Fingerprinting 2 B

PART 2, JANUARY 23, 2020

ASSIGNED READING CHAPTER 8

PROF. BARRY SAVILLE

Syllabus Clarification

Jan 20, 23 Fingerprints (Ch 8)

Jan 27, 30 Collection of Crime Scene Evidence (Ch 4); Physical Evidence (Ch 5);

Feb 3, 6 Physical Evidence 11(Ch5), Trace Evidence: Hair and Fiber (Ch 13)

Midterm Online Saturday, Feb 8

Feb 10,13 Trace Evidence II (Ch 14)

Week of Feb 17 Reading week

FRSC 1011 B

Jan 27, 30 Collection of Crime Scene Evidence (Ch 4), Physical Evidence (Ch 5)

No in-person lab.

Online assignment 4

Online Reading Quiz 1

Feb 3, 6 Trace Evidence: Hair and Fiber (Ch 13)

Midterm online Saturday, Feb 8 10-11 am

In-person labs

Feb 10, 13 Trace Evidence II (Ch 14)

No in-person lab.

Online Assignment 5

Week of Feb 17 Reading week

Lecture overview

Latent vs visible fingerprints

Fingerprint identification

- Detecting Fingerprints
- Developing & Enhancing Latent Prints
- Preservation Photography
- Recovery or Retention
- Matching Comparisons –to the extent time permits

Types of Finger Prints

- Exemplar: deliberately taken
- Patent: visible prints as a result of foreign transfer material
- Plastic: found on soft surfaces that retains shape (impressions)
- Latent: not visible

Detecting Prints

A device called the Reflected Ultraviolet Imaging System (RUVIS) or other alternate light sources can aid in the detecting of latent fingerprints, without chemicals or powder.

Once located, the crime scene investigator can develop the print in the most appropriate fashion.

Developing & Enhancing Prints

Development and enhancement of a deposited fingerprint is dependent on two factors:

- Type of secretion
- Type of substrate print is deposited on

Type of Secretions

Secretions responsible for depositing a fingerprint

- Eccrine Sweat Glands
- Sebaceous Glands

Eccrine glands are in high density on the palms and soles of your feet

- Controlled by the autonomic nervous system and therefore are not consciously controlled

Eccrine Sweat Glands

Sweat released from eccrine sweat glands are composed of

- Water 98.5% to 99.5%
- Solids 0.5% to 1.5%

These solids are ~ 1/3 to 1/2 inorganic salts and 1/2 to 2/3 various organic substances

- Amino acids and fatty acids are the more prominent factors affecting fingerprint development and enhancement

Sebaceous Glands

Sebum is the secretion from sebaceous glands and consists mainly of saturated fats, waxes and squalene

Sebaceous glands are usually found in hair covered areas of the body, NOT on the friction ridge surfaces of the hands and feet

Sebum is found on the hands as a result of touching other parts of the body with sebaceous glands

Type of Substrate*

Two main types of substrates

- Porous
  - Paper, textiles, carpet, etc.
- Non Porous
  - Glass, Metal, Plastic, etc.

Enhancement techniques will vary depending on which type of substrate (surface) the print is deposited on

Development Techniques

Powders

Chemical Developers

- Iodine Fuming
- Ninhydrin
- Cyanoacrylate (super glue)
- Crystal Violet
- Physical Developer

