DACTYLOGRAPHY

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DACTYLOGRAPHY

- Derived from GK word daktylose- finger ,graphein- to write
- Method of identification based on unique epidermal ridge pattern on the tips of fingers.
- Syn-Fingerprinting, Dermatoglyphics, Galton system of identification

SALIENT FEATURES OF FINGERPRINTS

- It is a most accurate and unfailing method of positive identification.
- No Two Individual will have identical fingerprints
- It is better method of identification than DNA profiling.
- DNA profiling would be same in identical twins but fingerprints are different.

- Fingerprints remain permanent throughout life and even after death and in advance stage of decomposition.
- Fingerprints have general characteristic ridge patterns that permit them to be systematically classified.
- Pattern can be easily emailed and printed, enabling intercontinental criminals can be caught easily.

DEVELOPMENT OF FINGERPRINTS

- 6-8 wks-volar pads forms ,these are ball like structure forms contoure of fetal hand.
- 10-12 wks- volar pad begin to recede.
- 13th wks- skin ridge appears.
- Between 10-16 wks –amniotic fluid pressure influence fingerprint pattern.
- 21 wks onward –fingerprint pattern is complete.

- Epidermal ridge(friction ridge) are raised portion of the epidermis on the figers, palms ,soles.
- Their function is to amplify vibrations and to assist in gripping rough and wet surface.
- Sweat gland pores open on their top-responsible for fingerprints.
- Subsidiary ridge is a incompletely develop ridge.
- Sweat pores do not open over them-they do not produce prints.

HISTORY OF FINGERPRINT

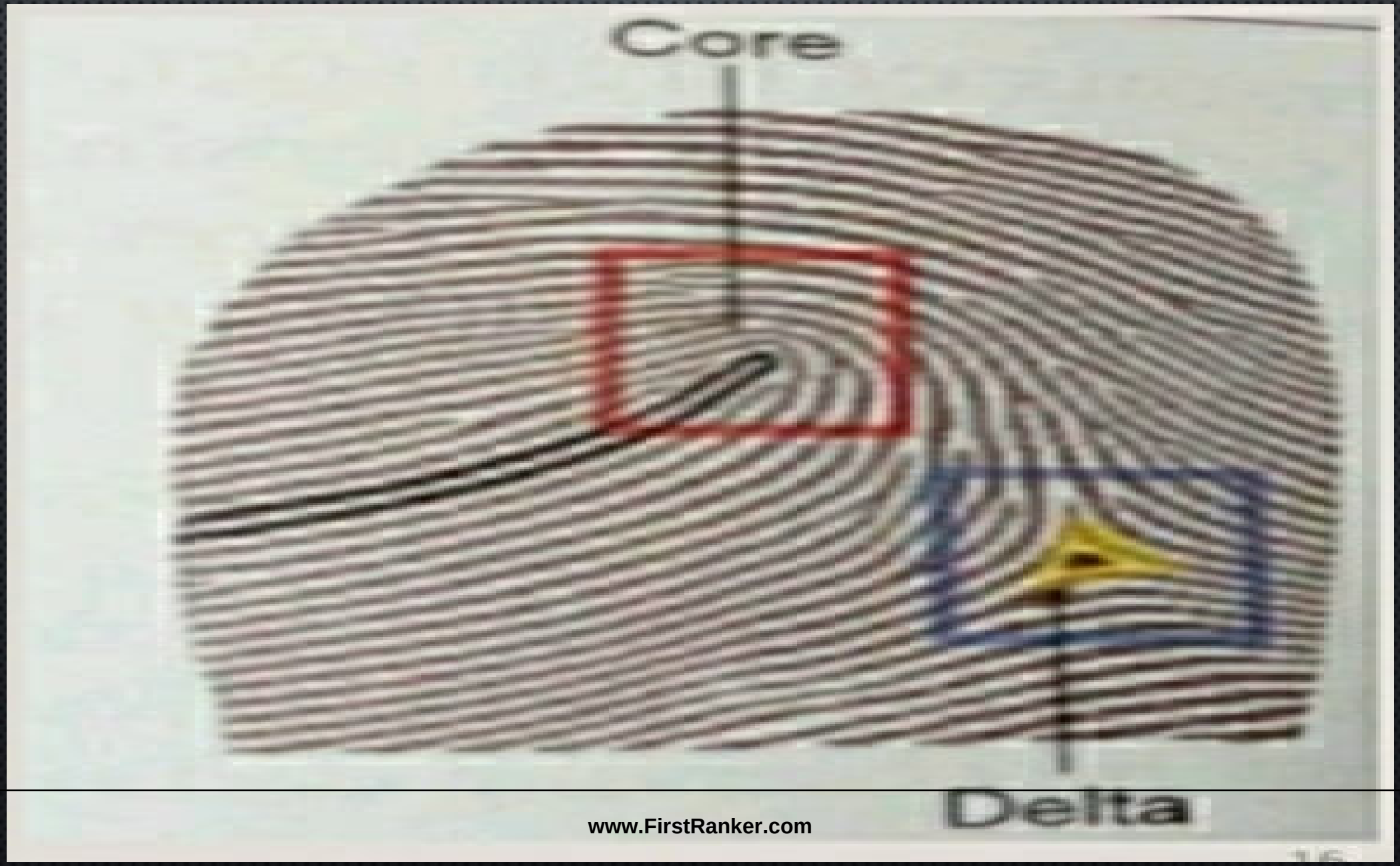
- In the BC era, fingerprints were used on pottery to indicate the make and brand.
- Clay slabs with fingerprints nearly 3000 years old have been found in Egyptian tomb.
- Thumbprints were used as official seals or documents by Chinese emperors since 240BC.

