STANDARD: SFS2a-Identify and utilize appropriate techniques used to lift and evaluate readable, latent, plastic and visible prints.

EQ: How are prints used to trace a suspect to a crime?

WARM-UP: Read the Case File on pg 482 and answer the following questions.

1.   What was Richard Ramirez known as?
2.   What is he infamous for doing?
3.   What was his "mode of operation/modus operandi"?
4.   How was he caught?
5.   What was his sentence?

Fingerprints

Fingerprints

- **Friction Ridge Skin Patterns**
  - Used for personal identification
    - Due to two features:
      1. Every fingerprint is unique to an individual
      2. Fingerprints do not change during a lifetime
        - Unless there is damage to the dermal skin layer
  - Characterized by complicated pattern of "hills and valleys"
    - "hills" = ridges
    - "valleys" = furrows
  - Formed early in embryonic development and remain constant throughout life
    - Due, in part, to genetic make-up and other factors – identical twins
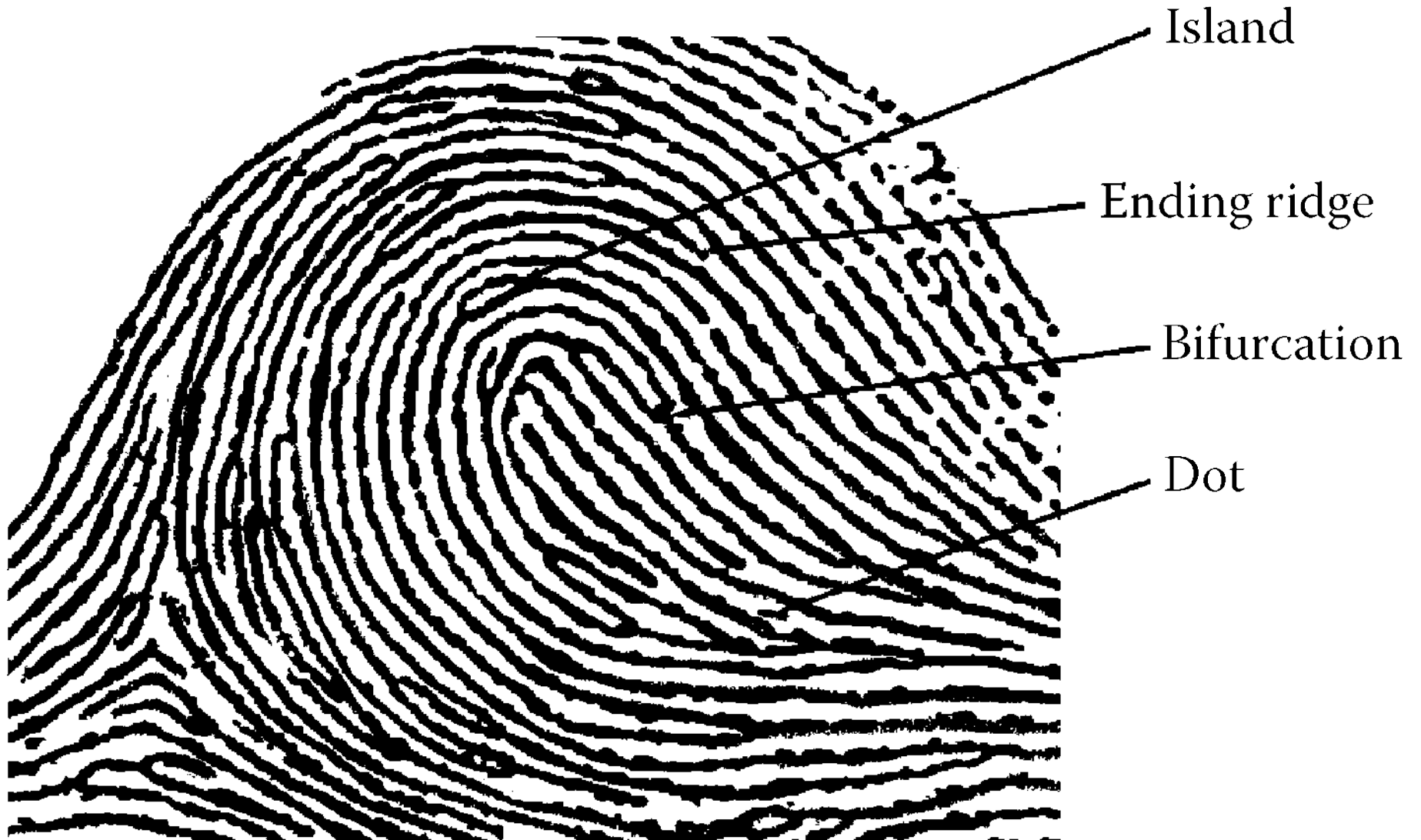
Fingerprints

