ADMINISTRATION OF JUSTICE

FINGERPRINTS:
YOUR PERSONAL SIGNATURE

I. HISTORY OF PERSONAL IDENTIFICATION

A. Early methods of criminal identification

1. In the eighth century, the Chinese used thumbprints to seal important documents.

   a. There is no record of whether they were actually used for identification, and there was no systematic classification.

2. Quintilian, a Roman lawyer, made use of a bloody handprint in a murder case in 1000 A.D.

3. In 1892, Francis Galton published the book Fingerprints and proposed the use of fingerprints as a means of personal identification.
a. Galton explained the many different characteristics present in a fingerprint and how they can combine to form a unique print for each person. (1) He called these characteristics minutiae, but today they are referred to as Galton’s Details.

b. Galton also demonstrated that fingerprints are permanent and will not change with a person's age like bone measurements.

B. Crime identification using fingerprints expands in the twentieth century

1. The first criminal trial to result in a conviction based primarily on fingerprint evidence took place in 1901.

2. In 1902, the New York Civil Service began the practice of fingerprinting everyone who took a civil service exam.

3. In 1903, the New York State prison system started fingerprinting all the inmates and Leavenworth Penitentiary followed a year later.
4. In 1905, the U.S. Army began using fingerprints, and the U.S. Department of Justice set up the Bureau of Criminal Identification in Washington, DC, to **centralize** and standardize the use of fingerprinting in the United States.

5. In 1924, the U.S. Congress established the FBI as the central **repository** for all fingerprint information.

6. In 2004, the FBI crime lab identification section began using the Integrated **Automated** Fingerprint Identification System (IAFIS) with more than 46 million records in its database.

II. **GETTING A GRIP ON FINGERPRINTS**

A. **What are fingerprints?**

1. Fingerprints are an **impression** left behind when the raised ridges on the skin on the bottom of the last joint of the fingers and thumb come into **contact** with a surface.

   a. As each person's finger prints are unique, the taking of fingerprints provides a means of **identification**.
2. Deliberate fingerprinting is used in the identification processing for a government job application or when placed under arrest.

   a. Recording fingerprints is easy: the fingers are inked and then rolled onto a form to record the fingerprint image.

3. The process of analyzing fingerprints is known as dactylography.

B. Fingerprints are used to identify an unknown victim, witness, or suspect, to verify records, and most importantly, as links and matches between a suspect and a crime.

   1. Even when you have no suspect, prints can develop leads, and sometimes provide clues about the criminal's size, sex, and occupation.

      a. Small prints tend to be made by small people, and prints on a wall indicate the suspect's height.

      b. Construction workers tend to have rough hands, and musicians tend to develop calluses on the tips of their fingers.
2. It's important not to rely too heavily on these clues as they are not facts.
   a. Prints can substantiate or disprove the story of a victim or witness by locating their prints where they said they were.
   b. Even the absence of prints may be a key factor.
      (1) Suicide scenes, for example, should never show any attempt at wiping prints away.

C. There are three guiding principles that make fingerprints especially useful for personal identification in forensic science.

1. First, a fingerprint is unique and is not shared by any two people.
   a. Each person has his or her own set of fingerprints.
   b. Even though identical twins have the same DNA, they have different fingerprints.
   c. Fingerprints are an image of the friction ridges present on the surfaces of the fingers.
(1) There are various kinds of ridge characteristics or **minutiae** including the following:

(a) Bifurcation: A single friction ridge that has **split** into two  
(b) Ridge ending: The point where a friction ridge **ends**  
(c) Short ridge: A single friction ridge that runs only a **short** distance  
(d) Ridge (island): A friction ridge that is about as long as it is **wide**  
(e) Enclosure: A single ridge that splits in two and then comes back together to form a single **ridge** again  
(f) Spur: A bifurcation in which one of the ridges ends after a **short** distance  
(g) Crossing: Two ridges that **cross** over one another and form an X  
(h) Crossover: A short ridge that runs between two **parallel** ridges.

2. Second, a fingerprint remains **unchanged** throughout life.  
   a. The fingerprints you're born with are the same ones you die with.
b. If someone burns or *shaves* off the pads of his fingers, the prints disappear for a while, but as the skin repairs itself and wounds *heal*, the print reappears.

c. More severe damage that involves deeper layers of the skin may leave a permanent scar and *prevent* prints from reemerging.

