FINGERPRINT LABORATORY

Observations are important in chemistry and related fields such as forensic chemistry. Forensic chemistry is the application of a broad spectrum of sciences to answer questions of interest to a legal system. In this laboratory you will be using your power of observation to study fingerprints.

READ ALL INSTRUCTIONS CAREFULLY FIRST AND THEN FOLLOW STEP BY STEP

In order to develop a latent print, you will need to powder (or dust), lift and transfer the print to a card or celluloid sheet. The following procedures are general guidelines for powdering, lifting, and transferring a latent print.

Black fingerprint powder is a very fine, lightweight material that can be quite messy and difficult to remove from treated surfaces. Use a minimal amount of powder to obtain the best prints and to maintain a clean work area. Also, do not work with your nose and mouth too close to the surface being powdered to avoid breathing the dust. Please respect our laboratory facilities and leave your work areas at least as clean as when you first started.

Latent prints can often be made visible by using an oblique light source (at a 45° angle). A good forensic investigator would photograph the prints before lifting them in case the process destroys the prints.

I. Developing Latent Fingerprints with powder:

Work in groups of two.

• Obtain two items of glassware (laboratory beakers, graduated cylinders, etc.) and a jar of fingerprint powder. Use one item of glassware for each student.
• Camel’s hair brush for powdering (match the color to the powder!)
• A roll of lifting tape
• White cards (fingerprint cards) or celluloid sheets

All the items listed above are usually included in a field kit.

There may be times when you need to select appropriate color print powder:

• Use white or gray powder:
  a. if the surface is dark-colored.
  b. on mirrors and metal-polished surfaces (since these colors photograph more easily with less double image on mirrors).

• Use black powder if the surface is light-colored. The color of the powder and the color of the surface should contrast with each other to make the print visible against the background.
1. If your brush had been previously used, tap the handle or twirl the brush between the fingers to remove excess powder from the bristles.

2. Place some of the dusting powder in the lid or on a piece of paper, and dip the tips of the brush bristles in the dusting powder. CAUTION: Too much powder on the brush will not allow you to control the amount of powder needed to deposit properly on the surface to be dusted, and can easily ruin very clearly defined latent prints. Practice this important technique!

5. Before dusting your glassware, carefully clean it to remove all extraneous fingerprints. (Gloves may be helpful). Place one of your fingers firmly on the object. If your finger is dry, rub it along your nose or forehead or through your hair to pick up some oil. Remember which finger you use and record this in your notes.

6. Use a circular sweeping motion, while barely coming into contact with the surface, to brush across the area to be developed until you see the print begin to appear. Concentrate your brushing on the exposed fingerprint taking care to brush very lightly with good technique. If necessary, pick up additional dusting powder, using the previous steps outlined here. Once the ridges appear, the motion of the brush should follow the direction of the ridge flow. When the print is clearly developed, stop brushing. Further development may easily destroy the print.

7. Repeat this exercise on different portions of the same glassware until you feel comfortable with the technique and have achieved acceptable prints.

II. LIFTING LATENT PRINTS:

1. With a smooth motion, pull off approximately 6 to 7 cm (2.5” to 3”) of tape from the roll. Do NOT cut the tape from the roll yet!

2. Place the free end of the tape about 6 cm from the top of the developed print. Secure the loose end of the tape beside the print to be lifted and hold it there with the forefinger. Cover the print with the tape by smoothing the tape over the print with your finger, beginning from the free end and working slowly over the print. Do NOT simply lay the tape over the print! Air bubbles under the tape will partially ruin the lifted fingerprint. Therefore, take extra care to avoid air bubbles as you proceed slowly and carefully to smooth the tape over the print.

CAUTION: Do not release the roll during this procedure.

Commercial rubber lifting tapes are available in various sizes of black and white, but in this section you will be using transparent tape with a durable adhesive surface to learn the basics of lifting prints. Ordinary cellophane tape is not suitable due to the deterioration or drying of the adhesive.

3. After the tape completely covers the print, and extends approximately 1 cm past it, use the roll of tape as a handle and lift the tape with the developed print smoothly from the surface in one continuous, unbroken motion. This will prevent distortion of the print.
4. Place the free end of the tape on the backing card (use a light colored card for dark powder and a dark card for lighter powder). Repeat the laying-down, smoothing procedure described in #3 until the print is taped to the backing card.

5. Cut the tape from the roll, trim any excess tape from the card, and label it for identification purposes. Include the following information:
   a. The object from which the print was taken
   b. The date when the print was developed and lifted
   c. Your initials.