- **Basic Fingerprint Patterns**

  - Within fingerprint patterns, there are a number of features called <u>minutiae</u>

  - Used to actually compare the fingerprints and decide whether they are or are not from the same source

1. Ending ridge: ridge ends abruptly

2. Bifurcation: ridge splits into two

3. Dot: ridge short in length

4. Island: two bifurcations facing each other

Island

Ending ridge

Bifurcation
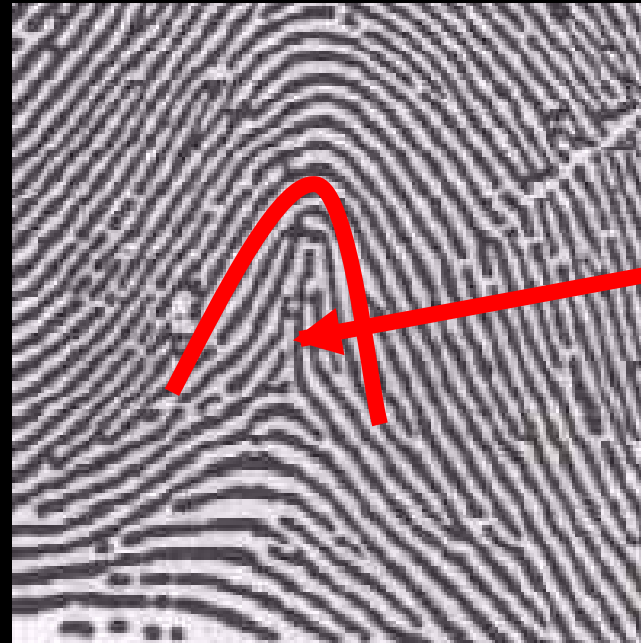
Dot

Fingerprints

- **Basic Fingerprint Patterns**
  1. Arch

  - Plain arch   - Tented arch

"Significant upthrust"

