easy-to-use 35 mm cameras. The newer high-resolution digital single-lens reflex cameras are also suitable for finger- print photography (Dalrymple, Shaw, and Woods, 2002, pp 750–761; Crispino, Touron, and Elkader, 2001, pp 479–495).

11.3.5 Cameras

As in field work (see section 11.2.5), most cameras and accessories that are capable of close-up photography should be suitable for fingerprint photography in the lab. Special-purpose fingerprint cameras were developed that employed a fixed focus and were placed directly over the print to be photographed. These cameras were equipped with batteries and small bulbs for illumination. They primarily used 2.25" x 3.25" or 4" x 5" sheet film. Press and view cameras (e.g., 4" x 5" Crown and Speed Graphics) were also used and had the advantage of being useful for general crime scene photography. During the 1960s, the Polaroid Corporation introduced the MP-3 copy camera and, later, the MP-4 (Figure 11–7). The MP-4 became a widely used tool for fingerprint photography within the laboratory setting because it allowed for the use of glass plate holders, sheet film holders, roll film adapters, film pack holders, and ground glass focusing. The use of 4" x 5" sheet film to record fingerprints at a life-size scale on the negative is still common in some agencies. However, the trend of using 35mm and digital equipment (cameras and scanners) is becoming more common.

Digital equipment is convenient and produces results that are instantly viewable. Issues of quality are measured in many ways, with resolution and bit depth being two important issues. "Friction ridge impressions should be captured (color or grayscale) at 1000 ppi or higher

resolution. Grayscale digital imaging should be at a minimum of 8 bits. Color digital imaging should be at a minimum of 24 bits" (SWGFAST, 2002, p 277).

Bloody Fingerprints—Protocol

1. If a bloody fingerprint contains ridge detail, photograph the fingerprint prior to development and processing.
2. Collect a blood sample for DNA analysis by swabbing a portion of the fingerprint. If coagulated (thickened) blood has collected in portion of a fingerprint, collect the coagulated portion. If possible, avoid the core of the print and any minutiae points.
3. Apply the appropriate blood-enhancement chemical and rinse (if applicable).
4. Take a second photograph of the fingerprint.
5. Apply blood-enhancement chemically a second time (if applicable).
6. Take a third photograph of the fingerprint.

Vacuum Metal Deposition

Vacuum metal deposition (VMD) is a process by which evidence is placed in a vacuum and metal fragments are transferred onto the evidence, revealing latent fingerprint residue. The process may be used on smooth, nonporous surfaces such as plastic bags and packaging, leather, plastic, glass, some fabrics, and other smooth surfaces. Due to its expense, VMD is not commonly used.

FINGERPRINT PHOTOGRAPHY

General Guidelines

A forensic technician must photograph fingerprints on various surfaces and under various lighting conditions. Although fingerprint powder and lifting techniques are used, the fingerprint should be photographed prior to lifting. In many criminal cases, photography is the only means of documenting the fingerprint evidence. The steps to photographing a fingerprint include the following:

1. Place a camera on a tripod. The face of the camera lens must be parallel with the fingerprint.
2. If using a digital camera, it should be eight megapixels or above and should be set at the maximum resolution available.
3. Take orientation photos of the location of the fingerprint with an evidence placard in place.

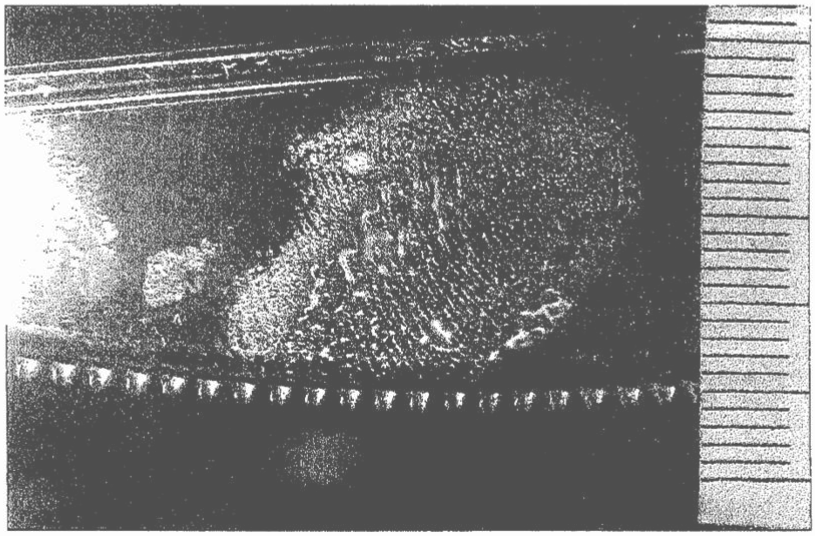


Photo 5-36. Bloody fingerprint on plastic knife.

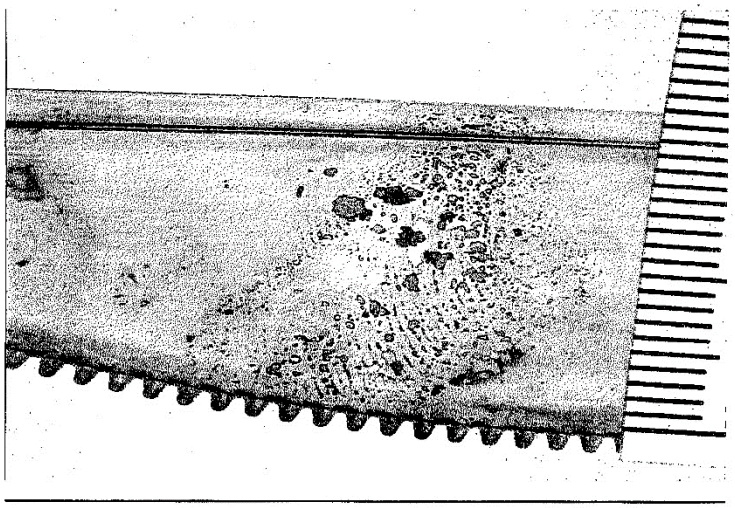


Photo 5-37. Bloody fingerprint after chemical enhancement.

4. Place an adhesive-backed scale on the surface next to the fingerprint. Many agencies require that photographs be taken without and with a scale.
5. Using a macro lens, fill the frame of the viewfinder with the scale and fingerprint.
6. Set the white balance to the dominant lighting in the room.
7. Auto metering may be used.
8. The depth-of-field may require adjustment. F-11 will generally produce sufficient depth-of-field. Adjust the shutter speed to obtain the appropriate exposure.
9. If a flash unit is necessary, position the unit at a 45-degree angle to the print to avoid hot spots. Take a control photograph without the flash to ensure that the flash does not obscure detail of the fingerprint.
10. Side (continuous) lighting positioned at 45 degrees to the evidence may be used. Adjust the white balance accordingly.

Fingerprints on Low-Level Vertical Surfaces

Fingerprints on low-level vertical surfaces will require inverse mounting of the camera on a tripod. Viewfinder accessories that attach to the camera and operate like a periscope accompany some cameras. The periscope helps the photographer peer through the viewfinder when the camera is in an awkward position. If such accessories are not available, it may be necessary for the photographer to lie in a prone position to peer through the camera's viewfinder. To avoid contact with contaminates that may be present, the forensic technician should place craft paper or plastic sheeting on the surface before lying down.

Fingerprints on Curved Surfaces

Photographing fingerprints on curved surfaces such as bottles or cans requires excellent depth-of-field, preferably F-22. Alternatively, one may capture multiple, overlapping images of the fingerprint and layer the photographs with a software program (e.g., Adobe Photoshop®).

Fingerprints on Mirrors

Photographing a fingerprint on a mirror can be problematic because a reflective (duplicate) image of the fingerprint will be observed in the

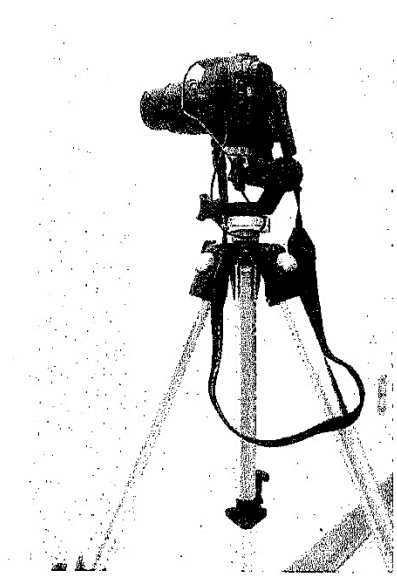


Photo 5-38. Photographic setup with print on a vertical surface.

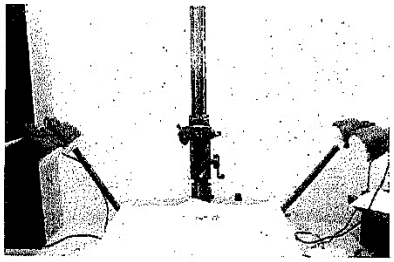


Photo 5-40. Photographic setup with print on horizontal surface.

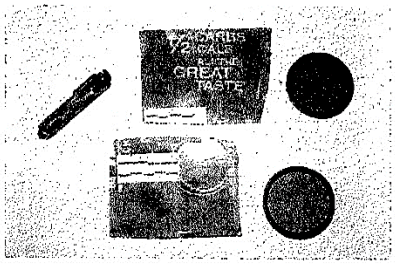


Photo 5-41. Filters may be used to remove background colors.

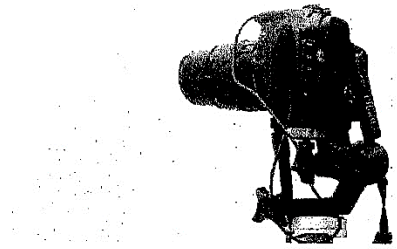


Photo 5-39. Photographic setup with print on a vertical surface.

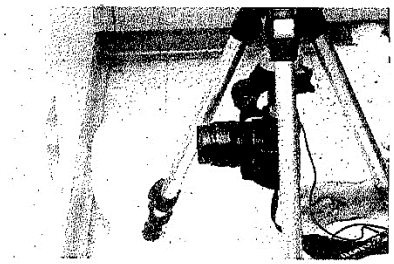


Photo 5-42. Photographic setup for evidence on low vertical surface.

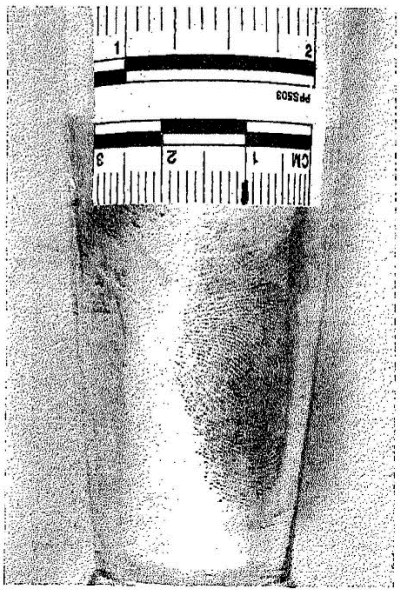


Photo 5-43. Fingerprint on curved bottle.

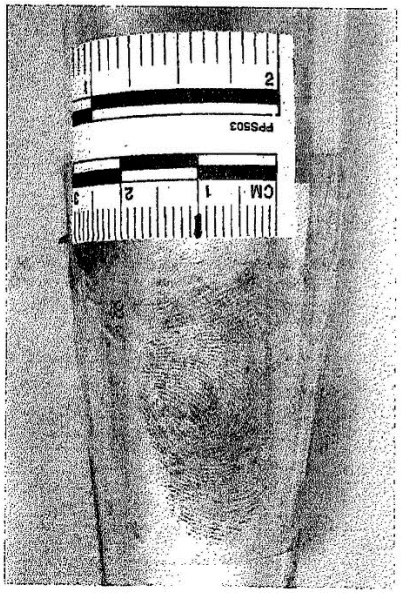


Photo 5-44. Fingerprint on curved bottle.

photo. If good depth-of-field is used, the duplicate image is enhanced. Therefore, the photographer should use **poor depth-of-field**, which minimizes the duplicate image reflected by the **mirror**.

The photographer should **bracket** images of the print, using multiple f-stop settings, starting with the poorest depth-of-field setting and increasing the f-stop with each subsequent photograph. The shutter speed may be adjusted to compensate for exposure changes with each photograph. One of the photographs should produce little or no duplicative image but provide enough depth-of-field for comparison purposes.

Fingerprints on Vehicle Windows

Photographing fingerprints on vehicle windows can be challenging also. Reflection and objects on the opposite side of the window can distort the fingerprint image. A sheet of paper may be taped to the opposite side of the window to prevent reflections or obscure distracting objects. Diffused lighting may help if the window is reflective. Reducing depth-of-field will also help diminish distracting images on the opposite side of the glass.

Alternate Light Source Photography

An ALS, also referred to as a forensic light source, is used in a variety of forensic applications. To photograph evidence being viewed with the assistance of an ALS, one should follow a simple rule: *The ALS filter used by the photographer to observe the evidence should be of the same color as the filter used in the camera.* The steps to photographing evidence viewed with an ALS are as follows:

1. Place the camera on a tripod or copy stand. If photographing a fingerprint, the face of the camera lens must be level with and parallel to the fingerprint. The same procedure is followed

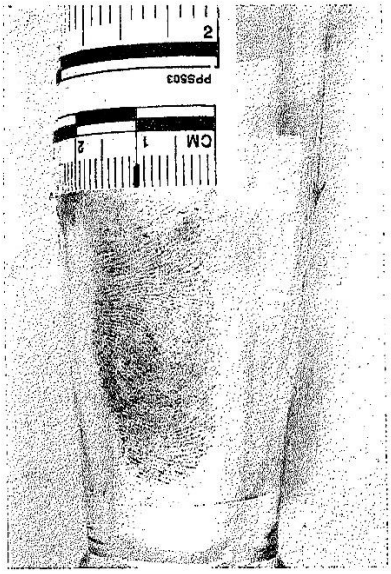


Photo 5-45. Fingerprint on curved bottle.

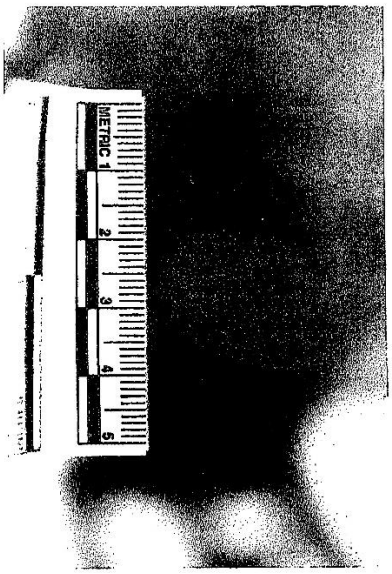


Photo 5-46. Fingerprint on mirror; poor depth of field was used to minimize reflection and double image.

for shoe impressions, bite marks, or any type of evidence subject to comparisons. When photographing evidence such as biological fluids for documentation (not comparison) purposes, the face of the camera lens need not be level or parallel with the evidence.

2. **The same filter color used on the ALS is used on the camera.** A glass or plastic filter is connected to the front of the camera lens. In lieu of a camera lens filter, a square plastic filter can be held in front of the lens.
3. The ALS and the square plastic filter should be stationary. A stand with clamps can be used to hold the ALS and plastic square in place. **The ALS should be positioned at an oblique (less than 90 degree) angle a few inches from the fingerprint.**
4. Depth-of-field depends on the surface. **F-8** is usually sufficient. If the surface is curved, the depth-of-field should be increased.
5. **ISO 400** film is recommended and the shutter speed is adjusted for proper exposure.
6. Auto white balance is recommended.
7. A scale is placed next to the fingerprint. The camera's photo frame is filled. Photographs without and with a scale should be taken.
8. The photographer should bracket the exposure, even if photographing digitally. Although the image may appear satisfactory on the LCD screen, the actual fingerprint image may be too bright. Therefore, the photographer should take underexposed and overexposed images two full f-stops in both directions. Underexposed images are usually best for fingerprints viewed with an ALS.

