Crime Scene Investigation

The Basics of Fingerprinting
According to criminal investigators, fingerprints follow 3 fundamental principles:

• A fingerprint is an **individual** characteristic; no two people have been found with the **exact** same fingerprint pattern.

• A fingerprint **pattern** will remain **unchanged** for the **life** of an individual; however, the print itself may change due to permanent scars and skin diseases.

• Fingerprints have general characteristic **ridge** patterns that allow them to be systematically identified.
There are 3 specific classes for all fingerprints based upon their visual pattern: arches, loops, and whorls.

Each group is divided into smaller groups as seen in the lists below.

**Arch**
- Plain arch
- Tented arch

**Loop**
- Radial Loop
- Ulnar loop

**Whorl**
- Plain whorl
- Central pocket whorl
- Double loop whorl
- Accidental
Fingerprint Factoid:
60% of people have loops, 35% have whorls, and 5% have arches

Did you know?
Dactyloscopy is the study of fingerprint identification. Police investigators are experts in collecting “dactylograms”, otherwise known as fingerprints.
Arches are the simplest type of fingerprints that are formed by ridges that enter on one side of the print and exit on the other. No deltas are present.

**Plain Arch**
Ridges enter on one side and exit on the other side.

**Tented Arches**
Similar to the plain arch, but has a spike in the center.
Loops must have one delta and one or more ridges that enter and leave on the same side. These patterns are named for their positions related to the radius and ulna bones.

**Loops**

**Ulnar Loop (Right Thumb)**
Loop opens toward right or the ulna bone.

**Radial Loop (Right Thumb)**
Loop opens toward the left or the radial bone.

**NOTE:** On the left hand, a loop that opens to the left would be an ulnar loop, while one that opens to the right would be a radial loop.
Deltas & Cores

Core

Type Line

Delta

Type Line
Whorls have at least one ridge that makes (or tends to make) a complete circuit. They also have at least two deltas. If a print has more than two deltas, it is most likely an accidental.

Draw a line between the two deltas in the plain and central pocket whorls. If some of the curved ridges touch the line, it is a plain whorl. If none of the center core touches the line, it is a central pocket whorl.
**Accidental Whorl**

Accidental whorls contain two or more patterns (not including the plain arch), or does not clearly fall under any of the other categories.

**Double Loop Whorl**

Double loop whorls are made up of any two loops combined into one print.
Identify each fingerprint pattern.
It’s time to make some prints!

Avoid Partial Prints

GOOD PRINT
Get as much of the top part of your finger as possible!
Directions

1\textsuperscript{st} – Roll the “pad” portion of your thumb over the ink pad from the left side of your thumb to the right. You do not have to push down really hard!

2\textsuperscript{nd} – Roll the “pad” portion of your thumb from the left side of your thumb to the right in the correct box on your paper to make a thumbprint.

3\textsuperscript{rd} – Continue this process to make a fingerprint of all ten fingers on the provided fingerprint card.

4\textsuperscript{th} – Use your notes and a magnifying lens to help you figure out what type of pattern is found in each of your fingerprints. Label each one with the pattern’s name.
Developing Fingerprints

The Basics of Fingerprinting
Fingerprints

- Visible prints are made after coming in contact with colored material such as blood, paint, grease, or ink.
- Plastic prints are ridge impressions left on a soft material such as putty, wax, soap, or dust.
**Latent prints** are impressions left by friction ridge skin on a surface, such as a tool handle, glass, door, etc.

Prints may be collected by revealing them with a dusting of **black powder** and then lifted with a piece of **clear tape**.

**Did you know?** Camel hair is the most common animal hair used to make fingerprint brushes. Now many brushes (like the one above) are made out of fiberglass.
Some investigators use **fluorescent** powder and UV lights to help them find latent prints on multi-colored or dark surfaces.

**Magnetic** powder can also be used to reveal latent prints. This type of powder works better on **shiny** surfaces or **plastic** baggies or containers.

The **cyanoacrylate** fuming method (often called the super glue method) is a procedure that is used to develop latent fingerprints on a variety of objects.

**Ninhydrin** is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color. It is used to lift prints from surfaces such as paper and cardboard.
Directions:

1 - Cover your table with white butcher paper or newspaper. You must dust everything on the paper!

2 - Get a lifting kit from your teacher that contains black powder, brushes, and clear tape.

3 - Press the pad of your right thumb on a CD or glass slide to make a print. Place on the paper covering your table.

4 – Dip a brush lightly into the container of black powder and then tap off the extra on the lid. You only need a very small amount of powder to dust the print.

5 – Hold the brush over the print and rotate it between your thumb and fingers. Use the brush to remove any extra powder.

6 - Use a small piece of clear tape to lift the print and place it in the box on your worksheet.

CAUTION: The black powder will be messy and isn’t easy to clean up. Don’t dust anything without permission!
Clean Up

1 – Clean off the CDs or glass slides and put them back in the kit with the brushes and tape.

2 – Have someone help you fold the paper in half and tap it to return the extra black powder to the container.

3 – Put the black powder in the box and have it checked in by your teacher.

4 – Get a towel and “dry” wash the table – especially the edges that weren’t covered with paper.

5 – Get a wet towel to wash off the table and then wipe it with some dry towels. Keep cleaning until all the black powder is off the table!
Dusting

• Appropriate Surface:
  – Ridged/non-porous such as glass, plastic, or metal

• Theory:
  – Dust will adhere to sweat & oils left behind
Remove Excess Dust

Brush or Blow
Lift Print with Tape
Place Print on Card
Fingerprinting using Superglue

- Need a sealed container
- Water vapor
- Aluminum pan
- Superglue
- The aluminum dish may be placed on a beverage warming plate to produce copious fuming and to speed development of any latent fingerprints.

DO NOT GET SUPERGLUE TOO HOT!!!!
IT CREATES CYANIDE
Iodine Fuming

• Appropriate Surface:
  – porous and non-porous such as paper, index cards, magazines, and cardboard.

• Theory:
  – Sweat and oil will absorb iodine vapors
Place the Object in an Enclosed Container with Iodine Crystals
Prints should develop in a few minutes
Ninhydrin

- Appropriate Surface:
  - porous such as paper, tissue, and clothing

- Theory:
  - ninhydrin reacts with amino acids to form a purple compound
Soak Suspected Surface with Ninhydrin Solution & Allow to Dry
Prints should develop in a few minutes
Silver Nitrate and UV Light

• Appropriate Surface:
  – porous such as paper or drywall

• Theory:
  – When exposed to ultra-violet (UV) light, silver nitrate reacts with the salt in sweat to form a blackish-brown compound
Spray Surface With Silver Nitrate Solution
Expose to UV Light
Prints should develop in 5-10 minutes
Other Methods

• In recent years, there has been much advancement in the area of print developing. Advanced brushes and new chemical procedures make it possible to develop prints on a larger variety of surfaces.

• There are over a hundred different methods used to develop fingerprints, depending on the surface being examined.