NOTE: In a real crime scene, if the surface can be destroyed by removing the tape, it is not removed. The entire object would be submitted to the crime laboratory for examination.

III. Developing Latent Prints with Chemicals

Finger impressions on absorbent surfaces such as paper, cardboard, or unpainted wood more often respond better to chemical treatment than to the use of powders. Powders cannot be removed from such surfaces. Perspiration and oils from the ridges are absorbed into the material, and the result is little or no contrast between the ridges and the valleys of the impression when powder is applied.

When you find latent prints on an absorbent, porous, smooth surface such as paper, cardboard, or unpainted wood, you should place the item in a container with tweezers, if small enough. Then seal the container, mark it with all required data for identification, mark “TO BE PROCESSED FOR LATENT PRINTS,” and send it to a crime laboratory. Fingerprint specialists in a crime laboratory will then develop the latent prints using chemicals. Of the chemical methods available, iodine, ninhydrin, and silver nitrate are the most common. Superglue is sometimes used as well. We will do two: ninhydrin and superglue.

a. **Ninhydrin (wear gloves after marking with fingerprints!)**
   1. Place a fingerprint on a piece of paper.
   2. Cover the paper with ninhydrin dissolved in acetone.
   3. Place the paper on the hot plate (set on LOW) and let develop.

b. **Superglue fuming (wear gloves after marking with fingerprints!) Be careful not to get the glue on yourself (or your gloves)!**
   1. Obtain two fuming beakers, a microscope slide, and a hot plate.
   2. Fill the smaller beaker (~150 mL) half full of water.
   3. Put a fingerprint in the middle of the slide.
   4. Place 2-3 drops of superglue on each end of the slide. Place the slide across the top of the smaller beaker.
5. Place the smaller beaker on the hot plate. Then place the larger beaker (~600 mL) upside down over the smaller beaker.

6. Turn the hot plate on at about 100°C. Let sit for 10-20 minutes.

**Making a Ten-print (PSP) card**

You will fingerprint your partner on a ten-print card. Fully fill out the card. Your instructor will show you how to properly make a ten-print card.

Remember that the top part of the card is rolled prints and the bottom part of the card is simply pressing your fingers against the card. Turn in your ten-print card and make sure that the person who rolled your ten-print cards name appears in the box that says “signature of official taking prints.” Please be sure that you print your name. The ten-print card is at the end of this lab.

**The Main Features of a Typical Fingerprint**

On this and the following page are the features found on fingerprints and also the major types of fingerprints that you will find the features. Also keep in mind that fingerprints are also made unique by their owner. If a person was injured, a fingerprint could be damaged/ altered a bit. Also, some fingerprints have ‘wrinkles’ in them, making seemingly similar fingerprint patterns different.
Major Types of Fingerprints

**Plain Arch**: No Delta

**Tented Arch**: No Delta; taller than the plain arch

**Radial Loop** (left hand): Delta is on the ulnar side

**Radial Loop** (right hand): Delta is on the ulnar side

**Ulnar Loop** (left hand): Delta is on the radial side

**Ulnar Loop** (right hand): Delta is on the radial side

**Whorl**: Two deltas, one on either side

**Double Loop**: Two deltas, no circle in the middle

**Accidental**: Whorl like, no delta
Fingerprinting Lab
Pre-Laboratory Assignment

1.  a. Why would making careful observations of a fingerprint be important in using as evidence in a crime?

   b. Give two examples of details that one might look for in comparing fingerprints.

2. What is ninhydrin used for (be specific i.e. what types of surfaces)?
1. What is a 10-print card? What is it used for?

2. What are the positive and negative aspects of superglue fuming? What is it used for?

3. Which method do YOU think is best? Why? Support your answer using your knowledge you gained from the lab.

4. Hand in your lifted fingerprint (on the notecard with the tape over it) and your PSP card.

5. Locate the pre-made cards in the laboratory. Using the space below (or on the back of this page), label the unidentified fingerprints and features. Use the major types of prints and features that are included in this lab. Numbered examples will require you to name the type of fingerprint; Roman numeral (I, II, III) examples require you to name the feature.
**Signature of Official taking Prints:**

**Note:** You only need to fill out your name, the fingerprints, and make sure that the person who rolled your ten-print cards name appears in the box that says “signature of official taking prints.” the other information requested is not needed (it is only there to show what a real ten-print card looks like).