Advanced Lighting Techniques

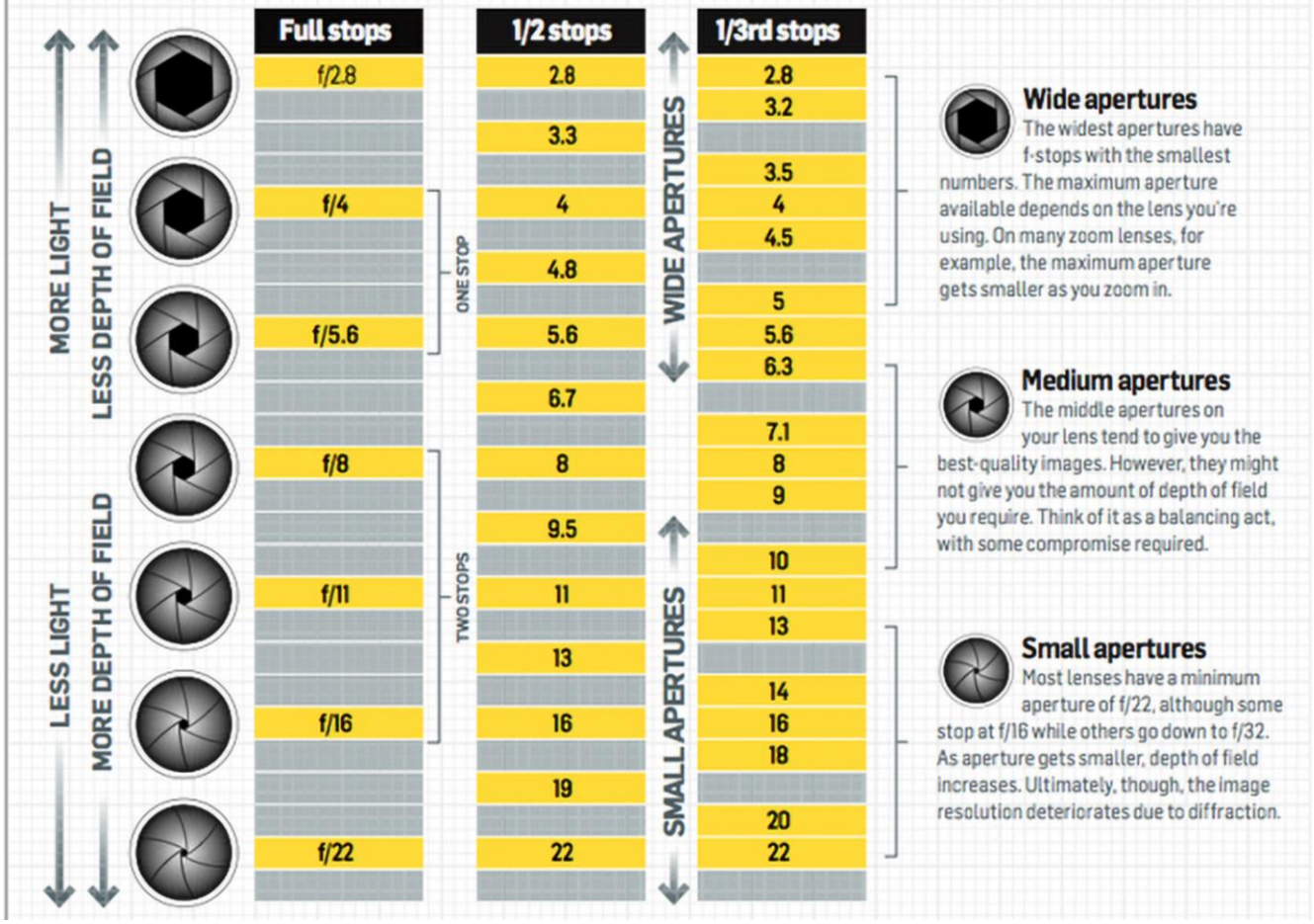
Lighting conditions are problematic when photographing a fingerprint located on reflective evi-

APERTURE NUMBERS

MAKING SENSE OF F-STOPS

Digital Camera World

Your at-a-glance guide to aperture scales and what the numbers mean



Wide apertures
The widest apertures have f-stops with the smallest numbers. The maximum aperture available depends on the lens you're using. On many zoom lenses, for example, the maximum aperture gets smaller as you zoom in.

Medium apertures
The middle apertures on your lens tend to give you the best-quality images. However, they might not give you the amount of depth of field you require. Think of it as a balancing act, with some compromise required.

Small apertures
Most lenses have a minimum aperture of f/22, although some stop at f/16 while others go down to f/32. As aperture gets smaller, depth of field increases. Ultimately, though, the image resolution deteriorates due to diffraction.

Module 1: Cyanoacrylate Ester Fuming (Superglue)

Introduction to cyanoacrylate ester:

- What types of evidence
- How the chamber works
- UV shelves / hooks
- Control / documentation
- Troubleshooting the chamber

1. Cyanoacrylate Ester polymerizes on some latent prints to produce a white deposit – catalyzed by water and possibly other constituents of latent prints.

2. Effectiveness is dependent on processing conditions – atmospheric pressure, normal room temperature and relative humidity of 80% are optimal conditions.

3. Use on non-porous surfaces and semi-porous (glossy) surfaces

4. Can use fluorescent dye to enhance prints

Superglue tank:

1. Purge tank if necessary (will say in the display if needed) – hit the green **Purge Cycle** button (if it says 10 purges left you need to change the carbon filters and sign the log)
2. The blue **Open Door** button will light up when the chamber is ready
3. Remove the racks and run them through a UV hood – both sides (hooks and clothespins too)
4. Replace the racks and load the evidence into the tank
5. Evidence should be placed in such a way to maximize exposure to the fumes
6. Place a fingerprint **control** on a black control card and place inside the tank
7. Pour a small amount of glue into a tin tray and place onto the hot plate inside the door
8. Check water level in tank
9. Close the door
10. Adjust the length of time for the glue cycle if necessary (20 minutes is the best time)
    - Push the green **Menu** button
    - To change the time, use the up/sown arrows accordingly
    - Push the green **Menu** button again – **EXIT** will be in the display
    - Push the down arrow to exit

1. When ready, push the blue **Auto Cycle** button to start
2. The full cycle will take approximately 75 minutes to complete to plan accordingly
3. The blue **Open Door** button will light up when the cycle is complete
4. Push the blue **Open Door** button to unlock the door and turn the handle to open
5. Remove the evidence
6. Throw away the tin with any remaining glue and the control
7. Photograph any positive results

8. Follow up with powders
9. Check the positive control box for “9” on the note page

References:

1. Crime Scene Unit Manual Section 3.2 and 3.3
2. National Institute of Justice, et al. *The fingerprint sourcebook.* July 2011
3. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.

7.9 Cyanoacrylate Fuming (7.9.1 Background)

The liquid commercial adhesive, super glue, was inadvertently developed in the 1950s by researchers who were trying to develop an acrylic polymer for the aircraft industry. Besides its use as a glue, CA adhesive also found use as a field dressing in Vietnam in the 1960s, although it neverreceived FDA approval for this use. In the late 1970s, re-searchers in Japan and the United Kingdom almost simultaneously discovered the latent fingerprint development capabilities of the fumes of the liquid adhesive. Shortly thereafter, latent print examiners from the U.S. Army Criminal Investigation Laboratory in Japan and the Bureau of Alcohol, Tobacco, and Firearms introduced this techniqueto North America. Once CA fuming proved practical, with the introduction of methods to make the technique faster and more effective, it quickly gained acceptance worldwide(German, 2005; Jueneman, 1982, p 15). Since those early discoveries, innumerable crimes have been solved through the routine use of CA ester (usually methyl or ethyl) fuming of evidence, and a substantial amount of research has been aimed at identifying the idealenvironment for the technique. Today, CA fuming continues to be a versatile and effective development technique on virtually all nonporous surfaces,including glass, metal, coated papers, and all forms of plastics.

The method is particularly effective on rough surfaces where physical contact with a fingerprint brush tends to develop the texture of the material along with thelatent fingerprints. CA vapors are extremely sensitive to fingerprint residue, adaptable to many different crime scene and laboratory situations, and are relatively inexpensive to employ. Studies into the explicit polymerization initiators and the role of water in the development of latent prints are ongoing. These studies should eventually lead to a better understanding of latent print polymerization as it relates tolatent print composition, pH, aging, and humidity.

7.9.2 Theory

Super glue or CA development of latent prints is best explained as a three-stage process to produce polymergrowth, thus enabling latent print visualization. The first stage occurs when fumes of CA ester monomers (see diagram of ethyl CA monomer in Figure 7–11) are introduced to latent fingerprints and quickly bond with initiators in the residue. In the second stage, the monomeron the fingerprint residue reacts with another CA monomerin the vapor phase to form a

dimer on the print. This reactswith yet another monomer, and another, eventually forminga polymer, a long chain of CA molecules. The final phase iswhen the polymer chain reaction is terminated. The overalldevelopment time is fast, especially when volatilization of the liquid glue is accelerated (Lewis et al., 2001, pp 241–246). The polymerization process may, however, be restarted later if fingerprints prove to be underdevelopedwith the first exposure to fumes. Fully developed CA prints are a white three-dimensional matrix, often visible to the unaided eye, and can be furtherenhanced with a variety of techniques. CA-developed impressions are generally more durable than untreated fingerprints because of the plasticization of the print. Becauseof this, some authorities recommend CA treatment in the field before evidence packaging to protect otherwise fragilefingerprints during transportation and storage (Perkins andThomas, 1991, pp 157–162). For normal eccrine sweat fingerprints, CA polymerized under ambient laboratory environmental conditions ap- pears as noodlelike, fibrous structures when viewed with a scanning electron microscope (SEM) (Figure 7–12). These polymer morphologies change, however, when variables such as the age of the latent print, the residue composition, and environmental conditions are altered.

FIGURE 7–10

Structure of 2-isononylninhydrin (INON).

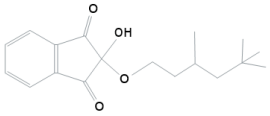
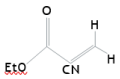


FIGURE 7–11

Ethyl cyanoacrylate monomer.



Lewis et al. (2001, pp 241–246) observed differences between clean and oily latent print residues and the effectsof aging on each. Latent prints lacking sebum (clean prints)tended to suffer from the effects of aging to a far greater extent than prints containing sebum (oily prints, Figure 7–13). After 1 day of aging, clean prints showed a trend away from the previously mentioned fibrous morphology toward polymer structures that appeared rounded under SEM. Clean prints also became difficult, if not impossible, to develop after a period of only 2 weeks, whereas prints contaminated with sebum produced distinguishablepolymer growth for periods of up to 6 months. Lewis et al. (2001, pp 241–246) also observed that a low-humidity

environment during latent print aging had a noticeable andadverse impact on development with CA, whereas prints aged under high humidity lasted longer and produced higher quality polymerization. Interestingly, latent prints developed in a vacuum chamberalso produce smooth spherical or capsule-type formations observed with SEM and tend to be more translucent to the unaided eye (Watkin et al., 1994, pp 545–554). This may be due in part to exposing the print to the near zero-humidity environment of the vacuum, presumably removing moisture from the fingerprints. The role of humidity inCA development of latent prints is not understood at this time. During the mid-1990s, Kent empirically observed that humid environments outperformed vacuum environments in the CA development of latent prints (Kent and Winfield, 1995; Kent, 2005, pp 681–683), whereas Lewis et al. (2001, pp 241–246) observed that humidity during the latent print aging process had a greater effect than during polymerization. Clearly, the role of humidity during aging and polymerization must be examined further. The actual initiators that cause latent print polymerization are just recently being understood. Originally, it was believed that CA primarily reacted with the water in finger- print residue (Jueneman, 1982, p 15).

However, current research indicates that water-soluble amines and carboxylic groups in latent print residue are the primary initiators of CA polymerization. These two groups each produce significantly higher molecular weights of polymer growth than water alone. Furthermore, amines and carboxylic acid will polymerize in the absence of any water, leaving the role ofwater during the aging and development process unclear (Wargacki et al., 2005). The pH of the humidity to which the latent prints are exposed prior to CA treatment may also play an importantrole by rejuvenating latent prints prior to the polymerization process.

Latent prints that are exposed to acetic acidvapors and then CA fumed have shown higher molecular weights than those not exposed. Conversely, basic humidity produced with ammonia vapors also appears to enhance CA development. Present research makes it clear that acidic and basic humidity environments will both individually enhance latent print polymer growth, with acidic enhancement proving more effective. Although the actual mechanism is not fully understood, it is currently thought that exposure to ammonia vapors primarily enhances the functionality of the amine groups, whereas acetic acid vapors favorably influence the more robust carboxylic initiators (Wargacki et al., 2005).

7.9.3 Application

It is important to mention that liquid CA and its fumes can cause acute damage to skin, eyes, and mucous membranes, and the long-term effects of exposure are not fully known. The user must take care to use appropriateate ventilation and personal protective equipment and to always practice safe handling. All manufacturer's warnings,including those given in material safety data sheets, must be heeded during use. The ideal result of CA development is polymerization on the latent print that sufficiently scatters light and does not coat the background, making the white impression slightlyvisible against the substrate. This type of "minimal" development produces the greatest amount of detail, especiallywhen used in conjunction with fluorescent dye stains (Figure 7–14). Over fuming will leave prints appearing "frosty" with a lack of edge detail, making them difficult to differentiate from a background also coated with CA polymer. Sometimes, depending on latent composition and environmental conditions, developed impressions will appear translucent or glassy in nature and will be very difficult to detect without specific lighting or fluorescent dye staining.

In fact, most impressions will be aided by some form ofenhancement before recording. Fuming with CA can be as simple and inexpensive as vaporizing the glue in a fish tank with a tight-fitting lid or as elaborate as using a commercially designed chamber with dynamic temperature and humidity controls. Both systems are intended to achieve the same result: vaporizing liquid glue in an environment suitable for polymerization of CA onlatent prints. A common and effective approach to the volatilization of CA is to warm a small amount of liquid glue (approximately 0g or less) in an aluminum evaporation dish on a heatingblock or coffee cup warmer. An aluminum dish is preferredbecause it inhibits polymerization (Olenik, 1983, pp 9–10).The warm fumes rise but soon fall to the bottom of the chamber as cooling sets in. Therefore, a circulation fan is often used during fuming to keep the vapors evenly dispersed around the evidence at all levels of the tank. Printsthat are later determined to be under fumed can be fumed again, in effect restarting the polymerization process. A second approach to vaporizing CA utilizes a commerciallyavailable fuming wand. These wands typically use butane fuel to heat a small brass cartridge containing ethyl CA (Weaver and Clary, 1993, pp 481–492).

Fumes from the heated cartridge on the end of the wand can be directed toward the evidence or used to fill a chamber. The disadvantage of using a fuming wand in an open environment isthat air currents easily sweep the CA vapors away from theevidence, making

development difficult to control. The use of a fuming wand outside a fume hood also presents somehealth and safety challenges that must be considered (Froude, 1996, pp 19–31). Vaporization can also be achieved without an external heatsource. Instead, chemical acceleration is produced by the exothermic reaction that can be achieved by pouring liquidglue on a pad of high cellulose content pretreated with sodium hydroxide. Pretreatment simply involves a cotton ball prepared with a few drops of NaOH solution.

CA fuming without acceleration can be achieved by in- creasing the total surface area of the liquid glue, thereby increasing the rate of evaporation. One way to achieve thisis to sandwich a bead of liquid glue between two sheets ofaluminum foil (Olenik, 1989, pp 302–304). The sheets are then pressed together and an ink roller is used to evenly disperse the glue into a thin layer across the entire inside of the foil surfaces. These sheets are then opened and placed inside a chamber, exposing the relatively volatile layers of glue to the air. CA development time using this method will vary significantly with the size of the chamber. Fuming in a vacuum chamber has also been suggested as a method of increasing the volatility of CA (Campbell, 1991,pp 12–16; Yamashita, 1994, pp 149–158; Harvey et al., 2000, pp 29–31; Bessman et al., 2005, pp 10–27). The reduced atmospheric pressure lowers the boiling point of the liquid glue and may vaporize it more rapidly at room temperature.

The negative pressure also eliminates humidity in the tank, affecting the overall appearance of thedeveloped impressions. Prints developed in a vacuum environment often appear translucent, making them hard to detect without liquid dye stains (Watkin et al., 1994, pp 545–554). Some researchers have found, however, that this practice is less effective overall than the use of controlled humidity environments (Kent and Winfield, 1995;Kent, 2005, pp 681–683). Although CA development in a laboratory chamber is preferred, makeshift chambers in the field can also be easily created. Chambers include cardboard boxes, small frames with clear plastic sheeting, large tents, vehicle interiors, and even entire rooms (Weaver, 1993, pp 135–137; Bandey and Kent, 2003).