Fingerprints

- **Basic Fingerprint Patterns**
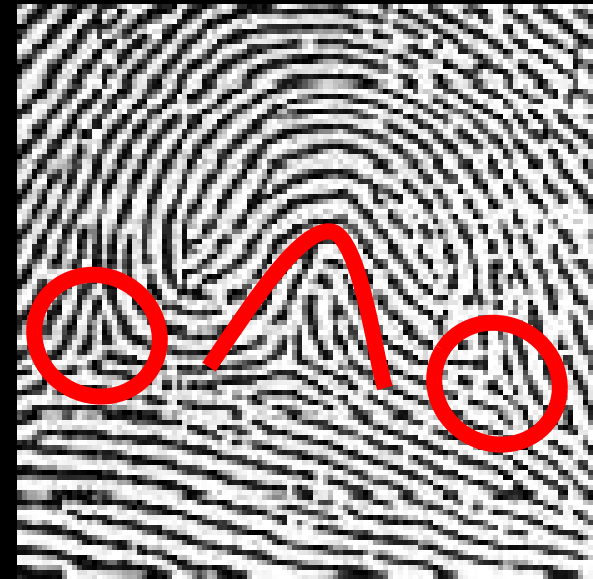 2. Loop
  - Radial loop
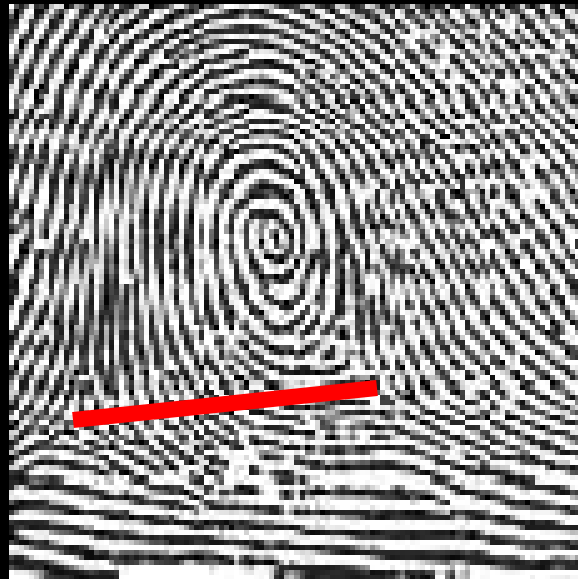
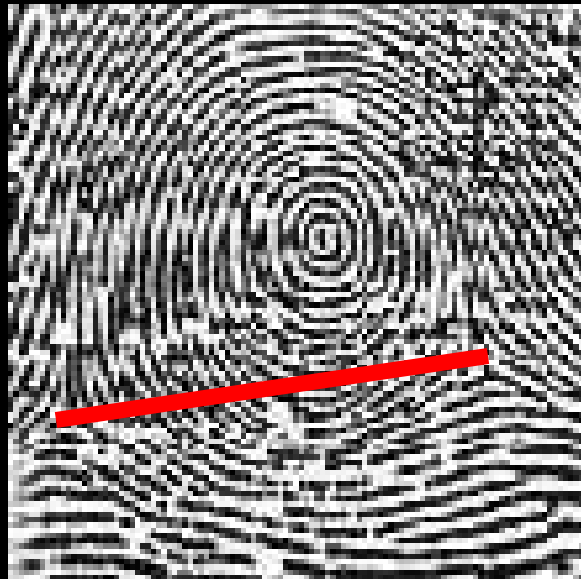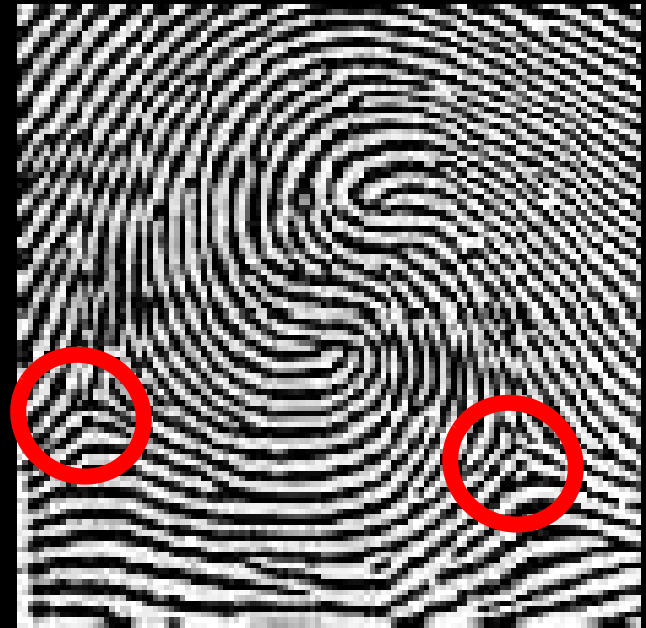 - Ulnar loop   Delta

