Latent Prints

Friction ridge detail from the fingers, palms, and feet has been a valuable method of personal identification in forensic science and criminal investigations for more than 100 years. One of the most significant benefits of this evidence is that it can establish an individual’s presence at a crime scene or contact with an object.

Friction ridge evidence is most significant when the person identified had no lawful presence where the print was found or no lawful contact with the object touched. It is the totality of the circumstances, established through an investigation, which determines the significance of a friction ridge identification in a court of law.

I. Friction Ridge Overview

Friction ridge impressions can be categorized as follows:

- Latent prints – invisible or hidden
- Patent prints – visible prints
- Plastic prints – 3-dimensional impressions

**Latent prints** are prints that require physical or chemical enhancement for collection. The processes used to recover latent prints are routinely determined by the surface of the object on which the latent prints are deposited and the condition of that surface. These surfaces can be divided into four general categories:

- **Non-porous** – surface does not absorb water: glass, metals, plastics
- **Porous** – surface absorbs water: paper, cardboard, wood
- **Semi-porous** – shiny surface which may absorb water: glossy papers, printed boxes
- **Sticky surfaces** – surface with an adhesive side: tapes, labels, stamps
Patent prints are visible prints typically resulting from a foreign substance such as blood, dirt, ink, paint, etc. These types of prints are first preserved through photography with a scale. Once these prints are captured photographically, the items may be processed as for latent prints based on the surface type.

Plastic prints, like patent prints, are visible prints usually impressed into a medium such as dust, dirt, clay, wax, soap, paint, etc. Plastic prints are first preserved through photography with a scale and then may be recovered with silicone-type casting materials.

II. Locating Friction Ridge Evidence

Even though all objects at a crime scene could be viewed as a possible source of friction ridge detail, it would be impractical, if not impossible, to process everything. When processing for friction ridge detail, the following should be considered:

- Which objects were likely to have been touched by the suspect(s)?
- Were any objects left behind at the scene?
- Will prints on the object be probative to the investigation?

This evaluation process can save valuable time at a crime scene and at the Laboratory, allowing time and resources to be directed toward items of evidentiary value.

Deciding what to process within the scene should be done systematically. Try to reconstruct the suspect’s movements outside and inside the scene if possible. Determining the following may also be helpful in locating valuable evidence linking the suspect to the scene:

- Points of entry and exit – doors, door frames, door knobs, windows, screen and window frames, broken glass, or tools used to gain entry
- Points of attack – areas where items have been disturbed, damaged or removed
Areas of restricted movement – narrow hallways, stairways and cluttered areas may result in inadvertent touching of walls, handrails and other obstructions.

Once it is determined what items are to be processed for prints, any fragile or transient evidence should be considered first. Each item should be evaluated separately as to the following:

- Can the item be collected or must it be processed at the scene?
- What are the recommended processing techniques?
- Do I have the necessary equipment to complete the processing?
- Will processing for prints likely destroy other evidence that may be present?

The question, “Can the evidence be collected or must it be processed at the scene?” is a particularly important element to effective crime scene management. While it is not required to collect evidence for future processing, it is a practical recommendation to avoid being overwhelmed at the scene. Collecting scene evidence for future processing may also provide:

- A more conducive work environment for evaluating and examining evidence
- Time to effectively complete the processing and to consult reference materials
- The availability of additional equipment and/or technical assistance

The items collected for future processing should be handled carefully. Avoid unnecessary handling as even gloved hands can destroy prints or dislodge other evidence. If DNA (see **Chapter 6 - DNA Evidence and Standards**) is a consideration, be sure to change gloves as needed. Items collected should be packaged following the recommendations outlined in **Chapter 1** of this handbook.
Visual Exams

Nondestructive visual examinations should always be done prior to processing. The use of a magnifier, aided by oblique lighting with a flashlight can facilitate the discovery of visible prints. Visual exams can also facilitate the discovery of other evidence not readily seen by casual observation: trace materials, hairs, fibers, biological stains, etc.

Document the location of any evidence observed during visual examinations and perform the appropriate recovery technique. Friction ridge impressions observed during visual exams should be photographed with a scale (see Chapter 2) prior to using physical or chemical processing techniques.