The most common of these field chambers is probably the automobile interior. One method of fuming involves placing a hot plate (reaching approximately60 °C) in the center of the vehicle, with approximately 1 gram of glue in an evaporation dish. The interior is then sealed off by closing all the doors and windows. The fumes from the heated glue rapidly fill the vehicle interior, developing impressions throughout. This process takes approximately 10–30 minutes,

although the length of time is variable. In some cases, so as not to destroy the entire vehicle, parts of the vehicle may be removed and fumed separately (e.g., steering wheel, mirror).

In some instances, CA fuming of a firearm may interferewith subsequent firearms examinations. The firearm examiners may have to be consulted before any CA processing (Rosati, 2005, pp 3–6). Fuming times depend on the size of the chamber, the quantity of glue, the temperature of the heat source, and the nature of the substrate and latent print residue. Under all conditions, fuming should be terminated shortly after the first signs of the appearance of fingerprints. Some examiners will place a test strip with fingerprints in the chamber to watch for the development of prints. This not only helps to determine when processing should cease but also acts to ensure that the equipment is functioning properly. Fuming can be restarted later if impressions appear underdeveloped.

7.9.4 Enhancement

Once prints have been developed, they can be enhanced optically with oblique, axial, reflected, and transmitted lighting techniques; chemically enhanced with fluorescent dye stains; and physically enhanced with the application offingerprint powder, in that order. Fluorescent dye staining and examination with a laser or forensic light source usually produces the most dramatic results; however, not all CA-polymerized prints will accept dye stains. Dye staining simply requires preparing a commercially available fluorescent stain in solution and applying it to the polymerized fingerprints. For a comprehensive reference of fluorescent dye stain recipes, see the FBI *Processing Guide for Developing Latent Prints* (Trozzi et al., 2000) or the Home Office manual (Kent, 1998, 2004). Once a dye solution is chosen, it is applied to the nonporous surfaces treated with CA fumes by dipping or using a wash bottle tospray it. It is thought that dye-staining polymerized prints works like a molecular sieve, where the dye molecules get stuck in the polymer by filling voids in the compound (Menzel, 1999, p 162). For this reason, it is important to adequately rinse the surface bearing the fingerprints withthe dye stain. The result is a print that produces intense fluorescence when viewed with a forensic light source or laser (Figure 7–14).

At this stage, proper photography cango beyond simply documenting the image to enhance thevisibility of the fluorescing print by recording detail imperceptible to the unaided eye. Powdering is also a good way to visualize and document polymerized impressions.

Oftentimes, impressions are durable enough that they may be repeatedly brushed with fingerprint powder and lifted with tape until the right contrast is achieved in the lift (Illsley, 1984, p 15).

7.9.5 Conclusion

CA fuming is a proven and effective method of developing latent print impressions containing eccrine and sebaceous residues that has been in use since the late 1970s. The CA molecules bond to residue via polymerization to form a visbile and durable compound that can be enhanced and re- corded by fluorescence, photography, and lifting. Researchis ongoing into the actual chemistry and mechanics of the CA reaction. Currently, the heat-accelerated technique in controlled high humidity (60–80% relative humidity) is most often the suggested method of application. It is alsorecommended that CA development be done shortly afterfingerprint deposition for maximum results. Although CA fuming has proven effective for considerable durations of time after deposition, CA fuming prior to evidence packaging can also be an effective means of stabilizing fragile latent impressions during storage and transportation.

FIGURE 7–14

(A) Cyanoacrylate (CA) polymerized print on a plastic wrapper. (B) CA print stained with RAM and viewed at 475 nm with anorange barrier filter.*

*RAM is a fluorescent stain mixture of rhodamine 6G, Ardrox, and 7-(*p*-methoxybenzylamino)-4-nitrobenz-2- oxa-1,3-diazole (MBD).

Technical Note

Chemical Fuming: A Practical Method for Fingerprint Development on Thermal Paper

Rongliang Ma [1, 2]
Qun Wei [1]

Abstract: This paper describes a useful method of chemical fuming for the development of latent fingerprints on the thermal surface of thermal paper. Nine chemicals were tried, and the effectiveness between chemical fuming and ninhydrin was also compared. Several chemicals were effective in developing fingerprints on the thermal surface; however, acetic acid was the best.

Introduction

Thermal paper is widely used for business applications (e.g., sales receipts and facsimile paper). Generally, there are two types of thermal paper: one type has two thermal surfaces, the other has one thermal surface and one nonthermal surface that is composed of ordinary paper (base paper). It is easy to develop fingerprints on the nonthermal surface, but it is difficult on the thermal surface, because substances in the paper react with the processing solvents, turning the surface dark and yielding poor results. Forensic scientists have investigated ways of overcoming the difficulties posed by thermal paper. Stimac used ninhydrin dissolved in an HFE series solvent [1]. Broniek et al. found that muriatic acid fuming produced excellent results [2]. Wakefield et al. used a solvent-free heating method to detect fingerprints

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on thermal paper [3]. Stimac also found that indanedione works well on fingerprint development on thermal paper [4]. This paper explores the effectiveness of several chemicals in developing fingerprints on the thermal surface of thermal paper via fuming.

Methods

Preparation of Fingerprints

Blank thermal paper that had a thermal surface and a nonthermal surface was purchased from Data Roll Australia Company (Queensland). Ordinary fingerprints were left by donors on small pieces of the blank thermal paper. (Wiping secretions from the forehead and nose was not needed.)

Preparation of Ninhydrin

Ninhydrin was prepared in an HFE-711PA solvent and processed according to the procedures described by Stimac [1].

Chemicals

Nine chemicals (acetone, ethyl acetate, acetate acid, ethanol, methanol, iso-propyl alcohol, hydrochloric acid, HFE-7100, and n-hexane) were used in the experiments. The fuming chemicals were analytical reagent grade and bought from local chemistry shops.

Fuming Process

In a ventilated cabinet, each chemical was assessed individually by adding about 20 mL into a petri dish. The thermal paper was suspended above the dish with the thermal surface facing down, allowing maximum contact of the chemical vapors with the fingerprints. (An alternative fuming method is also possible: Using forceps, the small pieces of thermal paper can be tucked into the top of a half-full 500 mL beaker, exposing the thermal paper to the concentrated chemical vapors inside the beaker and reducing the volatilization of vapor in the cabinet. The paper must not be immersed in the liquids or contact the liquid directly.) The development time varied for different chemicals, but generally was not more than 20 seconds.

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Technical Note: Chemical Fuming

Experiments

Experiment 1: To determine the best chemical for fingerprint development on thermal paper

A donor left fingerprints on 10 pieces of blank thermal paper for immediate development with each of the above chemicals.

Experiment 2: To determine the effect of chemical fuming on aged fingerprints

Two donors each left 80 fingerprints on small pieces of blank thermal paper. The 160 fingerprints were divided into eight groups of 20 fingerprints (10 fingerprints from each donor). Four groups were developed by chemical fuming using acetic acid at intervals of one week, one month, two months, and four months to examine the effectiveness of the reagent on aging fingerprints. The other four groups of fingerprints were developed by ninhydrin as a control at the same times.

Experiment 3: To examine the effect of chemical fuming on fingerprint development on the nonthermal side of thermal paper

One donor left fingerprints on both sides of small pieces of blank thermal paper. Three fingerprints were left on the thermal surface and two fingerprints were left on the other side of each piece of paper. The fingerprints were marked by pencil and, in total, 20 pieces of paper were made. After two days, one-half of the fingerprints were developed sequentially by acetic acid fuming (only on the thermal surface) and then with ninhydrin. At the same time, the other half of the fingerprints were developed by ninhydrin directly as a control.

Experiment 4: To examine the effect on actual receipts

One hundred bank, shop, and supermarket sales receipts from businesses in Adelaide were developed to examine the fuming procedure with real samples. Among the 100 receipts, 50 were developed by acetic acid fuming and ninhydrin sequentially; the other 50 were developed by ninhydrin directly.

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Results

The percentages are the ratios of the number of fingerprints developed that had sufficient details to determine individualization to the total number of fingerprints processed. The percentages do not include those fingerprints that lacked sufficient detail for individualization, even if some ridges were developed. Acetic acid yielded the best results in experiment 1, so it was chosen as the fuming chemical in experiments 2, 3, and 4.

Experiment 1 - Comparison of Different Chemicals	
Chemicals	**Results**
Acetic acid	Best. 100% fresh fingerprints were developed and were suitable for identification, often with good third-level characteristics.
Acetone, ethanol, methanol, ethyl acetate	Good. 95% fresh fingerprints were developed and were suitable for identification but were not as good as the acetic acid results.
Iso-propyl alcohol, hydrochloric acid	Poor. Development rate was lower and the quality of the fingerprint was much poorer.
HFE-7100, n-hexane	Worst. None of the fingerprints were developed.

Experiment 2 - Chemical Fuming on Aged Fingerprints Twenty samples processed in each test.				
	One week	**One month**	**Two months**	**Four months**
Acetic acid	20	20	19	19
	100%	100%	95%	95%
Ninhydrin	19	13	10	12
	95%	65%	50%	60%

Experiment 3 - Acetic Acid Fuming and Ninhydrin on Both Sides of Thermal Paper		
	Thermal side Thirty samples processed	**Nonthermal side** Twenty samples processed with ninhydrin
Acetic acid	30 100%	20 100%
Ninhydrin	30 100%	20 100%

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Experiment 4 - Actual Receipts		
	Thermal side Fifty samples processed	**Nonthermal side** Fifty samples processed with ninhydrin
Acetic acid	35	18
Ninhydrin	41	30

Discussion

Within the practical limitations of time and the chemicals that were available to us, only five chemicals (acetic acid, acetone, ethanol, methanol, ethyl acetate) were determined to be suitable for developing fingerprints by fuming. (Other chemicals might also be effective.) An interesting observation is that chemicals that are suitable for fuming are poor ninhydrin carriers to develop fingerprints on thermal surfaces. Conversely, some of the chemicals that do not produce suitable fuming results are good carriers for thermal paper ninhydrin formulas. For example, iso-propyl alcohol and HFE-7100 are poor fuming chemicals, but they can be prepared into HFE711PA, which is suitable for developing fingerprints on thermal surfaces. Some people may think it is a polar solvent that reacts with chemicals in thermal paper that causes the paper to turn black [3], but we have found that it is not certain that more polar solvents make the thermal paper darken. For example, iso-propyl alcohol, which is more polar than acetone [5], darkens thermal paper far less than does acetone.

An interesting but difficult to explain observation is that the ridge color of the fingerprints varies with different chemicals; white ridges were obtained from fingerprints developed by acetone, ethyl acetate, ethanol, and iso-propyl alcohol. Black ridges were obtained from fingerprints developed by hydrochloric acid, methanol, and acetic acid (Figures 1, 2). The white ridges may be easily explained because the thermal surface reacts with chemical vapors and turns dark, and the fingerprint constituents do not react with the vapors, leading to a strong contrast between the fingerprints and the black paper background. The reason for the black ridge may be that some constituents in the fingerprint react with the chemical vapor, whereas the substances in the thermal surface do not react. However, the identity of the substances involved in this process and how they react are unknown.

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Figure 1

A fresh fingerprint with white ridges developed by acetone fuming on blank thermal paper.

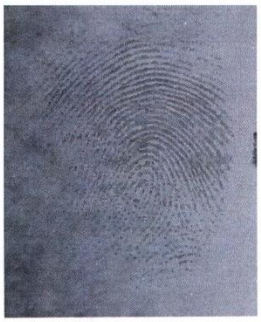

Figure 2

Fresh fingerprints with black ridges developed by methanol fuming on blank thermal paper.

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Experiments were also conducted to determine whether fingerprints on other surfaces could be fumed by acetic acid. Negative results were obtained on ordinary copy paper, glossy paper, PVC, and glass. These results show that the fuming principle must be related to the components of thermal paper and not only to the constituents of fingerprint deposits.

The data from experiment 2 show that acetic acid fuming is as effective for old fingerprints as for fresh fingerprints, but ninhydrin is less effective for old fingerprints (Figure 3). The development rate for acetic acid fuming was higher than with ninhydrin, so it seems that acetic fuming is more sensitive for old fingerprints than is ninhydrin.

The data from experiment 3 show that both acetic acid and ninhydrin gave excellent results. The fuming process did not affect fingerprint development on the nonthermal surface. The quality of fingerprints developed by ninhydrin directly on the nonthermal surface is a little better than that obtained after fuming, but no difference was detected on the thermal surface. The ninhydrin method can obliterate the ridge characteristics developed by acetic acid fuming, but the reverse process is not true. The reason for developing these fingerprints after two days was to permit the fingerprint substances to penetrate into the paper [6]. This also is more likely to represent the actual situation in a real case.

Experiment 4 resulted in fewer fingerprints being developed by fuming than by ninhydrin, but the difference was not remarkable and this could be reasonably explained. From this experiment, we can see that acetic acid fuming is an effective method to develop fingerprints on the thermal surface (Figure 4).

There are some disadvantages to using fuming methods. First, fuming will lead to some contamination of the paper, but this is normally acceptable, and if the development process is reasonable, it should not make the printing on the paper illegible. Maybe more importantly, if there are many exhibits to develop, the procedure will be very tiring. It is difficult to evenly fume large exhibits, which might result in some fingerprints being missed; but this will not happen with ninhydrin. Most of the receipts from the businesses were quite long, and it was difficult to ensure fuming of the complete surface. This may be the main reason for the better ninhydrin results in experiment 4. Of course, there is also the possibility that more fingerprints existed on the ninhydrin-processed receipts.

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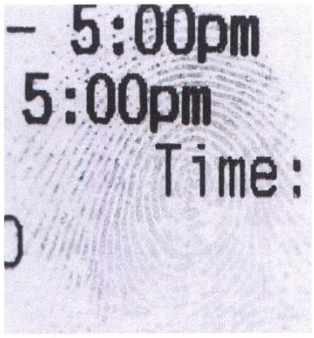

Figure 3

A four-month-old fingerprint with black ridges developed by acetic acid fuming on a commercial receipt.

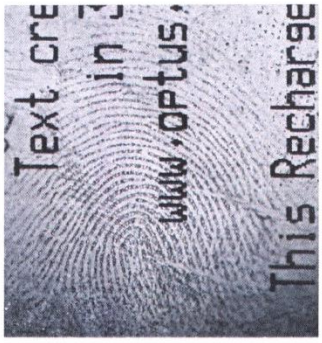

Figure 4

A one-week-old fingerprint with black ridges developed by acetic acid fuming on a commercial receipt.

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Some examiners have suggested soaking the exhibits in the normal ninhydrin HFE7100 solution for a longer time until all of the dark color disappears [7], thus avoiding the need to use any fuming chemicals or special ninhydrin solvents to develop fingerprints on thermal paper [8]. Experiments were initially carried out on this, but with poor results. This was because, when soaking the exhibits, some damage to the paper and printing will inevitably happen and often the fingerprint ridge is discontinuous (Figure 5).

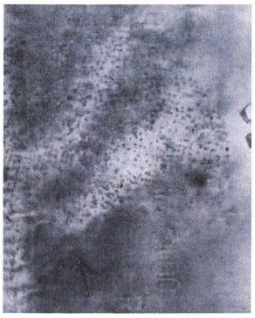

Figure 5

A two-day-old fingerprint developed by ninhydrin HFE7100 solution with longer soaking time until all dark color disappeared. The fingerprint is of poor quality, because the ridges are discontinuous and the printing on the thermal paper is damaged.

Conclusion

Acetic acid is inexpensive and available everywhere, and the operational procedure for acetic acid fuming of fingerprints is relatively easy. In comparison, the preparation of HFE711PA is difficult because of the poor solubility of ninhydrin in the HFE series solvents. Moreover, HFE solvents are expensive. Importantly, acetic acid fuming is more sensitive to the fingerprints on the thermal surface. Therefore, acetic acid fuming is a practical method to develop fingerprints on the thermal surface of thermal paper.

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Safety

Most of the chemicals used in these procedures are toxic and volatile, so the fuming operation must be conducted in a ventilated cabinet so that the vapors are not inhaled. Caution should be exercised to avoid contact with the skin, because some of the chemicals are corrosive.

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Cyanoacrylate Fuming (Microburst Method)

Cyanoacrylate fuming is used to develop latent prints on nonporous specimens.

