**Essential Standard**: Understand the characteristics of fingerprints that allow them to be systematically classified.

1. **Early Classification**
2. Francis Galton (1892):
3. outlined the \_\_\_\_\_\_\_\_of fingerprints in a text called *Fingerprints*
4. suggested methods of recording prints
5. proposed 3 pattern types:


   3. .
6. Chinese used prints as legal signatures
7. Henry Fauld
   1. suggest that fingerprints be used as personal identification

D. Sir Edward Richard Henry:

1. developed the classification system used by most English speaking countries
2. Dr. Juan Vucetich: developed a classification system used mainly in Spanish speaking countries
3. **Admissibility in Court:**

1999: United States v. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

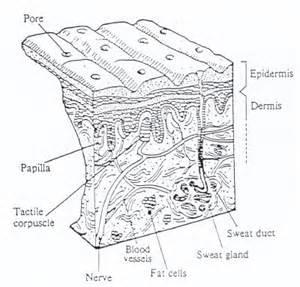
Defense argument: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

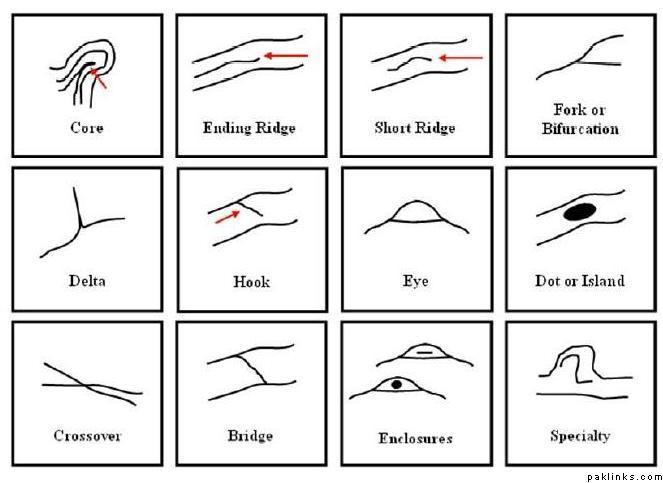
Judges Ruling:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Individuality:**
4. general shape and pattern
5. \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ give additional individuality
6. For a two prints to be a match the characteristics must be identical with the same relative\_\_\_\_\_\_\_\_\_\_\_\_\_as determined by an expert.

**IV. Principles of Fingerprints:**

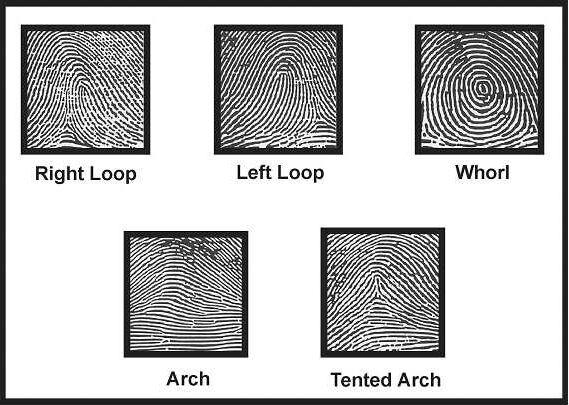
1. **Fingerprints are an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_characteristic. No two fingers have yet been found to possess identical \_\_\_\_\_\_\_\_\_\_\_\_\_\_characteristics.**
2. Probability of someone having the exact fingerprint as another person: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **A fingerprint remains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during an individual’s lifetime.**
4. reproductions of the skin ridges on the palm side of the \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_.
5. formed before birth at about \_\_\_\_\_\_\_\_\_\_\_\_\_weeks gestation (in utero).
6. created between the layers of the epidermis; hands and feet have an extra layer of epidermis
7. stress from varying growth rates and constraints of the layers of the dermis cause the basement membrane (stratum basale) to buckle forming ridges and ridge patterns. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_forms a boundary to create ridge.
8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_that match is sufficient to meet criteria of individuality.