The use of an alternate (forensic) light source (ALS) or portable laser may also be of benefit to visualize friction ridge impressions and other evidence before processing.

III. Processing

Superglue Fuming

Superglue (cyanoacrylate) fuming is a highly effective technique for developing friction ridge detail on non-porous surfaces. Superglue fumes adhere to latent print residue and make the prints more durable and less likely to be damaged or obliterated. These developed prints can then be enhanced using powder or fluorescent dye stains. Superglue fuming is recommended:

- if items are to be stored for long periods of time prior to processing and
- before fingerprint powders are used

The effectiveness of the superglue process is dependent on variables such as ambient temperature and humidity, the
container being used to process the items, and the length of time the items are fumed.
The superglue process is a relatively simple technique. A typical setup is shown in Figure 13-2. The equipment needed includes:

- an **airtight** chamber such as an aquarium
- superglue (pouches or liquid) – *make sure it contains cyanoacrylate* (some store brands do not)
- hot water to increase humidity
- a hot plate (if using liquid superglue) and a non-melting container to hold the superglue (foil is recommended)
- a method of suspending items such as plastic baggies in the chamber

**NOTE:** SUPERGLUE FUMES ARE EXTREMELY DANGEROUS! Use this process only in well ventilated areas such as an exhaust hood or a large open area to avoid inhaling superglue fumes.

![Fig. 13-1 Example of a typical superglue fuming chamber. (A) is a piece of wire from which items can be suspended. (B) is a beaker of hot water. (C) is a mug warmer to heat liquid superglue on a piece of foil.](image)

**NOTE:** If superglue pouches are used, the hot plate is not necessary.

**Superglue fuming procedure:**
1. Place the evidence into the chamber, making sure all surfaces of the items are exposed to the fumes
2. Put superglue (on a hot plate if necessary) and water into an airtight chamber
3. Monitor fuming development
4. **Properly ventilate the chamber before removing evidence**

**Continuously monitor the superglue development of latent prints to ensure that the items are not over-processed.** Depending on the size of the fuming container, items may be processed in as little as 5 minutes, so be sure to stop fuming once any indication of a white film is detected. A flashlight and a test print on a dark or shiny surface may help to visualize the development. It is always better to under-process than to over-process!

**Latent Print Powders**

*Non-porous* surfaces can be dusted with fingerprint powders to assist in locating and enhancing fiction ridge detail.

**NOTE:** *When items are removed from the scene for later processing, it is recommended that the nonporous items be processed with superglue (cyanoacrylate) prior to using any powders. The superglue process will make impressions more durable and less likely to be damaged during shipping or transportation to the Laboratory. In addition, further processing with chemical techniques and ALS/laser examination to develop and enhance any latent prints that are present can be performed at the Laboratory. Fingerprint powder interferes with these chemical techniques if the item was not initially processed with superglue.*

Either traditional or magnetic powder can be used on most non-porous surfaces. Powders should be applied using the following guidelines:

- Use black powder as often as possible; black powder can even be used on dark surfaces
- Apply gently and evenly using the least amount of powder necessary; it is best to start with less powder and add more powder as needed
- Apply powder carefully with a circular-type motion; **do not**
**brush across the ridges!**

- Evaluate continuously until desired contrast is obtained
- Stop processing if it damages the prints or the contrast diminishes
- Clean the developed prints to remove excess powder and to provide maximum clarity of detail (see Fig. 13-2)

Fig. 13-2 Failing to clean a print before lifting can result in air bubbles and powder debris voids.