Equipment

Heater, aluminum dish, fuming chamber

Materials and Chemicals

- Cyanoacrylate (premixed)

Processing Procedure

Using the fuming chamber,

1. Place the aluminum dish on a heating surface and turn the heater to the highest setting.
2. When the dish is hot, place enough liquid cyanoacrylate to cover the bottom surface of the dish (approximately 3 g for a small chamber).
3. When the cyanoacrylate begins to fume at a steady pace, place the specimen(s) in the chamber and secure the chamber door.
4. Fume the specimen(s). Fuming time varies depending on the size of the chamber; however, in most instances, fuming times ranging from 30 seconds to 4 minutes are sufficient.
5. After the procedure is complete, remove the specimen(s) from the chamber to view for latent prints. If necessary, the fuming process can be repeated.

If a humidified chamber is available, set the humidity between 70% and 80% for best results.

The accumulation of cyanoacrylate glue fumes on some parts of a firearm could have an unfavorable effect during a subsequent firearms examination. In those instances when a firearms examination is to be done or anticipated, each chamber opening (e.g., the cylinder of a revolver) and each barrel opening should be covered with a small piece of tape (just large enough to cover the opening) before fuming with glue. Ensure that the area to be covered by the tape is processed by other appropriate methods, *prior* to covering. Remove the tape after the cyanoacrylate glue fuming process.

Storage

Original container

Shelf Life

Indefinite

Disposal

Observe all federal, state, and local environmental disposal regulations.
State and local disposal regulations may differ from federal disposal regulations.

Cyanoacrylate Fluorescent Dye (RAM)

This formula is used to dye cyanoacrylate developed latent prints. These prints can then be better visualized by the use of a laser or alternate light source. This method is effective on all colors of nonporous surfaces. Additional formulas for dyes used to enhance cyanoacrylate developed latent prints can be found in later sections of this guide.

Equipment

Scales, beakers, graduated cylinder, magnetic stirrer and stirring bar, squirt bottle or sprayer, glass tray, laser or alternate light source, dark storage bottles

Materials and Chemicals

- Rhodamine 6G (dye content 99%)
- MBD
- Ardrox P133D
- Methanol
- Isopropanol
- Acetonitrile
- Petroleum ether
- Acetone

Mixing Procedure

Two stock solutions must be mixed prior to formulating the RAM dye.

Stock Solution 1 (Rhodamine 6G)

Rhodamine 6G ....1 g

Methanol.....1000 mL

Combine the ingredients and place on a stirring device until all the rhodamine 6G is thoroughly dissolved.

Stock Solution 2 (MBD)

MBD .....1 g

Acetone .....1000 mL

Combine the ingredients and place on a stirring device until all the MBD is thoroughly dissolved.

Module 1: Magnetic Powder

Introduction to powders:

- Sterile applicators / powder
- Plenum wall
- Cleaning the magnetic wand
- Latent print cards
- Tape / techniques

(Use magnetic powder after superglue)

Magnetic powder processing steps:

1. Clean the tip of the magnetic wand before use
2. Pour a small amount of magnetic powder onto a clean piece of butcher paper
3. Hold the wand over the powder until it adheres to it
4. Pass the wand over the evidence, dragging the magnetic powder across the surface
    - Be careful not to let the tip of the wand touch the evidence
    - It may take several passes with the wand to develop the prints
    - Tap the item to remove any excess powder – do **NOT** blow on the item
5. Use tape or Mikrosil to lift any developed prints and place onto a latent print card
6. Fill out the latent print card (create samples)
7. Document the lift number on the item of evidence and bracket the location of the lift

References:

1. Crime Scene Unit Manual Section 3.4
2. National Institute of Justice, et al. *The fingerprint sourcebook.* July 2011

7.3.1 Background

Latent print visualization with powder, or "dusting", involvesthe application of finely divided particles that physically adhere to the aqueous and oily components in latent print residue on nonporous surfaces (Sodhi and Kaur, 2001, pp 172–176). This technique is one of the oldest and most common methods of latent print detection, with one of the earliest references dating back to 1891 (Forgeot, 1891,pp 387–404). Early practitioners used a variety of locally available ingredients to make their own dusting powders, including charcoal, lead powder, cigar ashes (Moenssens,1971, pp 106–107), powdered "washing blue", powdered iron, soot (Lightning Powder Inc., 2002, pp 2–3), and talc (Olsen, 1978, pp 212–214).

7.3.2 Theory

Fingerprint dusting is relatively simple and relies on the adherence of powder to the latent print residue to providegood visibility and definition of fingerprint detail. Latent print powder has an affinity for moisture and preferentiallyclings to the residue deposited by friction ridge skin. It is well accepted that the mechanical attraction betweenthese particles and the moisture and oily components ina print causes adhesion, with absorption being a factor (Olsen, 1978, pp 212–214; Lee and Gaensslen, 2001, pp 108–109). Particle size, shape, relative surface area(Olsen, 1978, pp 212–214), and charge (Menzel, 1999,p 143) appear to play roles as well. Most commercial powders rely on at least two essential elements to provide adhesion to latent print residue with-out "painting" the substrate. These elements are referredto as pigment and binder. The pigment in fingerprint pow-der provides for effective visualization, offering contrast and definition against the background surface. The binder (also referred to as the carrier in some applications) pro- vides for maximum and preferential adhesion to latent print residue (Menzel, 1999, p 143). Some pigment powders offer enough adhesion to be used individually. Background painting occurs when an undesirable amountof powder adheres to the substrate as well as the latent print, hindering detection.

Visualization will occur via reflected light (light powders), absorbed light (dark powders), and luminescence (fluorescent powders). Sometimes powders are combined for effectiveness on both light and dark substrates. This is the case with bichromatic powder, which uses highly reflectivealuminum powder mixed with black powder to achieve visualization on

both light and dark surfaces. A disadvantage of mixing different types of pigment particles is that extremely faint impressions, with few particles adhering tothe print, may suffer from having only a fraction of the necessary pigment needed for visualization. This problem can be overcome by tagging a single type of pigment particle with a fluorescent dye stain, thus creating a particle with dual uses rather than combining different types of particles.

Commercial powder manufacturers tend to label powders by color, such as black, white, silver, gray, and so forth, rather than labeling the ingredients. Particles that serve asgood fingerprint powders include carbon black (colloidal carbon), lamp black, talc, kaolin, aluminum, metal flake, and dolomite (Lee and Gaensslen, 2001, pp 108–109), among others. Good binders include iron powder (Lee andGaennslen, 2001, pp 108–109), lycopodium, corn starch, rosin, and gum arabic (Menzel, 1999, p 143).

One of the most common latent print powders, known for its versatility and effectiveness, is carbon black. Whenmixed with a carrier, this powder works on a wide range of surfaces and causes little substrate painting (Cowger, 1983, pp 79–80). Carbon black mixtures produce a dark gray-black image that can be visualized on varying colored surfaces. This type of powder will also show up on glossy black surfaces, conversely appearing light in color (Cowger,1983, pp 79–80). Interestingly, black fingerprint powder canalso be prepared or "tagged" with a fluorescent dye stain (Thornton, 1978, pp 536–538), giving it the dual purpose asa photoluminescent technique as well. Other effective and widely used latent print powders areflake metal powders made from aluminum, zinc, cop- per, brass, stainless steel, iron, cobalt, and nickel. Somedata indicate that flake powders are more sensitive than non-flake powders (Kent, 1998).

However, flake powdersalso sometimes tend to "paint" the substrate more than non-flake particles do. Flake powders are manufactured by ball-milling spherical metallic particles into flakes ranging from 1 to 50 μm in diameter (James et al., 1991, pp 1368–1375). The increasedsurface area of the flake relative to the weight of the particle contributes to this powder's adhesion. It appears that commercially available flake powder with a mean diameter of 10 μm and an average thickness of 0.5 μm is optimum for latent print development. It is also important to note that the addition of stearic acid, intended to influence flake morphology during milling, increases the adhesion value of the flakes as well (James et al., 1990, pp247–252). Aluminum flake powder that was washed of its stearic acid content resulted in poor

fingerprint development, whereas aluminum flakes produced with approximately 10 weight-percent of stearic acid produced good results (James et al., 1991, pp 1368–1375). Another study indicated that a range of flake metals produced optimum results with 3–5 weight-percent of stearic acid levels (James et al., 1993, pp 391–401).

7.3.3 Application

All manufacturer warnings, including those in material safety data sheets, should be heeded when using finger- print powder. Although commercial suppliers of latent printpowder have discontinued using known hazardous ingredients such as lead, mercury, and cadmium, it is strongly recommended that the practitioner wear a dust mask or work on a downdraft table as minimum precautions while using any powder.

Powders are typically applied to nonporous surfaces with a soft brush. Powdering is not recommended for porous orhighly absorbent surfaces such as uncoated paper or raw wood because other chemical treatments outperform pow-der on these surfaces. The softness of the bristles is particularly important to prevent damage to fragile latent printresidue. Latent prints with a high moisture or oil content are easily damaged by a brush that is too stiff or is used with excessive force. Conventional brushes are typically made with animal hair, fiberglass filaments, or sometimes feathers. Although fingerprint brushes are largely taken forgranted these days, a study of brushes has been carried out (Bandey, 2004).

Powders applied with a traditional filament brush consist of very fine particles and are usually low density or "fluffy"in nature. This enables particles to be easily picked up or "loaded" onto the brush filaments. The low density of this powder also allows it to easily become airborne during thedusting process, making a dust mask or respirator necessary at the crime scene. It is important to keep brushes clean, dry, and relatively free of tangles. To apply fingerprint powder with a conventional brush, the filament tips are lightly dipped into a sterile, wide-mouth container holding a small amount of powder. This is called "loading" the brush. Excess powderis then shaken, spun, or tapped from the brush. The pow- der is then applied evenly to all areas of the substrate.

An area of the surface (or a substrate similar in nature) should be tested before fully processing the item. This is done to establish the optimum amount of powder to be used on that substrate and to avoid background painting. Brushing is accomplished with light and even strokes that resemble painting. It is important always to begin by lightlypowdering and slowly

building to heavier applications to minimize fingerprint damage. When latent prints appear, they can be lightly brushed byadding powder and subsequently brushing excess pow- der away. This is done in the direction of the ridge flow toprevent damage to the impression.

Another type of powder, called magnetic or magna powder, allows for application with a magnetized rod that has no bristles. This type of powder can be light, dark, or fluorescent and utilizes the ferromagnetic properties of iron powder mixed with pigment powders. The magnetized applicator (magna brush) is dipped into the powder, picking upa ball of the iron and particle mixture, essentially forming its own brush (Figure 7–1). This ball serves as an effective carrier for pigment particles and is passed back and forth over the substrate to develop latent impressions. It is important to note that the magnetic powder ball formed with a magna brush is much softer than conventional filament brushes and typically causes less damage to fragile latent prints (MacDonell, 1961, pp 7–15). Magnetic powders are usually less effective on ferromagnetic substrates such as steel or nickel and are therefore not recommended on those substrates. The magnetic attraction may cause contact between the applicator and substrate, damaging latent prints in the process. In addition, magnetized particles from the powder will cling to the substrate and resist removal.

There are two ways to record or preserve a powdered impression. The most common and simplest method is lifting. To lift a print, good-quality transparent tape is placed onto the surface bearing a powdered impression. Commontape size for fingerprint lifting is 1.5–2 in. wide. While it is being applied, the tape is rubbed to remove air bubbles andto ensure good adhesion to the latent prints. It is then removed and placed on a backing card that contrasts with the color of the powder. Probably the most common lift is of black fingerprint powder placed on a white backing card.Other adhesive lifting media are hinge lifters, where the adhesive square is attached to the backing card by a hinge; opaque adhesive gel lifters, typically black or white; and silicon-type materials that are spread onto the surface and allowed to harden to a flexible rubbery medium before lifting. Care must be taken during the comparison process to note which lifting techniques cause the print toappear reversed. If the impression will be photographed in situ, the importance of powder color increases. Documenting powderedimpressions this way requires combining proper selection of powder and photographic lighting that will produceample contrast against the substrate. Another type of powder that produces excellent results on a wide variety of surfaces is fluorescent powder.

Fluorescent powder relies on the principle of luminescence to provide contrast between fingerprint and background.Fluorescent powders are typically created by adding a laser dye in

solution to a binder and allowing the mixture to evaporate (Menzel, 1999, pp 62–65). The resulting driedmass is then ground into latent print powder. Fluorescent powdering is highly sensitive when used with a good forensic light source and the appropriate barrier filters. In theory, luminescent fingerprint powder should bemore sensitive than conventional methods (Menzel, 1999, pp 4–7). It is important to test tape and lift cards used with fluorescent powders for any inherent fluorescence because fluorescence caused by lifting media will interfere with the quality of the impression. Another use of fingerprint powder, or the components of fingerprint powder, is in a suspension, for use on wet surfaces or on adhesive tapes. Conventional small-particlereagent, for developing fingerprints on wet, nonporous surfaces, uses molybdenum disulphide in suspension, butother reagents have been developed (Frank and Almog, 1993, pp 240–244). A similar suspension, Sticky-side powder (Burns, 1994, pp 133–138), used to develop printson the adhesive side of tape, has also been reformulated using fingerprint powder (Bratton et al., 1996, p 28; Wade,2002, pp 551–559).

Finally, a word of caution may be in order. Although using fingerprint powder is quick and inexpensive, concerns have been raised recently concerning the possibility of contamination due to the transfer of DNA through the use of fingerprint brushes (van Oorschot et al., 2005, pp 1417–1422).Crime scene examiners are being warned to be aware of this possibility.

The magnetic brush, or *magna brush,* was developed by Herbert MacDonell in 1961 (MacDonell, 1961, p 7). Sincehis early design, many variations have been manufactured (Figure 11–1), from large wide-headed applicators to applicators that have a plastic disposable cover for usein situations where potentially hazardous material could contaminate an application (James, Pounds, and Wilshire, 1992, pp 531–542; Lightning Powder Company, 1999, p 3). Most have a similar design: a magnetized steel rod within anonmagnetic case. The magnetic rod is moveable and can be retracted within the case. When the rod is not retracted,the head of the applicator is magnetized. To use the magnetic applicator, it is lowered into the magnetic powder. The magnet allows the fingerprint powder tocling to the end of the applicator. The powder that adheresto the applicator will create a bristle like brush consisting ofonly powder. This very soft brush is then carefully brushed.

FIGURE 11–1

Fingerprint powder applicators.

Module 1: Black Powder

Introduction to powders:

- Sterile applicators / powder

- Plenum wall
- Latent print cards
- Tape / techniques

Use black powders after superglue and magnetic powder

Black powder processing steps

1. Use a new brush and powder for each item of evidence
2. Pour a small amount of powder onto a clean piece of butcher paper
3. Work the powder into the brush then lightly apply the brush to the item using a circular motion
    - It may take several passes with the brush to develop the prints
    - Tap the item to remove any excess powder – do **NOT** blow on the item
4. Use tape or Mikrosil to lift any developed prints and place onto a latent print card
5. Fill out the latent print card (see below)
6. Document the lift number on the item of evidence and bracket the location of the lift

Front side of latent print documentation

1. Each latent print card must be filled out completely
2. The **Beat** should be filled in as **Lab**
3. The **Case #** is located on the request form
    - If there is no case #, use the **Incident #**
4. The **Crime Type** is located on the request form
5. The **Name of Victim** is located on the request form
    - If there is no victim listed then leave blank
6. **Lifted By** is you
7. **I.D. #** is your ID #

Front side of latent print documentation continued

1. The **Date** is the date the lift was collected
2. The **Time** is the time the lift was collected (use **military** time)
3. The **Location of Latents** is a description of where on the evidence the lift was collected from
4. The **Address** is the barcode number of the item
5. The bottom of the card tracks the number of lifts
6. Each card is numbered starting with 1
7. The total number of lifts for **all** items on the request is the **of** part
    - Example: **This is # 3 of 8 cards**
8. The blank area on the right side of the card is for you to draw a picture of the evidence depicting where the lift was collected from
9. A directional arrow will be placed alongside the drawing to indicate which direction the lift was collected from

Back side of latent print documentation

1. The back side of the card will contain the actual lift of tape or Mikrosil
2. A directional arrow will be placed alongside the lift and should match the arrow drawn on the picture
3. The lift number on the bottom of the card will be written on the evidence in the place where the lift was collected, along with brackets showing the location of the lift
    - If you do more than one lift in the same place, both numbers will be written
    - Multiple lifts will be documented on the lift cards as **Lift 1 of 2**, etc.
4. One lift on multiple cards:
    - **Each** card gets a separate number (one lift on two latent print cards)
5. When the cards are completed, the informational side will be photocopied and included with the note pages

If you take photographs of the prints also, you need to make reference to the image number on the latent print card (See image #1).

