Introduction to Forensic Science – (Criminalistics)

Basic

Crime **S**cene **I**nvestigation Techniques

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This week the student will learn:

- History of fingerprinting
- Fundamentals of fingerprinting
- Classifications of fingerprints
- Methods of detecting fingerprints
- Cyanoacrylate fuming chambers
- Techniques used to preserve developed prints
- HOMEWORK
  - Read chapter 15 - Turn in second project - prints

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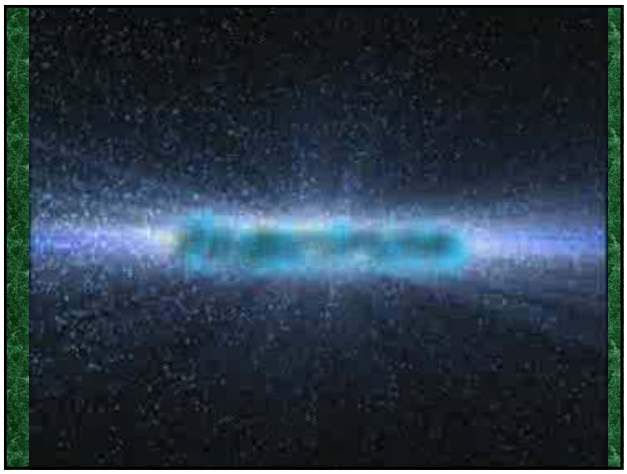

Review – Fingerprints

- The Chinese used fingerprints to sign legal documents more than 3,000 years ago
- While working in a Japanese on 1880, Henry Fauld determined that skin ridge patterns could ID criminals
- In 1892, Sir Francis Galton published the classic textbook "*Finger Prints*"
- In it, he demonstrated that prints remain unchanged for life and that no two are identical.

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Review – Fingerprints

- In 1891, Argentinian police officer Dr. Juan Vucetich devised a working classification system.
- It is still used in most Spanish speaking countries.
- In 1897, Sir Edward Richard Henry devised a different classification system.
- Most English speaking countries still use some version of this system.

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Review – Fingerprints

- Bertillon's system of Anthropometry began being phased out in 1903 due to convicts William West @ Leavenworth Prison.
- They looked and measured identically
- Fingerprints could distinguish them.
- Currently, the FBI has the largest fingerprint file in the world.
- In 1999, United States v. Byron C Mitchell reasserted that fingerprints are certifiable for identification.

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Review – Fingerprints

- Individuality is NOT determined by shape or pattern but by ridge characteristics known as minutiae.
- These minutiae must not only be identical, but in the exact relative position to each other.
- Minutiae include:
  - Ridge Endings
  - Bifurcations
  - Enclosures
  - Short Ridges
  - Ridge Crossings
  - Islands
  - Pores
  - Etc.

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Review – Fingerprints

- Any positive identification must be made by a person, and depends upon their experience and knowledge.
- What is a fingerprint?
  - A reproduction of the friction skin ridges found on the palm side of the fingers & thumb
- Hills = ridges
- Valleys = grooves
- Skin is made up of three layers.
  - Dermis - inner
  - Epidermis - outer
  - Dermal papillae - mid
- 1-2 mm penetration required to damage the dermal papillae.

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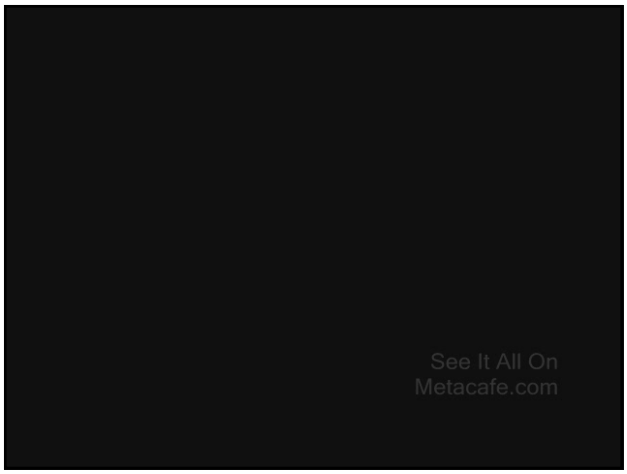

Review – Fingerprints

- Each ridge has one row of pores.
- These pores exude perspiration.
- Touching hairy parts of the body causes fingers to pick up minute amount of body oils
- When a finger touches a surface, it leaves behind this perspiration, oil and often dirt in the shape of the ridge pattern.
- This is a latent (hidden) fingerprint.