Powders*

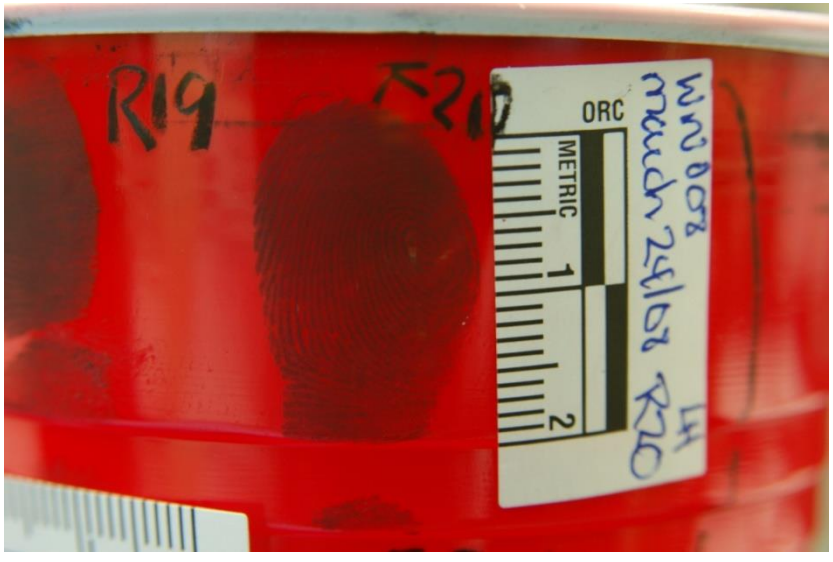
Powders for non-porous surfaces

- Black powder for light surface
- White/grey powder for dark surface
- Fluorescent powders for surfaces where no colour will suitably contrast the background

Powders for porous and non-metallic surfaces

- Magnetic powder

Powders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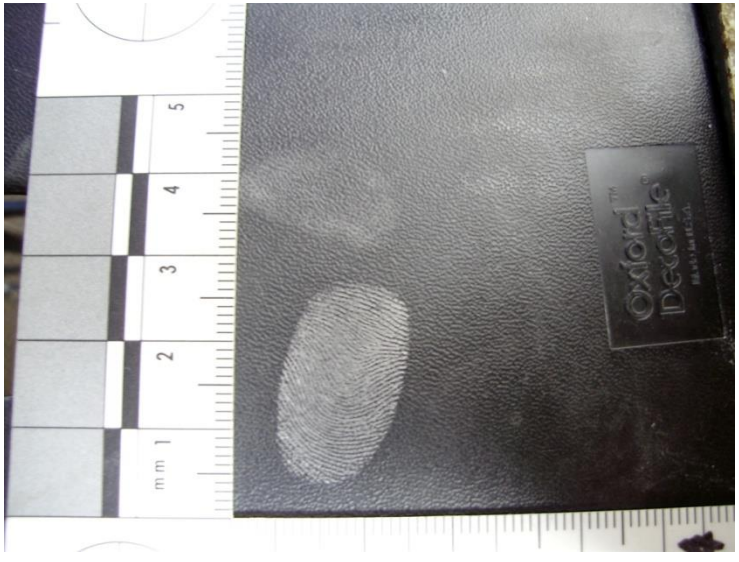
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MARCOS
Perfect Print
HOLD HERE
HOLD HERE

Iodine Fuming

Used on porous surfaces including

- Paper and skin

Development not completely understood, may react with lipids deposited by sebaceous secretions

Applied in a fuming chamber

Optimal on fresh prints up to 2 weeks old

Prints begin to fade immediately when removed from the fumes

- No permanent fixing methods are available although spraying with 1% starch in water yields a blue print that can last for weeks to months