References:

1. Crime Scene Unit Manual Section 3.4
2. National Institute of Justice, et al. *The fingerprint sourcebook.* July 2011
3. United States Department of Justice Federal Bureau of Investigation LaboratoryDivision. *Processing Guide for Developing Latent Prints*. Revised 2000.

Federal Bureau of Investigation Laboratory
Processing Guide for Developing Latent Prints

Processes and Procedures Used to Develop Latent Prints

Proper Sequences and Types of Processes for Porous, Nonporous, and Some Unique and/or Difficult Surfaces

Adherence to correct processing techniques increases the probability of developing the best quality latent prints. Adherence to the listed sequences ensures the best opportunity to develop all latent prints on an object and minimizes the chance of destroying latent prints.

Surfaces on which latent prints are deposited can be divided into two basic categories—porous and nonporous. Listed below are the suggested sequential processes for porous, nonporous, semiporous, and some unique and/or difficult surfaces.

Depending on the circumstances, all of the suggested processes will not always be performed. This is left to the discretion of the examiner.

Porous Surfaces

1. Visual
2. Inherent fluorescence by laser or alternate light source*
3. Iodine fuming
4. DFO (1,8-Diazafluoren-9-one)
5. Laser or alternate light source
6. Ninhydrin
7. Physical developer

* Alternate light source includes ultraviolet (UV) light

Nonporous Surfaces

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. Cyanoacrylate fuming
4. Laser or alternate light source
5. Cyanoacrylate dye
6. Laser or alternate light source
7. Vacuum metal deposition (VMD)

8. Powder

Bloodstained Specimens—Porous

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. DFO (1,8-Diazafluoren-9-one)
4. Laser or alternate light source
5. Ninhydrin
6. Diaminobenzidine (DAB); if not available, use amido black
7. Physical developer

Bloodstained Specimens—Nonporous

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. Diaminobenzidine (DAB); if not available, use leucocrystal violet (LCV) or amido black
4. Cyanoacrylate fuming
5. Laser or alternate light source
6. Cyanoacrylate dye
7. Laser or alternate light source
8. Vacuum metal deposition (VMD)
9. Powder

Cardboard

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. DFO (1,8-Diazafluoren-9-one)
4. Laser or alternate light source
5. Ninhydrin
6. Silver nitrate

Rubber Gloves—Semiporous

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. Iodine spray reagent
4. Cyanoacrylate fuming
5. Laser or alternate light source
6. Magnetic powder
7. Cyanoacrylate dye
8. Laser or alternate light source
9. Ninhydrin
10. Distilled water rinse
11. Physical developer

When processing the nonadhesive side of tape, the integrity of the adhesive side should not be compromised by contact with cyanoacrylate dyes or other solvents. Acetate or some other substrate should be used to protect the adhesive side.

Tape—Nonadhesive Side

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. Cyanoacrylate fuming
4. Laser or alternate light source

5.Cyanoacrylate dye

5. Laser or alternate light source
6. Vacuum metal deposition (VMD)
7. Powder

Tape—Adhesive Side

Light-colored adhesive side of tape

1. Visual
2. Inherent fluorescence by laser or alternate light source

3. Sticky-side powder; alternate black powder; ash gray powder; gentian violet

4. Laser or alternate light source

Dark-colored adhesive side of tape

1. Visual

2. Inherent fluorescence by laser or alternate light source

3. Ash gray powder; Liqui-Drox*; gentian violet

4. Laser or alternate light source

* Cyanoacrylate fuming must be done on the nonadhesive side of tape, then both sides can be processed with Liqui-Drox.

Wallpaper

1. Visual

2. Inherent fluorescence by laser or alternate light source

3. Iodine spray reagent

4. Ninhydrin

5. Silver nitrate

Photographs—Emulsion Side

1. Visual

2. Inherent fluorescence by laser or alternate light source

3. Iodine spray reagent

4. Cyanoacrylate fuming

5. Laser or alternate light source

6. Cyanoacrylate dye

7. Laser or alternate light source

8. Vacuum metal deposition (VMD)

9. Powder

Photographs—Paper Side—Semiporous

1. Visual

2. Inherent fluorescence by laser or alternate light source

3. Cyanoacrylate fuming
4. Laser or alternate light source
5. Magnetic powder
6. DFO (1,8-Diazafluoren-9-one)
7. Laser or alternate light source
8. Ninhydrin
9. Cyanoacrylate dye
10. Laser or alternate light source
11. Physical developer

Glossy Paper—Semiporous

1. Visual
2. Inherent fluorescence by laser or alternate light source
3. Cyanoacrylate fuming
4. Laser or alternate light source
5. Magnetic powder
6. DFO (1,8-Diazafluoren-9-one)
7. Laser or alternate light source
8. Ninhydrin
9. Cyanoacrylate dye
10. Laser or alternate light source
11. Physical developer

Selection of Processes

In addition to the type of surface, another determining factor in choosing the proper process is the residue of the latent print, including perspiration, blood, oil or grease, and dust.

The condition of the surface also contributes to determining the correct processes. Such surface characteristics include dryness, wetness, dirtiness, and tackiness or stickiness.

Processing Techniques

Visual

Visually examine all specimens for latent prints before using any latent print development technique. Ensure that the surface is well illuminated. Turn small articles or move and adjust light to change the angle of illumination. Some latent prints may be visible only by oblique lighting. Any useful latent prints detected must be photographed before proceeding with any development process. Some friction ridge prints found by this method may not be detected by any other means. Use extreme care when handling articles to avoid damaging other prints that may not yet be apparent.

Fluorescence

Certain properties of perspiration, body oils, and/or foreign substances contained in latent print residue fluoresce when exposed to a laser or an alternate light source. A filter is used to block the incident light of the light source. No pretreatment of the specimen is required; therefore, no alteration of the specimen occurs.

Use on all surfaces

- Nondestructive to specimen and subsequent examinations
- Detects prints on surfaces not suitable for powders or chemicals
- Detects prints not developed by other techniques

Procedures for conducting an examination

- Conduct examination in a dark room
- Aim expanded beam of light at object
- View object through an orange barrier or other appropriate colored filter
- Preserve latent prints by photography

Use fluorescence examination after application of the following chemicals

- Fluorescent dyes
- DFO (1,8-Diazafluoren-9-one)
- Liqui-Drox

Checking out evidence from the Property Room:

1. Check the barcode number on the request against the entry in the computer (verify the Incident # and Case # match the request)
2. Print up a **Named List** request for the Property Room (In the Report section)
3. The Property Clerk will pull the evidence and scan it to you (chain of custody)
4. You will sign for the items on the signature pad (electronic signature)
    - Initial and date the outer packaging of each item
    - Always try to open evidence in a new place to avoid cutting through another seal
5. When the evidence is done being processed, write the barcode number, initials on the item, your brackets for photographs and lifts.
6. Place the item back into the packaging and re-seal
    - The seal should have your initials, ID # and date
7. If the item has to be **re-packaged**, the original packaging **must** be included inside
    - Write **re-packed** on the outside of the new packaging with initials and date
    - Transfer any bin location information written on the original package to the new one
    - Print a new barcode label and attach to the outside

Also, if swabbed for DNA…

- If an item was swabbed for DNA you must write **swabbed for DNA** and your initials and date on the outside of the package
- Write the barcode number and your initials on the evidence when completed
- Evidence is then re-impounded into the Property Room
- You must **sign** the items back into the Property Room

References:

1. Crime Scene Unit Manual Sections 2.0-2.3

Discussion Topics: Preparation for Module 2:

- Introduction to DNA / Blood / Trace evidence collection and circumstances surrounding collection.
- When/where to swab for DNA (example: bag, gun, knife, bottle)
- How to swab for touch DNA and blood
- Types of trace evidence (example: hair, fibers)
- How to collect trace evidence

Module 1: Note Pages

1. Any notes generated on each case will be included as a note page in the report
2. Any mistakes will be corrected by a **single line cross-out** of the mistake along with your initials
3. All photocopies of evidence will become a note page
4. All latent print cards will be photocopied and included as note pages
5. All developed prints that are photographed will be documented in the note pages showing the location of the prints that were photographed (draw a square around the area photographed and write the corresponding image #)

6. All photographs taken of evidence for note purposes should be printed and included as note pages
    - The first page of notes will be **1 of X** pages
    - The remaining pages will only be labeled with their own page number (no **of X**)
    - The last page of notes will be **X of X** pages

7. Each note page will be documented in the upper- right hand corner with:
    - Your initials and ID # (must be handwritten)
    - Date
    - Case # and/or Incident #
    - EPR (Evidence Processing Report)

8. All swabs and/or trace evidence collected will be documented in the note pages showing the locations from which they were came (draw an arrow to or a square around the location of the swab/trace evidence collected and write the corresponding barcode number)

Nomenclature for processing note page:

A – use after the final technique if there are NO results for that technique
You will only have one A per item (if used)
B – use if you have positive results and are following up with either a photograph or a lift
C – use if there is no result yet and are following up with another technique
D – use anytime you have a numerical result of something
- This will be used for all swabs, photographs and lifts

(Give them a sample of this)
Note Page Information:

1. The upper right-hand corner of all note pages must include:

    - Initials
    - ID #
    - Date
    - Case number or Incident #

    EPR (evidence processing report)

Module 1: Assignment 1

This assignment contains five items of evidence.
The evidence will be given to you in sealed packages with barcodes attached.

1. Utilize the following techniques on each item:
    - Note page photography
    - Photography (any visible and / or superglue developed prints)
    - Cyanoacrylate ester fuming
    - Magnetic Powder
    - Black powder
    - Tape lifts on latent print cards

2. Complete the following:
    - Save latent print photographs to one Master and one Working Copy disc
    - Barcode (new created evidence items / evidence sub-items)
    - Print note page photographs (document locations of photographed prints)
    - Print CSU Property Report from barcode system
    - Write report

Item #1: Disc (CD or DVD
Item #2: Can
Item #3: Box cutter
Item #4: Clear plastic bag
Item #5: Sharpie / Highlighter

Reviewed By:
Completion of exercise: _____
Name & Date

Comments:

Page _____

SAN DIEGO POLICE – CRIME SCENE UNIT – EVIDENCE PROCESSING REPORT NOTE PAGE

Incident # :		Case # :		Examiner's Initials/ID #	
Start Date:		**End Date:**		**Quantity Processed:**	

1	Visual (A = ALS)	6	Coomasie Blue	10	Gentian Violet	13B	Swabs (Blood)
2	Liquid Glue	7B	Sticky Side Powder (Black)	11	Mikrosil	13D	Swabs (DNA)
4A	Ninhydrin (Acetone)	7W	Sticky Side Powder (White)	12	Photography	14	Tape Lift (s)
4H	Ninhydrin (Heptane)	8	Black Powder	12S	Scans	15	Other Additional Items
5	Magnetic Powder	9	Cyanoacrylate Ester	13	Swabs (Not Blood or DNA)	16	Other – Not Listed

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence & Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence& Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

images were transferred and verified on

Evidence will be impounded in accordance with Crime Scene Unit policy.
Form CS-2 -(Version 10) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

1	Visual (A=ALS)	7W	Sticky Side Powder (White)	13	Swab (not blood or DNA)
4A	Ninhydrin (Acetone)	8	Black Powder	13B	Swab (blood)
4H	Ninhydrin (Heptane)	9	Cyanoacrylate Ester Fuming	13D	Swab (DNA)
5	Magnetic Powder	11	Mikrosil	14	Tape Lift (s)
6	Coomasie Blue	12	Photography	15	Other additional items
7B	Sticky Side Powder (Black)	12S	Scans	16	Other – not listed

Page ________

CRIME SCENE UNIT

Case or Inc.#:_______________

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Evidence will be impounded in accordance with Crime Scene Unit policy.

Printed Copies are Not Controlled

Form CS-2 continued -(Version 9) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Introduction to DNA / blood / trace

- Location of supplies
- Swabbing techniques / demonstration
- Wet
- Making bindles
- Sticky lifts
- Documentation of envelopes
- Types of evidence
- Packaging
- Note pages
- Photographs

DNA / Blood

You will need:

- Nanopure water
- Sterile cotton tipped applicators
- Manila envelopes (one small and one large)
- Freezer packet

1. Always wear a mask and gloves when handling evidence that will be swabbed for DNA
2. Wet the tip of a cotton tipped applicator with one or two drops of water
3. Do not saturate the swab
4. Run the applicator over the area to be swabbed
    - Concentrate the swab to the tip if it's a small area (example: small blood drop) and write "Tip Only" on envelope, otherwise roll/rotate swab.
5. Insert the used swab into the smaller manila envelope (do **not** snap off the stick)
6. Insert the small manila envelope into the larger envelope
7. Seal the large manila envelope with evidence tape

Document the envelope with:

- What is inside (one swab of possible DNA evidence / apparent hair / apparent fiber)
- Where it came from (collected from the mouth of the beer bottle)
- The barcode number of the item that was swabbed (beer bottle – 10045894)
- Your initials and ID #
- Date and time of collection
- Adhere the new (created) barcode label
- Write the new barcode number next to the label in case the label comes off

Fill out the information on the freezer pack

    - Cross off Item # and put Inv # (inventory) there
    - Write in the assigned inventory numbers (located on the barcode label)
- Place the sealed swab envelopes inside the freezer pack
- Swabs should dry for at least 24 hours before placing in freezer
- Store the freezer packs in the freezer until impounded

Special circumstances (DNA)

Firearms:

- Swab the textured areas **before** print processing
- Swab the entire surface **after** print processing
- Will discuss new processing steps when (only) prints are visible

Knives:

- Swab the blade and handle separately for people crimes
- Swab the entire knife for property crimes

Water/soda bottles:

- Swab the mouth area and inside the cap (if there) with one swab

DO NOT SWAB:

- Porous items (FB will take cuttings)
- Cartridges
- Cigarette Butts (FB should process first)

Trace Evidence (hairs/fibers)

You will need:

- Clean paper to make a bindle (or Post-It note)
- Manila envelope
- Freezer packet

To make a bindle from a standard sheet of paper:

- Fold the paper into thirds lengthwise
- Then fold the paper into thirds widthwise

Collect trace evidence using gloved fingers when possible

- Tweezers can damage hairs/fibers
- Use plastic forceps if necessary (make sure they are sterilized)
- Place the trace evidence into the bindle and re-fold
- Place the bindle into the manila envelope
- Label the envelope (see above)
- If the evidence is apparent hairs – store in the freezer
- If the evidence is fibers – impound with regular evidence
- If you are not sure – store in the freezer

References:

1. Crime Scene Unit Manual Section 3.22 and 3.23

Module 3: Alternate Light Source (ALS)

Introduction to the ALS:

- Setting up the ALS
- How to use the ALS
- When to use the ALS
- How to photograph using the ALS
- Documentation

1. The ALS emits high intensity ultraviolet, visible and infrared light. The ALS can fluoresce untreated prints (visual examination) or prints treated with chemicals or fluorescent powders. The ALS will fluoresce prints treated with cyanoacrylate ester fuming, Rhodamine 6G, Basic Yellow, Ardrox, DFO, Ninhydrin (porous items) and fluorescent powders.

Crime Light 4x4 and 8x8

There are three available wavelengths:

- *Blue (430 - 470 nm)*
- *Blue/green (460 - 510 nm)*
- *Green (500 – 550 nm)*

1. Place the item under the camera / Crime Light box.
2. Wear the appropriate goggles (lower wavelengths use yellow, mid-range wavelengths use orange and higher wavelengths (500+) use red).
3. You **MUST** wear goggles to see the fluorescence and to protect your eyes from damage.
4. Turn off all overhead lights and view the item with the ALS. Start with the lower wavelengths and proceed to the higher wavelengths.
5. Photograph any positive results using the appropriate filter (the filter should match the color of the goggles). The filter slides into the Crime Light box, underneath the camera.