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Review – Fingerprints

- The presence of permanent scars provides new characteristics
- John Dillinger acid to damag fingerprints in attempt to co remove them.
- Dillinger's attempt completely failed.

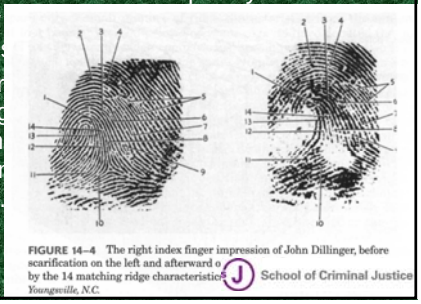

FIGURE 14–4 The right index finger impression of John Dillinger, before scarification on the left and afterward o by the 14 matching ridge characteristics *Youngsville, N.C.*

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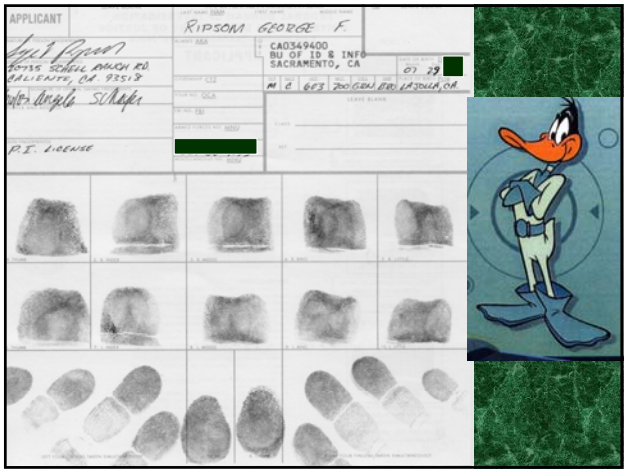

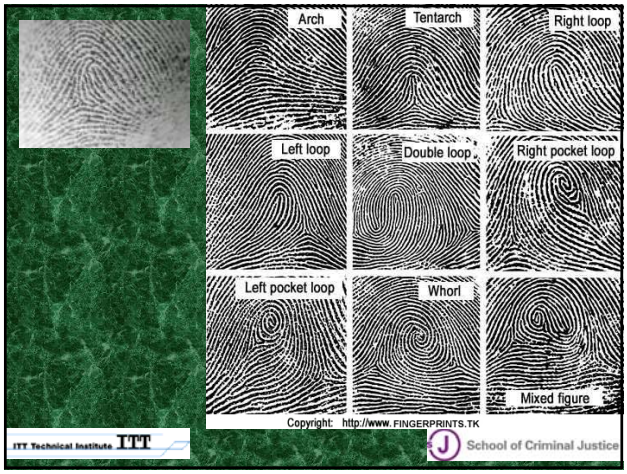

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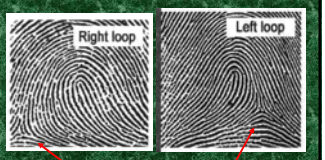
Review – Fingerprints

- A loop must have one or more ridges entering from one side of the print, recurving, and exiting on the same side.
  - Ulner loop – loop opens towards little finger
  - Radial loop – opens towards thumb



  - All loops must have one delta

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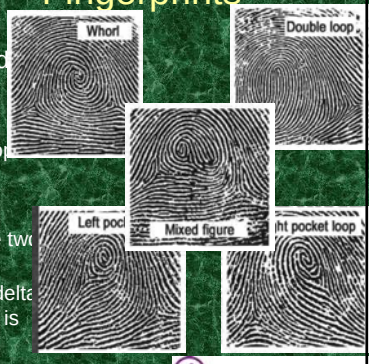
Review – Fingerprints

- Whorls are divided into four groups
  - Plain
  - Central pocket loop
  - Double loop
  - Accidental
  - Whorls must have two deltas
  - Draw a line from delta to delta, if a spiral is touched it is plain.