(1) Completely *obliterating* a print is difficult, and any scars left behind by attempts to do so create new individual characteristics that an examiner can use for making a match.

3. Third, fingerprints exhibit general patterns that provide a basis for *classification*.

a. General patterns exist within every person's prints, and all people share these *patterns* to varying degrees.

b. Prints can be systematically classified, reducing the number of records that must be searched when looking for a *match*. 
D. In general, there are three types of fingerprints that investigators can look for at the crime scene: visible, plastic, and latent.

1. Visible fingerprints can be easily seen by the investigator and photographed without any preparation.
   a. Examples of visible fingerprints include those made by oil, grease, paint, or blood.

2. Plastic or molded fingerprints are made in soft material that takes an impression of the fingerprint such as tar, wax, soap, or dust.
   a. Plastic fingerprints can be present in pools of blood after they have hardened.

3. Latent fingerprints are fingerprints that are invisible to the human eye.
   a. Latent fingerprints require treatment either by dusting or chemical processing to make them visible.
   b. These procedures make the oils and salts left behind when an object is touched visible to the eye.
E. Latent fingerprints can be visualized by a variety of methods and the techniques can be separated into two groups, physical and chemical.

1. Physical methods include the use of lasers and dusting powders.

   a. Lasers work because there are chemicals in the skin secretions left behind by the finger touching the surface that undergo fluorescence.
   b. The advantage of lasers is that large areas can be covered in a relatively short period of time.

2. Dusting powders are used in one of the oldest and trusted methods of latent fingerprint visualization.

   a. The oils left behind are slightly sticky, and very fine particles adhere to surfaces.
   b. Special powders are used to "develop" invisible prints left on hard, nonabsorbent surfaces such as glass, tile, mirrors, and painted wood.
c. The powder is carefully dusted onto the surface using a feather duster, fine camel hair, or fiberglass brush.

d. The powder reacts with deposited skin oils, adhering to the oils or sweat and thereby revealing an impression of the print.

e. Fingerprints revealed by dusting are carefully photographed.

f. Prints may be lifted, using a special transparent adhesive tape.

g. The tape is applied to the dusted print, lifted off, and the resulting image is immediately transferred to a fingerprint card.

h. The photograph or card is analyzed to determine the classification of the print, and it is then compared to prints that are on file.

3. Chemical methods of latent fingerprint identification include superglue fuming, iodine fuming (sublimation), ninhydrin, and silver nitrate.
a. Chemical processing is used to develop invisible prints that may have been left on soft, porous surfaces such as cardboard, paper, or cloth that don't work well with dusting powders.

b. Superglue is composed of the chemical cyanoacrylate ester that causes a chemical reaction when its fumes come in contact with the oils of a latent fingerprint.
   (1) The cyanoacrylate polymerizes into a hard, white substance that forms an exact image of the fingerprint.
   (2) A cyanoacrylate print can be dusted with powder and the print lifted.

c. In iodine fuming, the oldest method for visualizing fingerprints, vapors react with skin oils to stain the invisible print brown.
   (1) In iodine fuming, iodine crystals are loaded into a special fuming cabinet:
      (a) if the object to be examined is small enough to take to the crime lab and fit into the cabinet.
(b) If it is too large to be brought to the crime lab a **fuming** gun will be used at the crime scene.

(c) The image that results from fuming quickly fades and must therefore be **photographed** immediately.

d. Ninhydrin can be sprayed or **brushed** onto evidence and in some cases, if practical, the evidence can be **dipped** into the ninhydrin.

(1) This chemical reacts with **amino** acids deposited by the fingertips, and an image is produced.

(2) While the resulting image does not quickly fade, it does lose **contrast** over time.
(a) As with images produced by iodine fuming, must be **photographed**.

e. Silver nitrate develops the **sodium** chloride (the salt that is in sweat) deposited by the fingers and produces a red-brown print.
(1) The evidence may be sprayed with a silver nitrate and alcohol solution or it may be dipped.

(2) Exposure to light speeds development.

(3) The image is ephemeral and must be photographed.

III. MAKING MATCHING EASIER: CLASSIFYING PRINTS

A. When prints are found, an expert compares them with samples known to have been made by a suspect.

1. The first thing to be done is compare ridge patterns and then look for ridge characteristics.

   a. When these can be matched, they are referred to as points of comparison.