Polilight 500

1. There are ten available wavelengths and UV light ranging from 415 nm to 650 nm.

2. The Polilight must be used in a room that can become completely dark.

3. Plug in the Polilight (cord attaches to the back) and insert the light cord into the receptacle in the front.

4. Turn on the power (located on the back side).

5. Wear the appropriate goggles and turn off the overhead lights. Press the **000** button before turning off the lights and you will have white light to see by.

6. Check the controls with the light and go through each wavelength from lowest to highest. Descend back down to the lowest wavelength and start again with the evidence.

7. Photograph any positive results using the color filter that matches the goggles.

8. Let the Polilight cool down before putting it away.

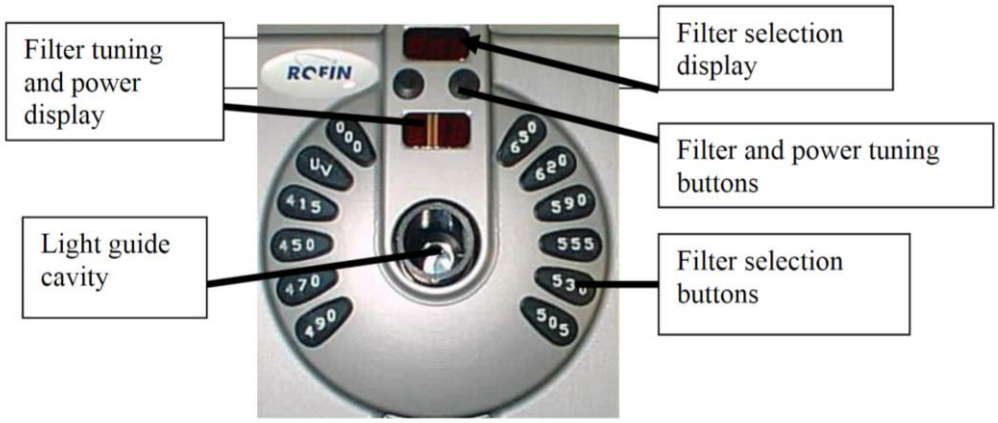
9. Record the wavelengths used on your worksheet.

Example:

I used Polilight PL500 ALS and viewed each item using wavelengths UV and 415 – 650 nm.

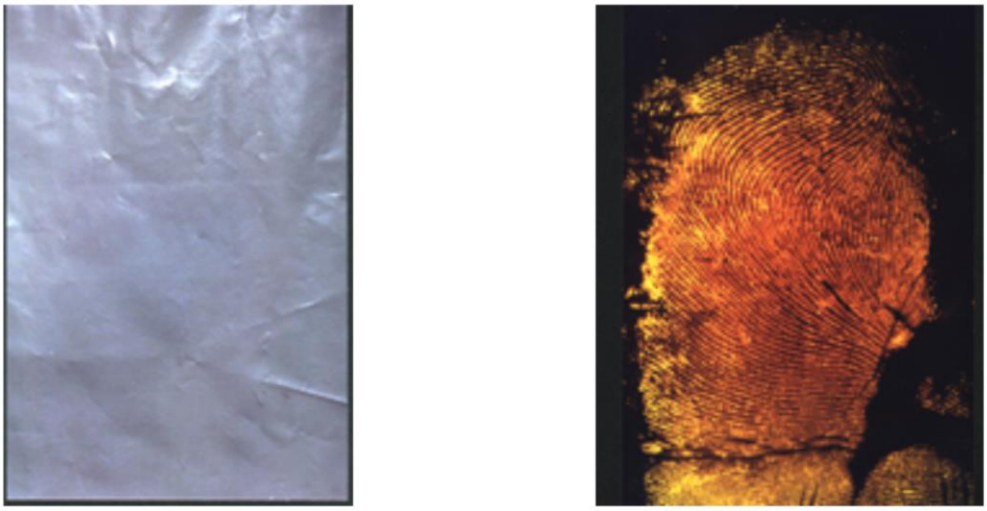
Barcode # / Item Type	01234567 / Bottle
Filter	Orange # OG550
Wavelength	450 nm
Image #	1 – 2

Twelve filter positions are provided which are selectable by individual filter selection buttons on the front control panel. The picture below shows a view of the front control panel of the PL500. Filter selection is provided by simple single button selection. An internal stepper motor driven filter wheel will then locate the correct filter and that light band will be emitted from the light guide.



The PL500 has 12 selectable output light bands which are described below. There is also an Infra-Red option

Band	Color	Band Width	General Application
400-680nm	White light band	280nm	General searching (footprints)
350nm	Ultra Violet band	80nm	General searching (stains fingerprints)
415nm	Violet (blood filter)	40nm	Blood prints, splatter, gunshot residue
450nm	Blue	100nm	General searching (semen, urea, fibers)
470nm	Blue	40nm	General searching (ninhydrin prints)
490nm	Blue	40nm	General (semen, urea, fibers)
505nm	Blue/Green	40nm	Superglue and ninhydrin treated prints
530nm	Green	40nm	DFO treated prints, background reduction
555nm	Green/Orange	27nm	DFO treated prints, background reduction
590nm	Orange	40nm	Ninhydrin treatments, background reduction
620nm	Orange/Red	40nm	Ninhydrin treatments, background reduction
650nm	Red	40nm	Ninhydrin treatments, background reduction
IR	Infra-Red	240nm	Document examination.



Fingerprint on plastic treated with superglue and Ardrox and viewed under daylight (left) and then illuminated with Polilight UV and viewed through 490nm filter (right).

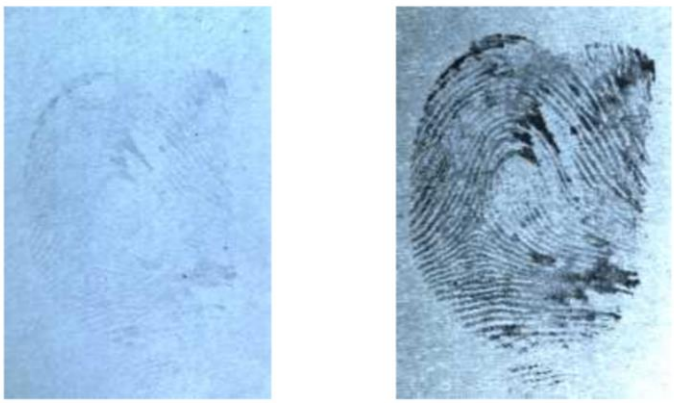
Differential Absorption

Materials can reflect light that falls on it but also absorb it. Certain materials will be better absorbers of certain colored light and better reflectors of other colors. This effect can be used to reduce background interference when attempting to capture fingerprint images.

Example: After either chemical treatment or powdering, fingerprints on multicolored backgrounds may not be able to be fully photographed. Colors in the background can be eliminated through the use of differential absorption whereby colored lighting matched to the background can eliminate background interference.

A ninhydrin treated finger print on a colored background (left) is enhanced by illumination with a bluish colored light (right). The red of the ninhydrin absorbs the blue light and this also helps to enhance the fingerprint.

Example : Blood absorbs purple light (415nm) so a blood finger print can appear dark against its background when illuminated with purple light.



Faint blood fingerprint viewed in daylight (left) and then under Polilight 415nm light (right).

Discussion Topics:

- DCS5 Fingerprint Imaging Workstation

Reference:

1. Crime Scene Unit Manual Section 3.1-3.8
2. National Institute of Justice, et al. *The fingerprint sourcebook.* July 2011
3. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.
4. Rofin Australia Pty. Ltd. Polilight PL500 Version 2 Instruction Manual.

Module 3: Fluorescent Powder

Introduction to powders:

- Sterile applicators / powder
- Plenum wall
- Latent print cards
- Tape / techniques

1. Use fluorescent powders **after** superglue
2. The powders available are pink, yellow and green

Fluorescent Powder

1. Follow the same directions above for magnetic powder application
2. Photograph positive results using the ALS
3. Make sure the lift card has the appropriate contrast for the powder used
4. Should be able to see the lift easily on a black latent print card

References:

1. Crime Scene Unit Manual Section 3.6
2. National Institute of Justice, et al. *The Fingerprint Sourcebook*. July 2014.
3. Fisher, Barry A.J. and David R. Fisher. *Techniques of Crime Scene Investigation*. EighthEdition. 2012.
4. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.
5. Police Scientific Development Branch (London). *Scene of Crime Handbook of FingerprintDevelopment Techniques.* 1993.

The Fingerprint Sourcebook
Chapter 7 Development

7.10.1 Background

As early as 1933, fluorescence examination with UV light was suggested as a method of visualizing latent prints dusted with anthracene powder on multicolored surfaces (Inbau, 1934, p 4). Before the late 1970s, UV fluorescent powder was used occasionally and appears to have been the only credible fluorescent method of latent print detection. In 1976, researchers at the Xerox Research Centre of Canada discovered inherent latent print fluorescence via continuous wave argon ion laser illumination. Shortly there-after, the first latent print in a criminal case was identified, using inherent luminescence via laser excitation (fingerprinton black electrical tape) (Menzel and Duff, 1979, p 96).

Since the late 1970s, advancements in the technology of fluorescence detection have greatly aided the hunt for many types of forensic evidence. Today, evidence that would be barely perceptible or even invisible undernormal lighting is routinely intensified by fluorescence. Bloodstains, semen, bruises, bone fragments, questioned documents, flammable residues, fibers, and fingerprints allmerit examination with a forensic light source or laser.

7.10.2 Theory

Visible light consists of electromagnetic radiation of different colors and wavelengths. When light passes through a prism, it is separated spatially according to wavelengths, resulting in the classic colors of the rainbow. Violet light has the highest energy and the shortest wavelength (ap- proximately 400 nm, where a nanometer is one-billionth ofa meter), whereas red light has the lowest energy and thelongest wavelength (approximately 700 nm), with green, yellow, and orange being intermediate in energy and wave-length (Champod et al., 2004, pp 41–76). Atoms and molecules have different unique arrangements of electrons around their nuclei, corresponding to different discrete “energy levels”. When light falls on a surface, a photon of light is absorbed if the energy of the photon exactly matches the difference in energy between two of the energy levels of the molecules of the surface substance. If light of a particular color or energy does not match the difference in energy, it is reflected.

The color of the surface ismade up of the colors of light that are reflected and is not the color corresponding to the wavelengths of light that areabsorbed. Objects that are different colors are absorbing and reflecting different wavelengths of light. For example, chlorophyll, which

gives leaves their green color, absorbs strongly at the red and blue ends of the visible spectrum, but reflects green light. We see the world by observing thewavelengths of light reflecting off objects all around us.

After a molecule absorbs light and is raised to a higherenergy level, it tends to relax back to the lowest level or "ground state" by giving off energy as heat, usuallythrough collisions with other molecules. In some molecules, however, the excess absorbed energy is given off in the form of light. This is photoluminescence. If theemission is immediate, it is termed fluorescence. If it is long-lived, it is phosphorescence. Fluorescence stops within nanoseconds when the forensic light source is turned off, whereas phosphorescence will continue. Theglowing numbers of a darkroom timer are an example ofphosphorescence.

The excited molecule will lose some of its energy before it emits light as photoluminescence. As a result, the emitted light is of a different color or wavelength than the excitationlight (Figure 7–15). The fluorescence is said to be "red- shifted", meaning that it is to the red side of the electro- magnetic spectrum in relation to the incident light from theforensic light source. The difference in the wavelengths of the exciting and emitted light is called the Stokes shift. When using fluorescence to view a fingerprint, the viewingor barrier filter blocks the reflected wavelengths of light from the light source while allowing the fluorescent wave-lengths to pass through.

Fluorescence examination of latent prints is extremely sensitive (Menzel, 1999, p 5). By using the correct barrier filters that will block out the light from the forensic light source being used, but not the fluorescence, a very high signal-to-noise ratio may be observed. If there is fluorescent chemical only on the fingerprint, the background will give off no signal, and the print will be easily seen glowingagainst a black background.

Fingerprint examinations may produce fluorescence fromfour sources:

- Native constituents in latent print residue
- Foreign substances picked up by the hand and transferred through deposition
- Intentional chemical enhancement
- Substrate (background) fluorescence

Some research has been aimed at identifying "native" or inherent luminescence within fingerprint residue. This fluorescence is typically weak and is thought to come fromcompounds such as riboflavin and pyridoxin (Dalrymple et al., 1977, p 106). Foreign contaminants in

fingerprint residue, such as food or drug residue, also may appear luminescent. Treatment by chemical and physical means designed to produce fluorescence, however, is generally considered to be the most productive. Dramatic results areroutinely achieved through the use of fluorescent powders,dye stains, and chemical reagents.

7.10.3Application

The use of lasers and forensic light sources pose real and sometimes irreversible health hazards. Lasers can generateenough intensity that even incidental or reflected light maydamage the unprotected eye. Filtered lamps also produce intense light and, in addition, some will generate hazardous UV radiation. The appropriate eye protection must be used in coordination with the excitation wavelengths being employed. Please read all manufacturer warnings before using any forensic light source.

To visualize latent prints via fluorescence, a specific band- width of radiation must be shone on either an untreated latent print or one treated with a fluorescent chemical. The wavelengths chosen will be determined by the chemical involved and the luminescent nature of the substrate. The evidence is then examined through viewing goggles (Figure 7–16) or filter plates that block the incident light from the forensic light source. These goggles act as a barrier filter and are fundamental in separating the incident light generated by the light source and the weak fluorescing signal emitted by the latent print. This separation of incident and emitted light signals gives fluorescence examination its sensitivity. It is important to use the correct goggles to get the optimum results as well as for health and safety considerations.

UV-only excitation does not necessarily require viewing goggles because of the invisibility to the human eye of theincident lighting; however, protective goggles, which can include clear polycarbonate lenses, should be worn duringevidence examination to protect the eyes from reflected UV radiation. Not all UV light sources produce pure UV, and a yellow viewing filter will be required if visible light is present. Photography of UV-only excited fluorescence may also require the correct UV barrier filter on the camera be- cause some films and digital media may be sensitive to theincident lighting even when the human eye is not. Protective clothing should be worn to minimize skin exposure to UV radiation.

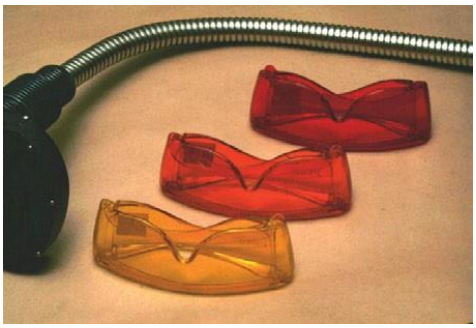
In general, yellow filters are used for incident light wave- lengths from UV to 445 nm, orange filters for light sourcesof 445–515 nm, and red filters for 515–550 nm. Specific goggles and filters will vary in transmission values and should be matched to the light source being used.

Viewing goggles are available through laser and forensic light source companies and most forensic supply houses.

Once a fluorescing image is observed, it can sometimes be “tuned” by adjusting the excitation wavelengths emit- ted by the light source, and the barrier filter used for viewing, to minimize background fluorescence and maximize contrast. The resulting image must be photographed usinga photographic filter that transmits the same wavelengths as the filter used for viewing.

FIGURE 7–16

Goggles.



Module 3: Mikrosil

Introduction to Mikrosil:

- Location of Mikrosil
- Opening a new tube
- How much to use
- Types of evidence
- Demonstration
- Taping lift to card
- Documentation of lift (reversal)

Used to lift powdered prints off difficult textured/curved surfaces

Opening a new box of Mikrosil:

1. Unwrap the Mikrosil from the tissue
2. Unscrew the red cap from the Mikrosil, turn it over and place back onto the tube
3. Push the pointed end of the red cap into the tube and twist on until completely open
4. Remove the used cap and **throw away**
5. Place the second **clean** red cap included in the box over the open end to close it

To use Mikrosil:

1. Place an unused latent print card down so the blank side is facing up
2. Squeeze out a line of Mikrosil across the card (should be a uniform line)
3. Squeeze out a line of hardener across the card next to the Mikrosil
4. The width of the hardener will be smaller but the length of the lines should be equal
5. Do not mix until ready
6. When ready, mix the two lines together quickly using a wooden spatula
7. Make sure you incorporate the two lines completely or you will have "wet" spots
8. When mixed, spread the Mikrosil over the area to be lifted
9. Be careful not to scrape the wooden spatula on the evidence
10. Spread out the Mikrosil in an even layer and let harden (several minutes)
11. Peel the hardened mixture off of the evidence
12. **Keep track of the direction of the lift as it will be in reverse**
13. Place the lift onto the lift card
14. Tape the Mikrosil down to the card using lifting tape
15. Fill out the latent print card as above

Module 3: Assignment 2

This assignment contains eight items of evidence.
The evidence will be given to you in sealed packages with barcodes attached.