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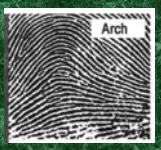
Review – Fingerprints

- Arches are divided into two categories
  - Plain arches
  - Tented arches
  - Have ridges entering from one side of the print and exiting on the opposite side.



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Review – Fingerprints

- In the US, we currently use the FBI system of classification, it is a derivative of the Henry system
  - If a whorl is found in the first pair = 16
  - If a whorl is found in the second pair = 8
  - If a whorl is found in the third pair = 4
  - If a whorl is found in the fourth pair = 2
  - If a whorl is found in the fifth pair = 0
  - Add 1 to top and bottom

R. Index / R. Ring / L. Thumb / L. Middle / L. Little
R. Thumb / R. Middle / R. Little / L. Index / L. Ring

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Review – Fingerprints

- Both, the Henry and the FBI are ten print systems, requiring all ten prints to search
- In 1970, the AFIS system began.
- Automated Fingerprint Identification System
- AFIS uses computers to scan and digitize minutiae for each print by type and exact location
- A set of ten prints can be searched against 500,000 10 print cards cards in 8/10 of a second.

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Review – Fingerprints

- California's AFIS system went on line, and in 20 minutes solved 15 serial murders.
- A single technician, manually searching the 1.7 million cards, would have taken 67 years.
- Visible prints – a print made when the finger deposits a visible material (ink, blood, dirt, etc.)
- Plastic prints – a print made in a soft substance (wet paint, putty, mud, soap, dust, etc.)

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Review – Fingerprints

- Hard non-absorbent surfaces like glass or painted wood require the application of powder or the use of super glue.
  - The most difficult part is often finding the prints to lift.
- RUVIS – Reflected Ultraviolet Imaging System, can find prints on a hard surface without powders
  - The UV strikes the print and is reflected back, showing the print.
  - Not used much since the advent of ALS

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Review – Fingerprints

- Magnetic sensitive powders is useful on surfaces like finished leather and rough plastics.
- Iodine Fuming is the oldest method used for visualization, used similar to super glue
- Iodine fuming permits prints to begin to disappear as soon as fuming process is stopped.
- Ninhydrin is used on porous materials by reacting with the amino acids in the print.

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Review – Fingerprints

- Ninhydrin is usually sprayed from an aerosol can.
- Prints begin to appear in 1 – 2 hours, but continue to develop for much longer.
- Physical developer is used when the first two fail.
- Physical developer must be used last because it destroys protein.
- Also very good on porous articles that were once wet.
- Super Glue fuming began in 1982.

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Review – Fingerprints

- Super glue is used for nonporous surfaces.
- Laser light will cause fingerprints to fluoresce
- Fluoresce – when a substance absorbs light and reemits it at a longer wavelength
- Fingerprints can also be treated with chemicals to increase the fluorescence
  - Zinc chloride after a ninhydrin treatment
  - Rhodamine 6G dye after super glue fuming
- DFO is now replacing ninhydrin, 2.5 times better at showing prints

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Review – Fingerprints

- ALS – Alternative Light Sources
  - Quartz halogen
  - Xenon arc
  - Indium arc
- Digital manipulation of fingerprints is standard procedure today, and is permitted by the court
- They increase contrast
- They reduce edge harshness
- Repetitive lines or dots can be removed (as in the background image) to make reading the print easier

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Review – Fingerprints

- Questions to be answered in notes:
  - Where was it found?
  - What was used to enhance the print? (eg. black powder, white powder, ninhydrin or perhaps the impression was made in dust and photographed)
  - How has the surface from which the print was lifted affected the appearance of the lift?
  - How has the enhancement process affected the appearance of the friction ridges?
  - What type of distortion is present? (many different kinds may be apparent on one lift)
  - How does the clarity or *lack of clarity* affect the amount of detail that is present in the unknown print?

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Review – Fingerprints

- Also, how does the clarity or lack of clarity affect the level of tolerance for any ridge formation discrepancies between the unknown and the known print in the comparison phase?
- Do you have sufficient quality and quantity of information to proceed to the comparison step in the identification process?
- Read (and know) Chapter 15 for next week, it is on tool marks

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My youngest student
And most faithful employee

Quiz Week #6

Quiz Week #6

Forget about it!