Iodine Fuming

Ninhydrin

Used on porous surfaces including

- Paper, textiles and carpet

Reacts with amino acids present in latent prints to produce a purple-blue color

Applied by spraying, painting or dipping

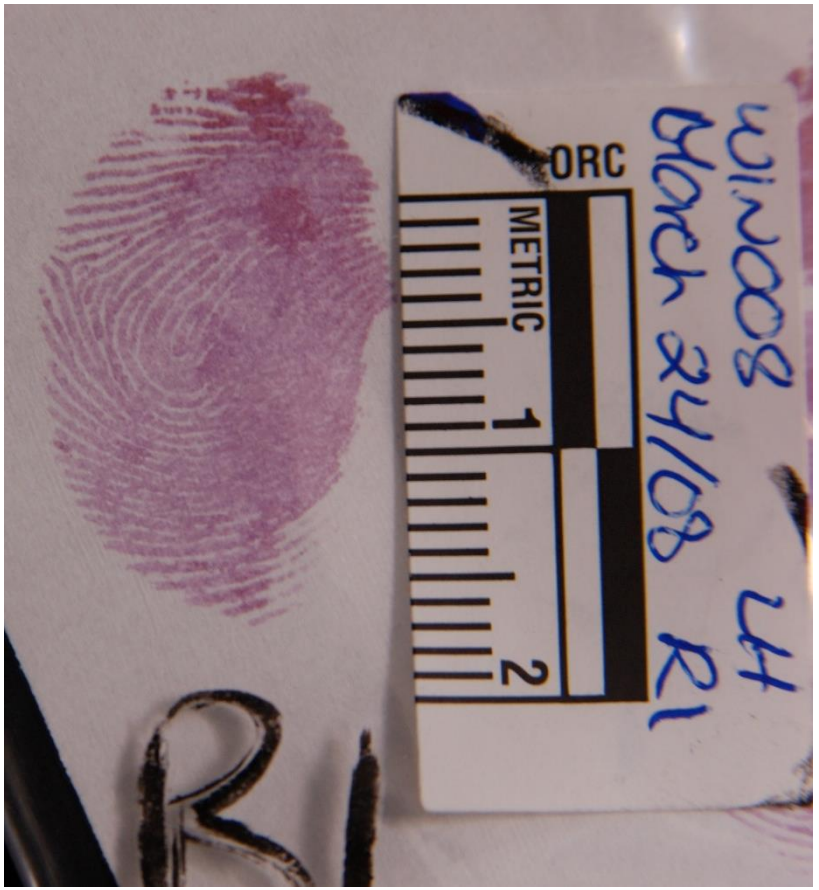
- Visible under natural light

Can also be used as a post-treatment with other chemical developers

- Enabling fingerprint to fluoresce better under Lasers or other light sources

Ninhydrin


NINHYDRIN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Cyanoacrylate Fuming

Super Glue® is approximately 98 to 99 percent cyanoacrylate ester, a chemical that actually interacts with and visualizes a latent fingerprint.

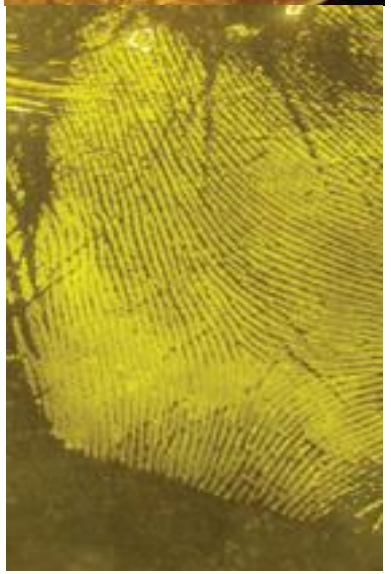
Used on non-porous surfaces including
- Glass, plastic, polished wood and metal surfaces

Many different techniques for super glue fuming
- Chamber, wand, +/- Heat, humidity or chemicals

Chemical fuming can include Rhodamine 6G to allow visualization with fluorescent light sources

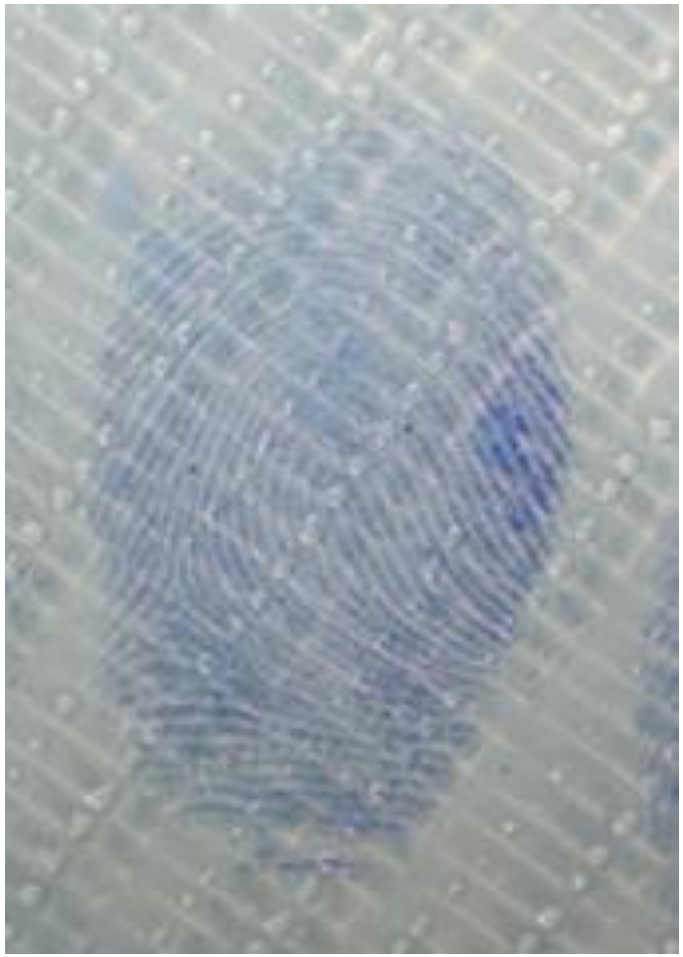
Used on exhibits which traditionally yield poor results