2. The general rule in the United States is that prints must match at least twelve (12) points of comparison before an identification can be regarded as positive.
3. The prints that may be found at a crime scene aren't always complete.
   a. What counts is the number of points of comparison.
   b. A partial print from just one finger may be all that's necessary for identification.

B. The Henry Classification System

1. This is the system for identifying and cataloging fingerprints that is used in the English-speaking world.
   a. According to this system, there are three basic patterns in fingerprints: the arch, the loop and the whorl.

C. Grouping by basic patterns called arches, loops and whorls.

1. Arches are ridgelines that rise in the center to create a wavelike pattern.
   a. Arches are sub grouped into plain and tented varieties.
b. Tented arches have a sharper central rise than do plain arches.
c. Only 5 percent of all pattern types are arches.

2. Loops are comprised of one or more ridges that double back on themselves.
a. About 60 percent of patterns in human fingerprints are loops.
b. They're subdivided into two types depending upon the direction the ridges flaw in relation to the two bones of the forearm - the radius and the ulna:

(1) Radial loops flow downward and toward the radius or the thumb side.
(2) Ulnar loops flow toward the ulna or little finger side.

3. Whorls look like little whirlpools of ridgelines.
a. They make up 35 percent of patterns seen in human fingerprints and are sub-grouped into four categories:
(1) Plain whorls are either concentric circles like a bull’s eye, or spirals like a wound spring.
(2) Central **pocket** loop whorls resemble a loop with a whorl at its end.

(3) Double loop whorls include two loops that collide to produce an S-shaped **pattern**.

(4) The accidental whorl contains more than two **deltas**, which are places where two lines run side by side, then diverge with a significant line that curves around and passes in front of the delta.

4. As far as arches, loops, and whorls go, there are some slight **racial** variations.

   a. People of African ancestry tend to have plenty of **arches**;
   b. people of European background have frequent **loops**;
   c. and Asians/Orientals have a fairly high frequency of **whorls**.
D. The nine basic fingerprint patterns

1. The FBI calls the nine basic fingerprint patterns: plain arch, tented arch, plain loop (right), plain loop (left), simple whorl, central pocket loop, lateral pocket loop, twinned loop, and accidental whorl.

2. The basic patterns allow investigators to narrow the search for file prints that may match prints obtained from crime evidence.

   a. Once a group of possible matches are obtained, a fingerprint expert compares specific identification points, minute features within the patterns that allow for specific matching of an evidence print with a file print.

IV. RECORDING AND LIFTING OF FINGERPRINTS

A. Fingerprints should always be photographed as soon as they are visualized as a record to reflect where they were found.
1. When fingerprint evidence is photographed, a complete record of all technical data about the camera, lens, film, shutter speed, lens opening, illumination, camera position, distance from object, and angle is also kept.

   a. With photos, three different exposures are usually taken:

      (1) a regular exposure,
      (2) an underexposure,
      (3) and an overexposure.

2. A camera fitted with a fixed-length adapter should be used to produce a one-to-one image.

   a. If the fingerprint is on a piece of paper or a weapon, the entire carrier of fingerprint should he sent to the crime lab with the finger-print still on it.

3. Once photographed the fingerprint should be lifted and preserved as potential evidence.
B. The next step is called **lifting** the print and involves using some adhesive material to remove the powdered print from the surface.

1. The three most common materials used in lifting prints are **hinged** lifters, rubber lifters, and **cellophane** tape.

2. If tape is used, a high quality clear **transparent** tape is best, not some glossy or opaque magic tape.
   
   a. The tape is **unrolled** a little at a time and folded over a bit to use as a tab for handling.

   b. It is important that the crime scene investigator not get their own **fingerprint**s on the tape.

   c. The investigator will pull on the roll of tape so that the rest of the exposed tape is kept slightly **taut**, and cover the print area about an **inch** beyond in the other direction.

   d. Investigators must be careful not to get air **bubbles** under the tape.
(1) Bubbles **destroy** the value of the print.

(2) The tape is gently **rubbed** over the print.

(3) After the tape is firmly in place, the print is lifted by pulling the roll gently and evenly **away** from the surface.

e. The tape with the fingerprint should be applied to a **card** or piece of paper as soon as possible and **excess** tape can be cut away.