The following cleaning techniques can improve the quality and clarity of powdered prints by removing excess powder:

- **Very carefully** use a powder-free detail brush to follow the flow of the ridges of the print
- **Gently** tap the item on its edge

**Porous & Semi-porous Items**

Porous items should not be processed with powders, but should be collected for chemical processing. While it may be possible to develop prints through the use of powders on some semi-porous items, *it is not recommended for optimal development*. Chemical techniques are available which may provide better results on these items. If you have any additional questions about porous and semi-porous items, please contact the Laboratory.
IV. Recovery

Photography

All visible, superglued, and powdered prints should be photographed with a scale prior to packaging or further processing. Powdered prints should always be photographed with a scale before attempting to lift them. Both mid-range and close-up photographs should be taken. Mid-range photographs document the location of the developed prints while close-up photographs provide the needed detail for comparisons. Close-up photographs should be taken as follows:

- Camera mounted on a tripod for stability
- Use a macro or near macro lens
- Prints should be photographed individually, filling the viewfinder, with the scale increments present in the image (see Fig. 13-3)
- The scale should be placed on the same plane as the print

Refer to Chapter 2 for more details on how to photograph impression evidence.

Fig. 13-3 Measurement increments should be visible in the photo to show whether they are in mm, cm, or inches.

Lifts
Lifts are primarily made with clear tape of various widths placed onto backing cards. Gel/rubber lifters, gel tapes, or casting materials such as Mikrosil may be used in lieu of tape for rough or textured surfaces (see Fig. 13-4). Choose the lifting material that will provide the best coverage and remove all of the print from the surface. A test lift can be attempted using an area of the surface without an evidentiary print to determine what lift method may work best.

Multiple lifts of the same impression can be made if the print can still be visualized after the first lift. This is especially true if the item has been processed with superglue first. The initial lift may clear away debris improving detail in the impression resulting in a second, better quality lift. When duplicate lifts are made, they should be clearly marked as such to avoid confusion during comparisons. Whenever possible, simultaneous finger impressions and palm prints should be lifted as one lift to assist in comparisons.

Fig. 13-4 Standard lifting tape on textured or rough surfaces can result in voids. Gel tapes, gel lifters, and casting materials which are more flexible can be used in an attempt to eliminate these voids. **NOTE:** Lifting should be attempted ONLY after scaled photography.

Tape lifts should be placed on a transparent acetate sheet or a card of a contrasting color to the powder used. Transparent sheets are strongly recommended when lifting prints that are difficult to see due to a lack of contrast, such as those dusted with white
or grey powder, though transparent cards can be used for all prints.

**Lifting Method**

Pull a length of tape sufficient to cover the area to be lifted from the roll in a single motion. The tape can remain attached to the roll for stability or can be cut from the roll if more flexibility is needed. When cutting the tape from the roll, either before or after lifting, it is advisable to leave a leader for future use. One way to produce a leader is to fold over the end of the tape after each cut. Another method is shown in Figure 13-5.

Fig. 13-5 Cutting the tape from A to B will leave a leader for the end of the roll and for the piece used for the lift.

Secure the end of the tape on the surface *without* covering the print(s) to be lifted to insure the tape will not buckle (see Figure 13-6). Keeping the tape above the surface, slowly smooth the tape across the print(s) with your fingers until the print is covered (see Fig. 13-7). Minimize or eliminate any resulting air bubbles or debris voids by rubbing with the flat surface of your fingernail. Larger air bubbles can be eliminated by first poking a small hole in the tape before smoothing with your fingernail.
Fig. 13-6 While keeping the tape off the evidence, one end of the tape is anchored at a point beyond the latent prints to be lifted.

Fig. 13-7 Smooth the tape over the suitable latent prints from one end to the other in a continuous motion eliminating air bubbles.

Training and experience is encouraged before working on case evidence to become more comfortable with these techniques.

**NOTE:** Do not discard any lift in which ridge detail is observed. The identification of a fingerprint can involve a relatively small area with limited detail.

V. Marking the Lift

After making the lift, it should be immediately marked for identification purposes (see Figure 13-8). The information recorded should include:

- Case number
- Date collected
- Item lift was collected from
- Name of the individual making lift
- A small sketch of the item on the back of the lift card with a mark orientating the location of the lift for future reference and court documentation.
Avoid placing circles or arrows on the lift tape to indicate where latent prints were observed. These markings often cover prints of weaker contrast. However, you should “X” out any friction ridge detail known to be deposited on the tape by the person making the lift (see Figure 13-9). Any other markings should be placed on the lifting card, not on the tape.

Contact the Identification Unit in your service area if you have any questions regarding the information contained in this chapter.