Core

Fingerprints

- **Basic Fingerprint Patterns**
  - 3. Whorl
    - Plain whorl
    - Central pocket loop whorl
    - Double loop whorl
    - Accidental whorl

http://www.tip.duke.edu/independent_learning/cdrom_courses/clues_interactive.swf
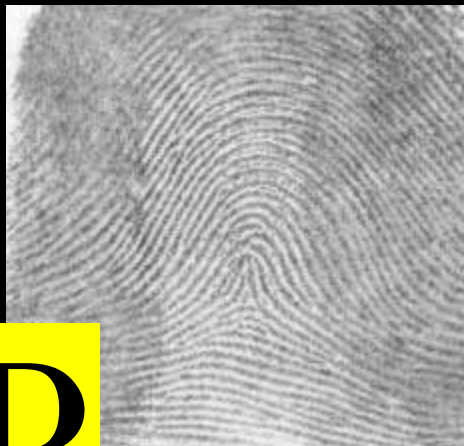
Identify each fingerprint pattern.

?

A
Left Hand

B
Right Hand

C
Right Hand

D
Right Hand

E
Left Hand

Avoid Partial Prints

GOOD PRINT

Get as much of the **top** part of your finger as possible!

Classification of Fingerprints

- FBI system = uses numerical values to categorize "ten prints" based on occurrence of whorl patterns
- Pair fingers in this sequence:

R Index	R Ring	L Thumb	L Middle	L Little
R Thumb	R Middle	R Little	L Index	L Ring

- If a whorl pattern is found on any finger:
    - plug in 16 on the first pair,
    - plug in 8 on the second pair,
    - plug in 4 on the third pair,
    - plug in 2 on the fourth pair, and
    - plug in 1 and on the last pair.
- Any finger with an arch or loop pattern is assigned a value of 0.

Classification of Fingerprints

R Index	R Ring	L Thumb	L Middle	L Little
R Thumb	R Middle	R Little	L Index	L Ring

- Any finger with an arch or loop pattern is assigned a value of 0.
- After values for all ten fingers are plugged in, they are totaled, and 1 is added to both the numerator and denominator, giving the primary classification.

$$\frac{16 + 8 + 0 + 0 + 0 + 1}{16 + 0 + 0 + 0 + 0 + 1} = \frac{25}{17}$$

- A fingerprint classification system cannot in itself 100% identify an individual; it merely provides the fingerprint examiner with a number of candidates.

Integrated Automated Fingerprint Identification Systems (IAFIS):

Computer scans digitally encodes fingerprints so that they can be subject to high-speed computer processing

Computer records type, position, and orientation of the minutiae

Types of Evidentiary Fingerprints

- **(3) Types of crime scene prints:**
  1. Visible Prints
     - Made by fingers touching a surface after the ridges have been in contact with a colored material
     - Often made from blood, paint, grease, or ink
  2. Plastic Prints
     - "impression" or "indented" print on a soft surface
     - Recognizable fingerprint indentation on a soft surface (butter, putty, wax, soap, tar, or dust)
  3. Latent Prints
     - Any fingerprint made by the deposit of oils and/or perspiration that is invisible to the naked eye
     - Requires additional processing
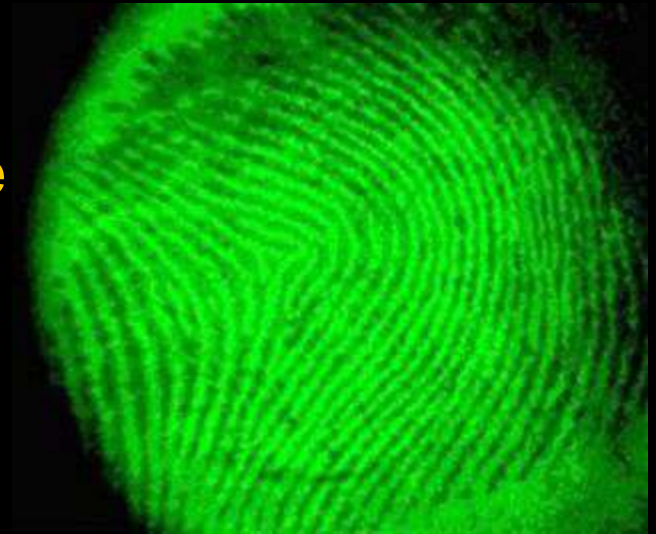
FEBRUARY 7, 2013
WARM-UP:

Fingerprint Pattern Identification

Directions: Determine whether the following fingerprints are arches (plain or tented), loops (radial or ulnar), or whorls (plain, central pocket, double loop, or accidental). Assume all prints came from the individual's right hand. Use your own paper.