You will utilize the following techniques on items 1 through 3:

- Note page photography
- Photography (any visible, superglue, fluorescent powder developed prints)
- Cyanoacrylate ester fuming
- Fluorescent powder
- Alternate Light Source
- Lifting with tape

Item #1: Crushed Can
Item #2: Disc (CD or DVD)
Item #3: Glossy magazine page

You will utilize the following techniques on items 4 through 8:

- Photography (any visible and/or superglue developed prints)
- Cyanoacrylate ester fuming
- Magnetic powder
- Mikrosil for lifts

Item #4: Plastic grocery bag
Item #5: Plastic bottle
Item #6: Box cutter (with blade that needs to be removed and processed)
Item #7: Cup with lid
Item #8: Plastic spoon

Complete the following:

- Save photographs to one Master and one Working Copy disc
- Barcode newly created items (evidence sub-items)
- Print note page photographs (document locations of photographed prints)
- Print CSU Property Report from barcode system
- Write report

Reviewed By:
Completion of exercise: _____

Name & Date

Comments:

_____

_____

_____

Module 3: Assignment 2
(Observation Notes)

Page _____

SAN DIEGO POLICE – CRIME SCENE UNIT – EVIDENCE PROCESSING REPORT NOTE PAGE

Incident # :		Case # :		Examiner's Initials/ID #	
Start Date:		**End Date:**		**Quantity Processed:**	

1	Visual (A = ALS)	6	Coomasie Blue	10	Gentian Violet	13B	Swabs (Blood)
2	Liquid Glue	7B	Sticky Side Powder (Black)	11	Mikrosil	13D	Swabs (DNA)
4A	Ninhydrin (Acetone)	7W	Sticky Side Powder (White)	12	Photography	14	Tape Lift (s)
4H	Ninhydrin (Heptane)	8	Black Powder	12S	Scans	15	Other Additional Items
5	Magnetic Powder	9	Cyanoacrylate Ester	13	Swabs (Not Blood or DNA)	16	Other – Not Listed

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence & Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence& Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

images were transferred and verified on

Evidence will be impounded in accordance with Crime Scene Unit policy.
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Module 3: Assignment 2
(Observation Notes)

1	Visual (A=ALS)	7W	Sticky Side Powder (White)	13	Swab (not blood or DNA)
4A	Ninhydrin (Acetone)	8	Black Powder	13B	Swab (blood)
4H	Ninhydrin (Heptane)	9	Cyanoacrylate Ester Fuming	13D	Swab (DNA)
5	Magnetic Powder	11	Mikrosil	14	Tape Lift (s)
6	Coomasie Blue	12	Photography	15	Other additional items
7B	Sticky Side Powder (Black)	12S	Scans	16	Other – not listed

Page ________

CRIME SCENE UNIT

Case or Inc.#:______________

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Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

Final Results	
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
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Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

Final Results	
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
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Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

Final Results	
	Latent Print Cards
	Photos / Scans
	Additional Items

Evidence will be impounded in accordance with Crime Scene Unit policy.
Printed Copies are Not Controlled

Form CS-2 continued -(Version 9) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Module 4: Sticky-Side Powder

Introduction to sticky-side powder:

- Location of chemicals
- What types of evidence
- How to use the sticky-side powder
- Controls

Reacts with the sebaceous and lipid components of prints

Use on adhesive surfaces and labels

1. The powders available are black and white
2. The powder used should provide a good contrast to the evidence
3. Place the needed amount of powder (based on the size of the item) into the provided container
4. Add enough Photo-Flo/distilled water solution to make a usable liquid suspension
    - Don't make it too thick or it won't rinse well
    - Must make a new control for each batch created
5. Paint the liquid suspension onto the evidence using the provided paint brush
6. Let the solution sit for approximately 30 seconds
7. Rinse the solution under a gentle stream of water
8. Let the evidence air dry
9. Examine and photograph any positive results
10. Check the positive control box for "7" on the note page

You MUST process the non-adhesive side of the evidence first:

- Visual, photography, Cyanoacrylate Ester fuming, magnetic powder, black powder and swabbing…All before using Sticky Side Powder.
- Sticky Side Powder is a non-sterile technique.

Reference:

1. Crime Scene Unit Manual Section 3.18
2. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.
3. Police Scientific Development Branch (London). *Scene of Crime Handbook of FingerprintDevelopment Techniques.* 1993.

Sticky-Side Powder

Sticky-side powder is used to process the sticky side of adhesive tapes and labels for latent prints.

Equipment

Petri or shallow dish, camel-hair or small brush

Materials and Chemicals

- Sticky-side powder
- Photo-Flo™ 200 solution

Mixing Procedure

Sticky-side powder .....1 tsp

Photo-Flo™ 200 solution

Place the sticky-side powder in a petri or shallow dish. Photo-Flo™ 200 must be diluted with distilled water by 50% to make Photo-Flo™ 100. Add Photo-Flo™ 100 solution to the powder and stir until mixture is the consistency of thin paint.

Processing Procedure

The solution is painted on the adhesive surface of the tape with a camel-hair or small brush. Allow to set for 30 to 60 seconds, then rinse off the solution with a slow stream of cold tap water. Allow to dry. Repeat procedure if necessary.

Storage

Not applicable

Shelf Life

Prepare as needed

Disposal

Observe all federal, state, and local environmental disposal regulations.
State and local disposal regulations may differ from federal disposal regulations.

(See page 63 for chart)

Sticky-side Powder™

Introduction

Sticky-side Powder™ is used to process the sticky-side of adhesive tapes and labels for latent prints. As with any chemical process, we suggest that you experiment on non-evidence items to become familiar with this process before using it on evidence.

Excellent results

duct tape	masking tape	packing labels
adhesive bandages	plastic surgical tape	double-sided foam tape
paper-backed label	clear plastic tape	reinforced packing tape

Good to fair results

cloth surgical tape — frosted plastic tape
adhesive edge of 3M™ Post-it® notes

Poor results

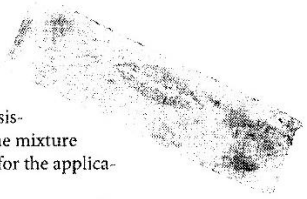
black electrical tape (due to poor contrast)
some paper labels and tapes and labels with dried-out adhesives
some contact papers or shelf papers

Safety

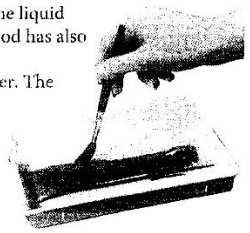
A dust mask is recommended when measuring the powder to prevent inhalation of particles. Once mixed, the material should not be ingested.

Mixing Instructions

Method One



- Place approximately equal amounts of water, Photo-Flo 200 and Sticky-side Powder™ into a small jar or beaker. It should be the consistency of thin paint. More liquid or powder can be added to make the mixture thicker or thinner as the need dictates. Mix a total volume suitable for the application at hand.
- Use a small brush or camelhair fingerprint brush to "paint" the liquid mixture onto the adhesive side of the tape or label. This method has also been found to work on the non-adhesive side of some tapes.
- Leave it on for 10 to 15 seconds and then rinse it off with water. The tape can be rinsed under running water, but the preferred method is to gently agitate it in a bowl of water.
- When most of the solution is rinsed off of the tape or label, examine it. Photograph any developed latent prints.
- If the solution is left on too long, it becomes difficult to rinse off. The solution may adhere too strongly to some tapes and



Lightning Powder Company (2 of 2)

labels. The solution may be applied but it must be rinsed immediately. The other alternative is to use Method Two for these types of tapes and labels.

Method Two

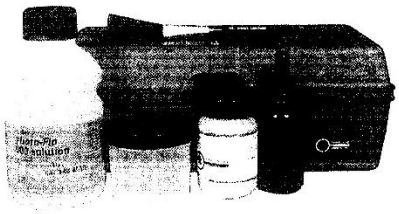
An alternative method for processing adhesive tapes and labels which are not suitable for the painting process, is a soaking process. Add some Sticky-side Powder™ to a bowl or tray of water. The rinse water left over from Method One can be saved and used for this method.
Agitate the bowl of water to stir up the Sticky-side Powder™ and submerge the tape pieces or labels with the sticky side up.
Allow the floating particles of Sticky-side Powder™ to settle on the tape. This process may take some time to develop the latent prints. The resulting prints may also be rather faint.

Method Three

- Another variation is to add some Sticky-side Powder™ to a bowl or tray of water which can be closed. The rinse water left over from Method One can be saved and used for this method.
- Agitate or shake the container to stir up the Sticky-side Powder™ until a large head of foam appears.
- Pass or draw the tape through the foam only.
- Rinse the tape as usual.

Kit Components

We offer a kit which contains 50 grams of Sticky-side Powder™, 473 ml (one pint) of Photo-Flo, a camelhair brush, spoon, dropper bottle, mixing jar, and instructions, all in a handy kit box.



Photography

Photography of latent prints developed with Sticky-side Powder™ should not pose any problems if the surface background is a light color. If the surface is a dark color but will fluoresce, it may be beneficial to use fluorescence examination to enhance the photographic contrast. If dark tape does not fluoresce, consider using TapeGlo™ instead. See page 52 for more information.

Ordering Information

Catalog No. 1-2722 ..... Sticky-side Powder™, 50 grams
Catalog No. 1-2727 ..... Photo-Flo, 16 oz.
Catalog No. 1-2723 ..... Sticky-side Powder Kit

Module 4: Gentian Violet

Introduction to Gentian Violet:

- Location of chemicals
- What types of evidence
- Location of trays / beakers
- Control / documentation

Reacts with the fatty constituents of sebaceous sweat producing an intense purple image

Use on adhesive surfaces

Gentian Violet Process Steps:

1. Place a very **small** amount of crystals into a beaker or shallow pan
2. Fill with water
3. Stir well until the crystals dissolve
4. The water will be a very intense purple color
5. You must make a new control for each batch created
6. Dip the evidence into the solution and keep submerged for approximately 30 seconds
7. Remove the evidence from the solution and rinse under a gentle stream of water
8. Let the evidence air dry
9. Examine and photograph any positive results
10. Check the positive control box for "10" on the note page

You MUST process the non-adhesive side of the evidence first

References:

1. Crime Scene Unit Manual Section 3.17
2. Fisher, Barry A.J. and David R. Fisher. *Techniques of Crime Scene Investigation*. EighthEdition. 2012.
3. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.

Gentian Violet

Gentian violet is used to develop latent prints on the adhesive side of tape.

Water-soluble, adhesive-type tapes should not be processed by this method.

Equipment

Scales, beakers, magnetic stirrer and stirring bar, glass tray, clear or dark storage bottles

Materials and Chemicals

- Gentian violet

Mixing Procedure

Gentian violet ..... 1 g

Distilled water ..... 1000 mL

Combine the ingredients and place on a stirring device for approximately 25 minutes.

Processing Procedure

Gentian violet is applied by dipping. When processing, place the specimen(s) in the gentian violet solution for approximately 1 to 2 minutes, then rinse with cold tap water.

The gentian violet solution can be reused.

Storage

Clear or dark bottles

Shelf Life

Indefinite

Disposal

Observe all federal, state, and local environmental disposal regulations.
State and local disposal regulations may differ from federal disposal regulations.

(See page 63 for chart)

Module 4: Ninhydrin

Introduction to Ninhydrin:

- Heptane v. Acetone
- Control / documentation
- Fume hood
- Thermal papers (receipts) – Acetone
- Scanning (refer to page 10)
- Caron Fingerprint Chamber

Reacts with amino acids and possibly other components producing a purple image

Use on paper products and other porous surfaces

Two types available:

1. Heptane
2. Acetone

- Heptane should be used on items that have writing (preserves the ink better)
- Each solution is made in large batches
- Each batch is control tested (no need to make new control for each use)
- Can be used by pouring / spraying directly onto the evidence or by dipping the evidence into a pool of solution in the tray
- Hang the item to dry over the drip tray
- After the item dries, remove it from the clips, and store in a plastic sleeve for 10 days (the plastic sleeve needs to have necessary case information printed on it)
- Examine and scan any positive results
- When done, place the item into a plastic pouch and seal it
- Place a chemical sticker (orange sticker) on the outside of the plastic pouch
- Check the positive control box for "4" on the note page

3. On your plastic pouch and note pages you need to document your start and end date (also any dates you checked your item for prints in between).

4. An iron can be used for steam to help develop prints after 10 days.

5. Evidence treated with Ninhydrin only needs to be in the hood when applying the Ninhydrin and while it is drying. Once dry it can be removed from the hood.

References:

1. National Institute of Justice, et al. *The Fingerprint Sourcebook*. July 2014.
2. United States Department of Justice Federal Bureau of Investigation Laboratory Division. *Processing Guide for Developing Latent Prints*. Revised 2000.
3. Police Scientific Development Branch (London). *Scene of Crime Handbook of FingerprintDevelopment Techniques.* 1993.

Ninhydrin (Petroleum Ether Base)

Ninhydrin is used to develop latent prints on porous surfaces. Ninhydrin reacts with the amino acids present in perspiration.

Equipment

Scales, beakers, graduated cylinder, brush, glass tray, magnetic stirrer and stirring bar, humidity chamber, iron, sprayer, dark storage bottles

Materials and Chemicals

- Ninhydrin
- Methanol
- Isopropanol
- Petroleum ether

Mixing Procedure

Ninhydrin..... 5 g

Methanol ..... 30 mL

Isopropanol ..... 40 mL

Petroleum ether ..... 930 mL

The ninhydrin crystals are first dissolved in methanol on a stirring device. Then the isopropanol is added, followed by the petroleum ether.

Processing Procedure

The ninhydrin solution can be applied to a specimen by spraying, dipping, or painting. Once the solution has been applied, it must be dried before any attempt is made to accelerate the development process using a humidified environment (e.g., a humidified chamber or a steam iron). If a humidified chamber is available, set humidity between 60% and 70% for best results.

Storage

Dark bottles

Shelf Life

Up to 1 year

Disposal

Observe all federal, state, and local environmental disposal regulations.
State and local disposal regulations may differ from federal disposal regulations.

Ninhydrin was first described in 1910 when Siegfried Ruhemann mistakenly prepared the compound (Ruhemann, 1910a, pp 1438–1449). Ruhemann observed thatthe new compound reacted with skin and amino acids to produce a purple product (Ruhemann, 1910b, pp 2025–2031), and he published a series of papers detailing this and other reactions (Ruhemann, 1911a, pp 792–800; 1911b, pp 1306–1310; 1911c, pp 1486–1492). He proposed a structure for the deeply colored product (Ruhemann, 1911c, pp 1486–1492), today known as Ruhemann's purple, and commented on the possible application of the reaction to the detection of trace amounts of amino acids and protein products in biological samples (Ruhemann, 1911a, pp 792–800).

Following Ruhemann's discovery, ninhydrin found wide-spread use in analytical chemistry and biochemistry applications. As early as 1913, the reaction with amino acids was an important diagnostic test for the presenceof protein and amine compounds in biological samples (Crown, 1969, pp 258–264; Friedman and Williams, 1974, pp 267–280). With the advent of chromatography, the reaction became even more useful for the location of amino acids on paper chromatograms or in fractions produced by liquid chromatography (Crown, 1969, pp 258–264; Smith and Agiza, 1951, pp 623–627).

Ruhemann's purple and other by-products of the ninhydrinand amino-acid reaction were also used to quantitatively measure amino acid content of samples (Yemm et al., 1955, 209–214; Smith and Agiza, 1951, pp 623–627). The reagent was so powerful and versatile that some authors suggested it was the most widely used reaction in analytical laboratories (Friedman and Williams, 1974, pp 267–280).

This use of ninhydrin was frequently accompanied by warnings to avoid contact between bare skin and any surfaces to come into contact with the reagent (Crown, 1969, pp 258–264). This was due to the strong reaction between ninhydrin and sweat, which would cause the appearance of fingerprints on chromatograms (Crown, 1969, pp 258– 264; Odén and von Hofsten, 1954, pp 449–450). Despite these warnings, which clearly indicated the ability of ninhydrin to develop fingerprints, the reagent was not applied in a forensic context until 1954 (Odén and von Hofsten,1954, pp 449–450).