Cyanoacrylate Fuming with Rhodamine 6G & Ardrox Fluorescent Dye



Crystal Violet*

Used to enhance prints on the adhesive side of virtually any type of tape



Physical Developer

Silver nitrate-based reagent used to develop prints when other chemical methods are ineffective - reacts with the sebaceous secretions

Destructive and therefore must be used as a final enhancement technique

Can be used on porous surfaces that may have been wet

Molybdenum Disulphide or SPR (Small particle reagent)

Used on wet non-porous surfaces

Mixed with a detergent and distilled water

Sprayed onto surface

Less affective on items that have been dried after being wet

Small Particle Reagent

Sprayed onto wet vehicle exterior

Then rinsed off with water

Detecting Prints

The high sensitivity of fluorescence serves as the underlying principle of many of the newer chemical techniques used to visualize latent fingerprints.

Fingerprints are treated with chemicals that induce fluorescence when exposed to lasers, or high-intensity light sources (“alternate light sources”) such as quartz halogen, xenon arc, or indium arc light sources.

Once the latent print has been visualized, it must be permanently preserved for future comparison and for possible use as court evidence.

A photograph must be taken before any further attempts at preservation are made.

Preserving Prints

If the object is small enough to be transported without destroying the print, it should be preserved in its entirety.

Prints on large immovable objects that have been developed with a powder can best be preserved by “lifting” with a broad adhesive tape.

Then, the tape is placed on a properly labeled card that provides a good background contrast with the powder.

Digital Imaging

Digital imaging is the process by which a picture is converted into a digital computer file.

With the help of digital imaging software, fingerprints, which are often not in perfect condition, can be enhanced for the most accurate and comprehensive analysis.

An important and useful tool, especially for fingerprint identification, is the compare function that places two images side by side and allows the examiner to chart the common features on both images simultaneously.