1   **2**   **3**

4.   5.   6.

Developing Latent Prints

- **Fingerprint Powders**

  - Do not involve any chemicals or chemical reactions

  - Works by applying fine particles to the fingerprint residue

  - Particles adhere, creating contrast between the ridges and the background

  - Most well-known method: powder dusting

  - Has been used for well over a century

  - Black powders more often used

What type of prints leave impressions on soft material such as soap?

Plastic Prints

Specialized Fingerprint Powders

Magnetic Sensitive Powder:

- Magnetic brush

- Brush doesn't have bristles, so no damage to print ridges during development process

Fluorescent Powder:

-Powders fluoresce under UV light, the pattern is photographed

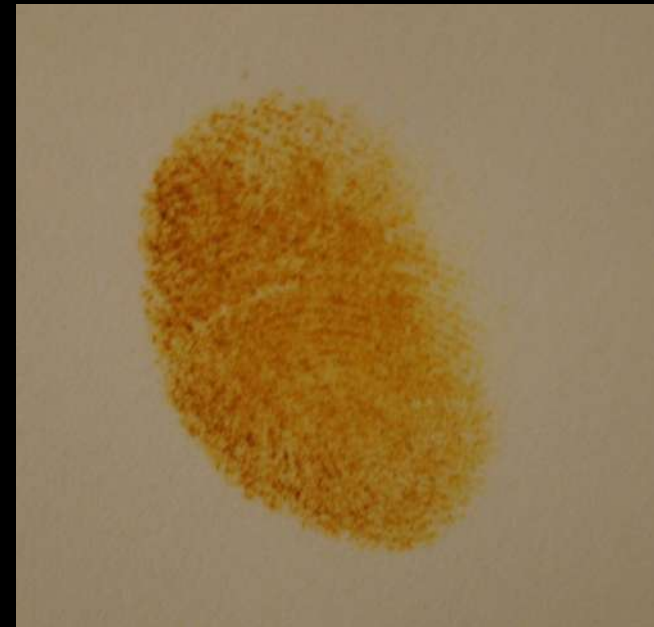-Benefit-color of the surface doesn't obscure the print

IODINE FUMING:

When the iodine crystal is heated it transforms from a solid to a vapor (sublimation)

Iodine gives ridge features a dirty-brown appearance

Not stable, must be photographed immediately because prints will begin to fade

NINHYDRIN:

Forms a purple-blue color when it reacts with amino acids in perspirations

Most commonly used chemical method used on porous (absorbent) materials

Which method prevents destruction or damage of the print?

Magnetic-Sensitive Powder

PHYSICAL DEVELOPER (PD):

Commonly used as a follow-up method to ninhydrin on porous surfaces (paper)

Silver nitrate-based liquid reagent

Usually used when latent prints are not visible using other methods

Excellent on porous articles that may have been wet at one time

SUPER GLUE FUMING:

Discovered in 1982

Develops prints on nonporous surfaces such as metals, electrical tape, leather, and plastic bags

Super glue (cyanoacrylate) is placed on absorbent cotton and treated with sodium hydroxide (NaOH)

Latent prints and fumes are enclosed in a chamber for 6 hours and prints appear white

Preservation of Developed Prints:

Developed latent impressions are lifted with transparent tape once print is visualized

Mounted on a backing card with a color maximally contrasting to that of the powder

- Ex. White backing for black powder

How is digital imaging used in fingerprint analysis?

Picture is converted into a digital file using scanners, digital cameras and video cameras