Following this initial report, ninhydrin rapidly became an in-dispensable tool in the detection of latent fingerprints, withwidespread use among jurisdictions being documented as early as 1959 (Speaks, 1964, pp 11–13, 23). The technique is now amongst the most popular methods for fingerprint detection on paper and other porous substrates (Champod et al., 2004, pp 114–136). This method has limitations, how-ever, and chemists have addressed these limitations by thesynthesis of analogues—compounds structurally related to ninhydrin that exhibit similar reactions with amino acids— to improve the clarity of the developed fingerprint (Almog, 2001, pp 177–209). Several of these analogues were highlysuccessful (e.g., 1,8-diazafluoren-9-one [DFO], 1,2-indanedione, and 5-methylthioninhydrin), although none have been able to completely replace ninhydrin as the most frequently used technique (Almog, 2001, pp 177–209).

Fingerprint Detection by Amino Acid Reagents

Some fingerprints are created by the deposition of sweatfrom the fingers when they come into contact with a sur-face. This sweat consists mainly of aqueous components, Structural studies of the reaction product have confirmed that Ruhemann's original product structure was correct andthat the reaction with amino acids produces the ammonium salt of Ruhemann's purple (Ruhemann, 1911c, pp 1486–1492; Grigg et al., 1986, pp 421–422; 1989, pp 3849–3862).

This reaction is complex and requires a finely tuned set of conditions in order to progress at a reasonable rate. The pH of the reaction must be above 4 (Friedman and Williams, 1974, pp 267–280; Bottom et al., 1978, pp 4–5) and ideally should be between 4.5 and 5.2 (Grigg et al., 1989, pp 3849–3862). Development in a high-humidity environment is of utmost importance (Champod et al., 2004, pp 116–117; Almog, 2001, pp 177–209) because water is a necessary reactant. Finally, because Ruhemann's purple isknown to degrade in the presence of light and oxygen, thetreated fingerprint should be stored in a dark, cool place (Friedman and Williams, 1974, pp 267–280; Joullié et al., 1991, pp 8791–8830). Ninhydrin-treated fingerprints are colored purple and exhibit excellent contrast and clarity of detail (Champod et al., 2004, p 117; Almog, 2001,pp 177–209).

7.4.3 Application

Several ninhydrin formulations have been reported in the literature (Crown, 1969, pp 258–264; Odén and van Hofsten, 1954, pp 449–450; Speaks, 1964, pp 11–13, 23; Champod et al., 2004, pp 117–120; Almog, 2001, pp 177–209; Everse and Menzel, 1986, pp 446–454; Clay,

1981, pp 12–13). Ninhydrin solutions are typically prepared in two steps: first, a stock solution is prepared that has a high proportion of polar solventto facilitate the stability of the mixture; second, a portion of the stock solution is diluted with a nonpolar carrier solvent to produce a reagent suitable for application to evidential items.

Application of ninhydrin working solutions can be per- formed by dipping, spraying, or brushing (Odén and van Hofsten, 1954, pp 449–450; Speaks, 1964, pp 11–13, 23),with the dipping method preferred in most instances. Theitem to be examined is briefly submerged in the working solution and allowed to air-dry to evaporate the solvent (Champod et al., 2004, pp 116–117).

Following treatment with ninhydrin solution, development should ideally proceed at room temperature, in a dark and humid environment (50–80% humidity), for a period of 1–2 days (Champod et al., 2004, pp 116–117). If ambient humidity is low, development in a specialized, humidity controlled fingerprint development chamber may be necessary (Almog,2001, pp 177–209). The development may be accelerated by the application of steam or heat, but this may result in agreater degree of background development, reducing the clarity and contrast of the resulting fingerprints (Almog, 2001, pp 177–209). Steaming can be achieved by holdinga steam iron above the exhibit; heat can be delivered in apress, oven, fingerprint development cabinet, or by a microwave oven and should not exceed 80 °C (Almog, 2001,pp 177–209).

Ninhydrin crystals may be ground in a mortar and pestle toform a fine powder and applied directly to the fingerprints with a fingerprint brush (Almog, 2001, pp 177–209). This method is slow and produces only faint prints but maybe suitable for some types of heat- or solvent-sensitive paper (Wakefield and Armitage, 2005). Ninhydrin may alsobe applied by a fuming method; a forensic fuming cabinet is used to heat the ninhydrin until it sublimes, allowing gaseous ninhydrin to deposit on the fingerprint residues (Schwarz and Frerichs, 2002, pp 1274–1277). The reagent ismost suited to paper, although any porous substrate may give visible results, and some nonporous substrates have been reported to produce visible fingerprints (Herod and Menzel, 1982a, pp 200–204; Speaks, 1966, pp 3–5).

Metal Salt Post-Treatment

The application of zincor cadmium salts to ninhydrin-developed fingerprints will result in an immediate color change from purple to orangeor red, respectively (Lennard et al., 1987, pp 597–605). Note that the use of zinc is preferred to cadmium becauseof cadmium’s toxicity.

Dipping the exhibit into the solutionis preferred over spraying because of the toxicity of some of the reagents. If humidity is low, a short blast of steam may be required to produce development. However, the humidity must be carefully controlled if zinc salts are usedbecause high moisture levels cause the formation of an unstable, nonfluorescent, red complex that will reduce the contrast of the resulting fingerprint (Stoilovic et al., 1986, pp 432–445; Davies et al., 1995a, pp 565–569). Post-treated fingerprints may be further enhanced by view-ing under 490 nm light (for zinc-treated residues) or 510 nmlight (for cadmium-treated residues) (Champod et al., 2004,p 120; Stoilovic et al., 1986, pp 432–445). Fluorescence may be induced by submerging the article in liquid nitro- gen and exciting the treated fingerprint with the above- mentioned wavelengths of light. The fluorescent emissionsshould be viewed using a 550–570 nm band-pass filter or a 550 nm long-pass filter (Champod et al., 2004, pp121–124).

Module 4: Assignment 3

This assignment contains fourteen items of evidence.
The evidence will be given to you in sealed packages with barcodes attached.

You will utilize the following techniques on items 1 through 5:

1. Photography (any visible, superglue, sticky-side powder developed prints)
2. Cyanoacrylate ester
3. Magnetic Powder
4. Black Powder
5. Lifting
6. Sticky-side powder (three black and three white)

Items 1 through 2 will be processed with black Sticky-Side Powder
Item #1: Gray duct tape
Item #2: Clear tape
Items 3 through 5 will be processed with white Sticky-Side Powder
Item #3: Black electrical tape (layered)
Item #4: Gray duct tape
Item #5: Clear tape

You will utilize the following techniques on items 6 through 8:

1. Photography (any visible, superglue, Gentian Violet developed prints)
2. Cyanoacrylate ester
3. Magnetic Powder
4. Black Powder
5. Lifting
6. Gentian Violet

Items 6 through 8 will be processed with Gentian Violet
Item #6: Gray duct tape
Item #7: Clear tape
Item #8: Label

You will utilize the following techniques on items 9 through 14:

1. Photography (any visible, superglue, heptane developed prints)
2. Cyanoacrylate ester
3. Ninhydrin (three acetone and three heptane)

Items 9 through 11 will be processed with Heptane Ninhydrin
Item #9: Paper
Item #10: Cardboard
Item #11: Envelope
Items 12 through 14 will be processed with Acetone Ninhydrin
Item #12: Receipt
Item #13: Wood
Item #14: Color Sticky Note

Complete the following:

1. Save photographs to one Master and one Working Copy disc
2. Barcode newly created items (evidence sub-items)
3. Print note page photographs (document locations of photographed/scanned prints)
   - (Refer to page 10 for scanning and/or photography)
4. Print CSU Property Report from barcode system
5. Write report

Reviewed By:

Completion of exercise: _____

Name & Date

Comments:

_____

_____

_____

Module 4: Assignment 3
(Observation Notes)

Page _____

SAN DIEGO POLICE – CRIME SCENE UNIT – EVIDENCE PROCESSING REPORT NOTE PAGE

Incident # :		Case # :		Examiner's Initials/ID #	
Start Date:		**End Date:**		**Quantity Processed:**	

1	Visual (A = ALS)	6	Coomasie Blue	10	Gentian Violet	13B	Swabs (Blood)
2	Liquid Glue	7B	Sticky Side Powder (Black)	11	Mikrosil	13D	Swabs (DNA)
4A	Ninhydrin (Acetone)	7W	Sticky Side Powder (White)	12	Photography	14	Tape Lift (s)
4H	Ninhydrin (Heptane)	8	Black Powder	12S	Scans	15	Other Additional Items
5	Magnetic Powder	9	Cyanoacrylate Ester	13	Swabs (Not Blood or DNA)	16	Other – Not Listed

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence & Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence& Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

images were transferred and verified on

Evidence will be impounded in accordance with Crime Scene Unit policy.
Form CS-2 -(Version 10) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Module 4: Assignment 3
(Observation Notes)

1	Visual (A=ALS)	7W	Sticky Side Powder (White)	13	Swab (not blood or DNA)
4A	Ninhydrin (Acetone)	8	Black Powder	13B	Swab (blood)
4H	Ninhydrin (Heptane)	9	Cyanoacrylate Ester Fuming	13D	Swab (DNA)
5	Magnetic Powder	11	Mikrosil	14	Tape Lift (s)
6	Coomasie Blue	12	Photography	15	Other additional items
7B	Sticky Side Powder (Black)	12S	Scans	16	Other – not listed

Page ________

CRIME SCENE UNIT

Case or Inc.#:______________

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Evidence will be impounded in accordance with Crime Scene Unit policy.
Printed Copies are Not Controlled

Form CS-2 continued -(Version 9) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Final Assignment #4

This assignment contains five items of evidence.
The evidence will be given to you in sealed packages with barcodes attached.

You will utilize any techniques you have used during your training to this point, along with the collection of trace, blood and DNA swabs.

Complete the following:

1. Save photographs to one Master and one Working Copy disc
2. Barcode newly created items (evidence sub-items)
3. Print note page photographs
    - Document locations of photographed prints (image numbers)
    - Document locations of swabs and/or trace evidence (barcode numbers)
4. Print CSU Property Report from barcode system
5. Write report

Item #1: Gun (with tape and blood) and magazine
Item #2: Knife (with blood and hair)
Item #3: Can / Bottle x2 (identical)
Item #4: Cardboard Box
Item #5: Latex glove

Reviewed By:
Completion of exercise: □ **PASS** □ **FAIL** _____
Name & Date

Comments:

Final Assignment #4
(Observation Notes)

Page _____

SAN DIEGO POLICE – CRIME SCENE UNIT – EVIDENCE PROCESSING REPORT NOTE PAGE

Incident # :		Case # :		Examiner's Initials/ID #	
Start Date:		**End Date:**		**Quantity Processed:**	

1	Visual (A = ALS)	6	Coomasie Blue	10	Gentian Violet	13B	Swabs (Blood)
2	Liquid Glue	7B	Sticky Side Powder (Black)	11	Mikrosil	13D	Swabs (DNA)
4A	Ninhydrin (Acetone)	7W	Sticky Side Powder (White)	12	Photography	14	Tape Lift (s)
4H	Ninhydrin (Heptane)	8	Black Powder	12S	Scans	15	Other Additional Items
5	Magnetic Powder	9	Cyanoacrylate Ester	13	Swabs (Not Blood or DNA)	16	Other – Not Listed

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence & Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

Barcode :		Date Rec./Coll.:		☐ Property Room	☐ Narcotics Vault	
		Packaging:		☐ Processed Prior to Impound	☐ Sealed	☐ Not Sealed

Technique, Sequence& Result												Final Results	
1													Latent Print Cards
													Photos / Scans
Qty.													Additional Items
Control +/-													
Date													

images were transferred and verified on

Evidence will be impounded in accordance with Crime Scene Unit policy.
Form CS-2 -(Version 10) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Final Assignment #4
(Observation Notes)

1	Visual (A=ALS)	7W	Sticky Side Powder (White)	13	Swab (not blood or DNA)
4A	Ninhydrin (Acetone)	8	Black Powder	13B	Swab (blood)
4H	Ninhydrin (Heptane)	9	Cyanoacrylate Ester Fuming	13D	Swab (DNA)
5	Magnetic Powder	11	Mikrosil	14	Tape Lift (s)
6	Coomasie Blue	12	Photography	15	Other additional items
7B	Sticky Side Powder (Black)	12S	Scans	16	Other – not listed

Page ________

CRIME SCENE UNIT

Case or Inc.#:_______________

A = No Visible Evidence B = Visible Evidence C = Undetermined/Process Further D = Not Applicable

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
		Packaging:		☐Processed Prior to Impound	☐Sealed	☐Not Sealed

Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Barcode :		Date Rec./Coll.:		☐Property Room	☐ Narcotics Vault	
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Technique, Sequence & Result											
1											
Qty.											
Control +/-											
Date											

	Final Results
	Latent Print Cards
	Photos / Scans
	Additional Items

Evidence will be impounded in accordance with Crime Scene Unit policy.
Printed Copies are Not Controlled

Form CS-2 continued -(Version 9) Approved by: Tom Washington, Supervising Crime Scene Specialist, 6/1/21

Module 5: Expert Witness Testimony

Expert Witness Testimony Introduction:

- Establishing yourself as an expert witness (education / training / qualification)
- Demonstrate competency in all aspects of processing and handling evidence.
- Be able to describe crime scene documentation clearly and professionally
- Learn the different court systems in which laboratory employees can testify to (superior, federal, etc.…).
- Understand how discovery motions, court orders, and outside experts are handled by the SDPD Crime Laboratory.
- Courtroom etiquette

Discussion Topics:

Courtroom testimony (PowerPoint)

Miscellaneous Information (1 of 3)

G Drive:

All photographs for note pages and all latent print photographs (1:1) will be transferred to the G drive as follows:

1. G Drive:
2. Laboratory
3. Case file:
4. Click on year:
5. Rename a working copy folder to a Case # or Inc # (if case number isn't available)
6. CSU
7. Create a new folder with description of photographs (i.e. "Evidence Processing" or "Latent Prints")
8. Upload photographs to this folder

Named List:

Printing out a list of evidence to be checked out from the Property Room:

6. Open FileOnQ
7. Clear your worklist
8. Clear the field
9. Enter the barcode number of the item to be checked out – enter
    - File
    - Worklist
    - Add current item (shortcut on toolbar)
    - Repeat process for each item to be checked out (make sure you clear the field in between)

    You can add several items at the same time from a single incident number

10. Instead of bringing up the item by barcode, go to the Incident number field and enter in
    - the Incident number – enter
    - Click on "Browse" on the toolbar
    - Select the items to be checked out by checking the appropriate boxes on the left side
    - Click "OK" at the bottom
    - File
    - Worklist
    - Add all items to worklist (shortcut on toolbar)

Miscellaneous Information (2 of 3)

When all items have been added:

- File
- Worklist
- Query worklist items
- Click on “Reports”
- External reports
- 15 Named List (a new window will pop up)
- Click on OK (another window will pop up)
- Click on the printer button (top left corner of window)
- Print screen will pop up
- Click Print

1. This will print up the list of items by the bin location for the Property Clerk

2. Some items will be at a sub-station and you will have to wait for the Property Room staff to get them.

3. Drug related items are picked up from the Narcotics Vault

Unit forms can be located in the G Drive:

- Crime Scene Unit
- Unit forms
- Or in Power DMS
- All tracked forms

Miscellaneous Information (3 of 3)

Documenting Lifts and Photographs:

1. All Latent Print Cards will be photocopied and included with note pages (information side only)
2. All photographs of developed prints will be documented in note pages:
    - A photograph of the item will be taken and the area where the prints were photographed will be outlined in the photograph (identifying which image number)

FileOnQ:

1. A CSU Property Report will be included with the report for the Technical and Administrative reviews of the reports

2. This is NOT a note page

3. You can keep the printout with your copy of the report after it has been signed

Expectations in the Processing Room:

1. Clean up after yourself
2. Restock supplies
3. Let Heidi know if supplies are running low (add to supply list)
4. If you don't know how to do something - **ASK**
5. Ask around if anyone needs to put evidence into the superglue tank if you are loading
6. Keep your paperwork clean
7. Write legibly
8. Use the correct pens for notes / documentation
9. Use the correct terminology / abbreviations (abbreviation list is on the G:drive)

NOTE: This material is subject to change, as this field is constantly evolving, and we strive to do the best quality work possible.