Preservation Photography

Importance

- Loss or destruction of print
- Court purposes
- Comparison with known print

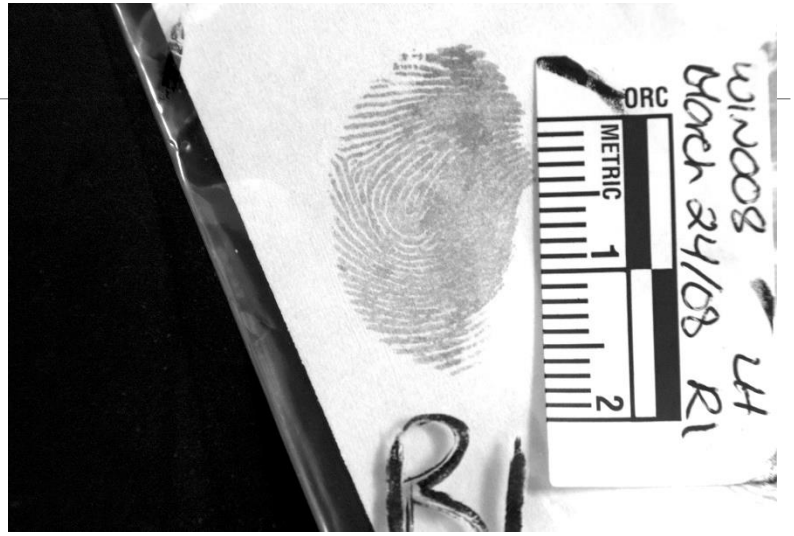
How many

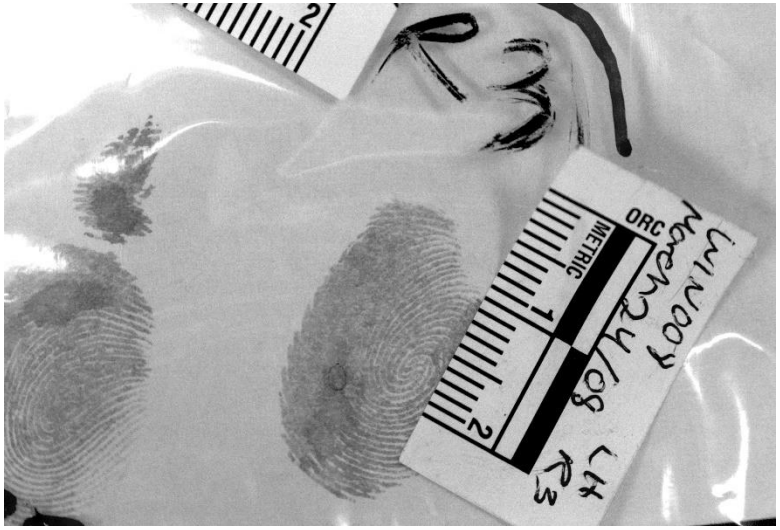
- 4 pictures of a print (overall, midrange, close-up, close-up with scale)
- May need more close-up pictures if more than one print

What is needed

- Affix a scale
- A label that has the examiners initials and date

Preservation Photography





Recovery or Retention

Also termed lifting

Place tape over the print

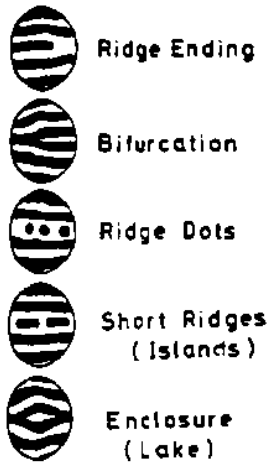
Smooth over tape to minimize air bubbles

Remove tape

Place tape on card (dark prints on white, light prints on dark)

Making a Sketch

Fingerprint experts will make an enlarged sketch of the identifiable characteristics in the unknown print for easier comparisons



Three Possible Outcomes of Fingerprint Comparison

1. The two prints cannot be excluded as having the same source

2. The two prints are excluded as being derived from the same source

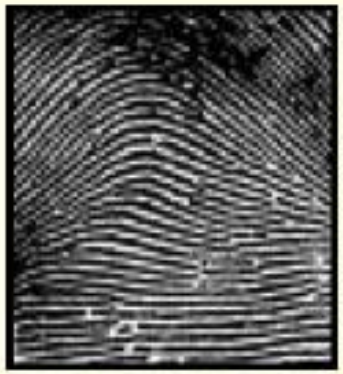
3. There is insufficient ridge detail to make a comparison

Comparing (Matching) prints

Preliminary Screening

- First level of detail
  - Sort prints based on class characteristics
  - Prints are grouped based on the presence of a whorl, loop or arch for each digit