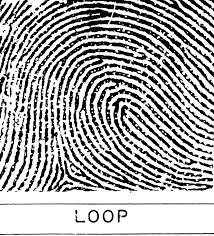


**Can fingerprints be changed? If so how?**

1. **Fingerprints have ridge patterns that allow them to be systematically classified.**



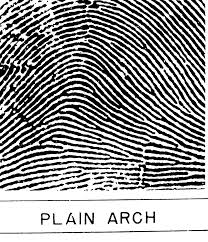
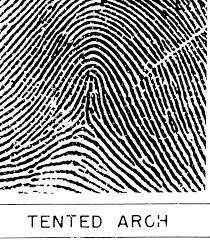
1. **Loops:** 
   1. Must have one or more \_\_\_\_\_\_\_\_\_\_\_\_\_ entering from one side of the print, recurving, and exiting from the side of entry
   2. Loops have a core (center of the pattern) and one delta
   3. 60-65% of the population has loops
   4. ulnar loop: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. radial loop: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   6. delta: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. **Whorls**
   1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**appearance
   2. must have at least two \_\_\_\_\_\_\_\_\_\_\_\_\_and type lines
   3. a plain whorl and a central pocket loop have at least one ridge that makes a complete circuit
   4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of population have whorls
   5. very common pattern especially on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   6. 4 types of whorls: central pocket loop whorls, plain whorls, accidental whorls



1. **Arches**
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_ of the population has arches
   2. ridge lines enter from one side and flow out the other side forming a wavelike pattern
   3. Arches do not have deltas or cores.
   4. most simple print but also uncommon
   5. Plain:
   6. Tented:



1. **Henry Classification System**
2. uses loops, whorls and arches approach
3. categorizes ten-print fingerprints into one of these groups
4. Assigns a number value to each finger based on the presence of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. results represent a ratio of odd/even fingers

**right hand left hand**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **thumb** | **index** | **middle** | **ring** | **pinky** | **thumb** | **index** | **middle** | **ring** | **pinky** |
| **no. (#)** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **whorl**  **present** | **16** | **16** | **8** | **8** | **4** | **4** | **2** | **2** | **1** | **1** |
| **ex.** | **0** | **16** | **0** | **8** | **0** | **0** | **2** | **0** |  |  |

Sum of odd finger values \_\_\_\_\_\_\_ + 1 = \_\_\_\_\_\_

Sum of even finger values\_\_\_\_\_+1 = \_\_\_\_\_\_\_

Grouping ratio: odd/even = \_\_\_\_\_\_\_\_

1. **Crime Scene Prints**
2. Four types of prints are of interest to the forensic scientist at the scene:
   1. known prints: deliberately collected from the subject using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. patent prints: visible prints made by fingers coated with a substance such as dirt, blood, ink,
   3. plastic prints: three-dimensional prints made in pliable surfaces such as wet paint, wax, soap
   4. latent prints: \_\_\_\_\_\_\_\_\_\_\_ to the naked eye; require enhancement using dusting powder or some other method; latent prints are impressions made by the transfer of natural oil or perspiration (sweat)
3. **Enhancement and Development methods**

**Non-porous or non-absorbent surfaces**

1. **Powder**: usually a colored powder that contrasts the color of the surface to be dusted. Powder is used for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_surfaces such as mirrors, tile, painted wood. Powder adheres to the oils and sweat in the print and creates a visible image.
   1. Fluorescent powder: glows under a black light
   2. Aluminum powder: light gray; works on \_\_\_\_\_\_\_ surfaces
   3. Carbon powder: black powder to use on \_\_\_\_\_\_\_ surfaces
   4. magnetic sensitive powder
2. Super Glue (cyanoacrylate fuming): use on non-porous or non absorbent surfaces
   1. **Chemical reaction:**

**Porous Surfaces (absorbent)**

1. Iodine fuming: oldest method for visualizing latent prints. Iodine crystals are heated in a chamber and the fumes of the iodine react with the print. Prints are not permanent and must be \_\_\_\_\_\_\_\_\_\_\_\_\_\_immediately to preserve and documented.
   1. **Chemical reaction**:
2. Physical developer (silver nitrate based reagent)
   1. **Chemical reaction:**
3. ninhydrin
4. fluorescent techniques and alternate light sources: high intensity light other than laser that filters the origin light and induces luminescence at the wavelength to excite the latent print.
5. argon ion laser: natural fluorescence by components in perspiration and blood)

**Preservation of prints**

Detected prints must be photographed before any preservation techniques are used. If the object that the print is on is small, the entire object can be taken and preserved. If the object is too large to remove, prints can be lifted using wide scotch tape after developing with one of the previously mentioned powders. The tape can then be put on a card for better examination.

**Prints and the Crime scene**

It is important to remember that prints found at a crime scene are not usually picture perfect. Many times only partial prints are left behind and they are often smudged or in poor condition. This makes analysis challenging. Photographs and scanned images can be helpful to clarify details.

**Automated Fingerprint Identification System (AFIS)**

AFIS is a fingerprint database that is used to classify prints. It automatically searches electronically stored fingerprint images and generates a “hit” list. This list is examined by an experienced fingerprint technician who determines if the prints match.