Comparing Prints



Plain Arch

Tented Arch

Ulnar Loop

Radial Loop

Plain Whorl

Central Pocket Loop

Double Loop Whorl

Accidental Whorl

Comparing Prints

Caution, partial prints may appear as one pattern when in fact it is another

Comparing Prints

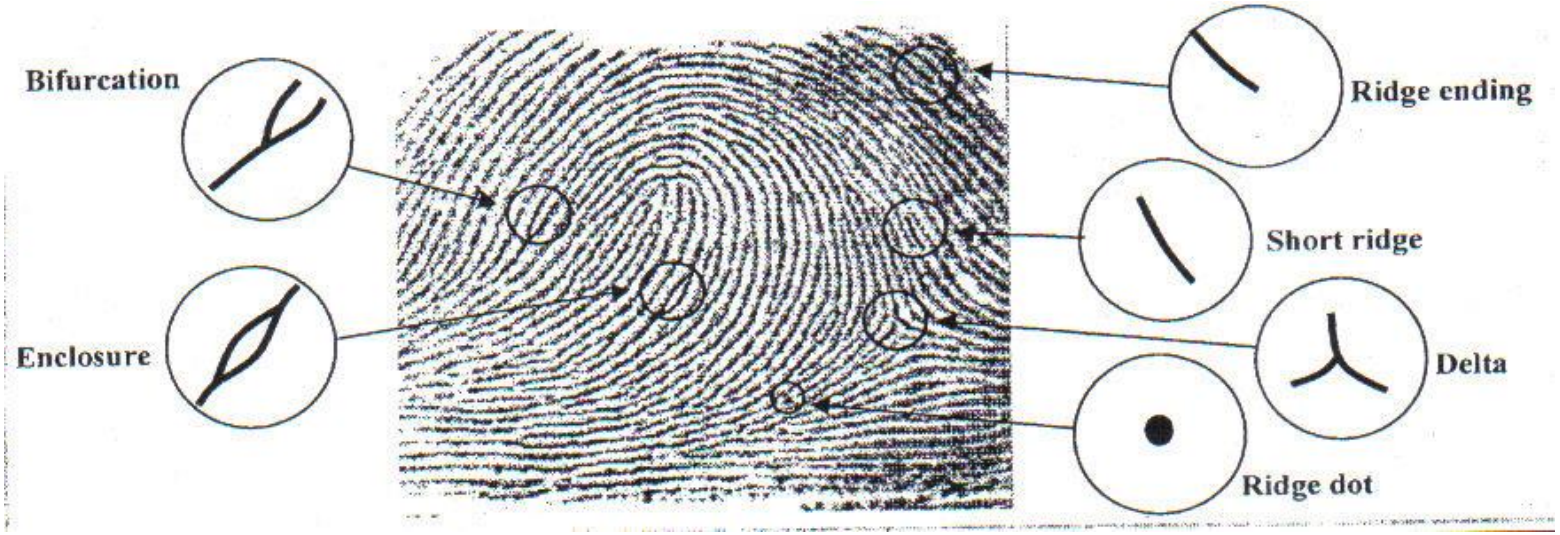
Double Loop Whorl

Comparing Prints

Second level of detail

- Type and placement of the ridge characteristics
- Begin to make comparisons, by referring to your sketch
  - Using magnifying glass
  - Ridge pointers
- Narrow down possible matches, which share several of the same identifiable characteristics

Comparing Prints



Comparing Prints

Third level of detail

- The actual shape of the ridge characteristics or ridge path deviations
- Place the two prints side by side with the same orientation
- Set up a magnifying glass over each print
- Look through both magnifying glasses simultaneously

Comparing Prints

- Using two ridge pointers, place one ridge point on a characteristic in one print and hold it there
- Now search for that same characteristic in the other print, if located place the other ridge pointer on that characteristic
- One by one, move the first ridge pointer to the next characteristic, noting the direction and the number of intervening ridges you crossed to get to the next identifiable characteristic
- Again, hold the ridge pointer there while you compare it to the next ridge characteristic on the other print

Comparing Prints

If there is not a matching characteristic in the new location do not give up the comparison immediately

Go back to the starting point on the unknown impression, move in a different direction

Having done this several times without matches you can be sure that you do not have a matching impression and can move on to the next suspect

Comparing Prints

As you perform this comparison you must observe the shape of each of the individual characteristics

Review

Latent vs visible fingerprints

Fingerprint identification

- Detecting Fingerprints
- Developing & Enhancing Latent Prints
- Preservation Photography
- Recovery or Retention
- Comparison

Outcomes

Method for comparing fingerprints