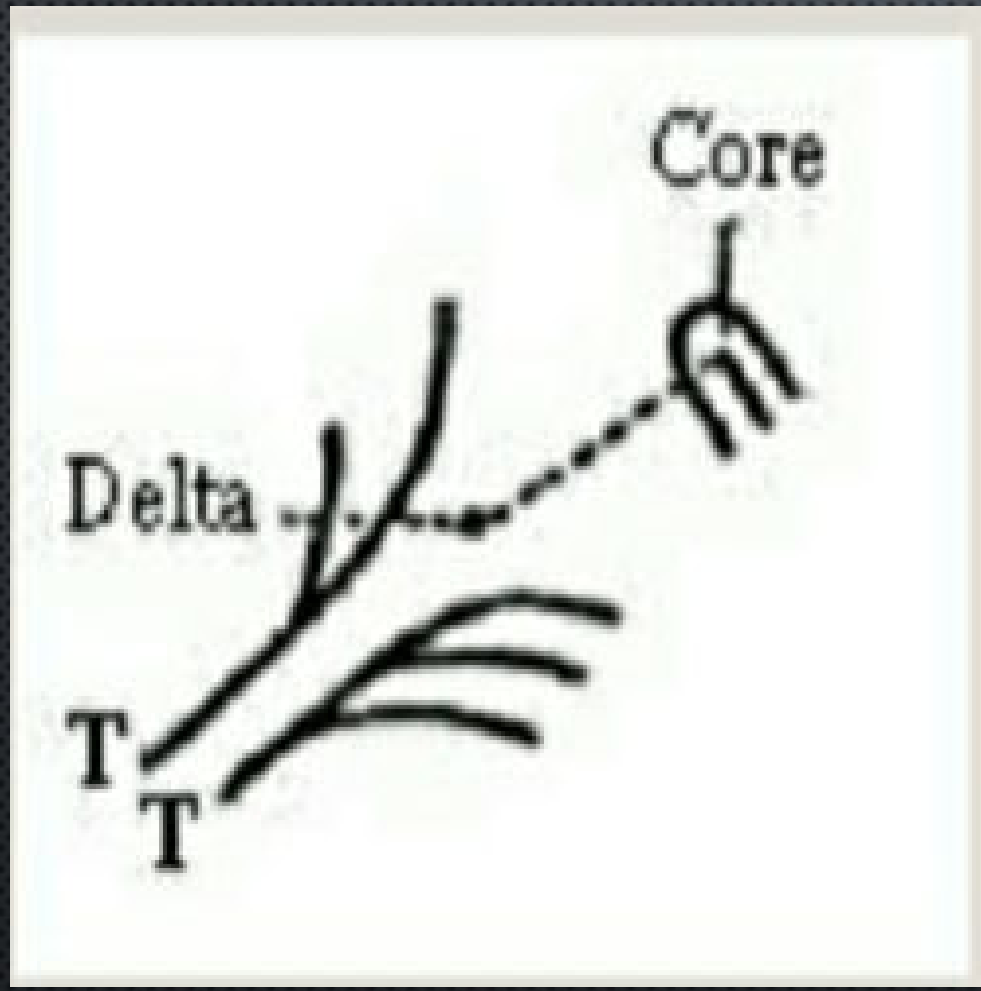
- **Grew (1684) and Biloo (1685)** gives earliest scientific descriptions of dermatoglyphics.
- **Purkinje's** in **1823** classified the varieties of finger patterns systematically.
- **W.J. Herschel in 1858** began the first known official use of fingerprints in India on a large scale.

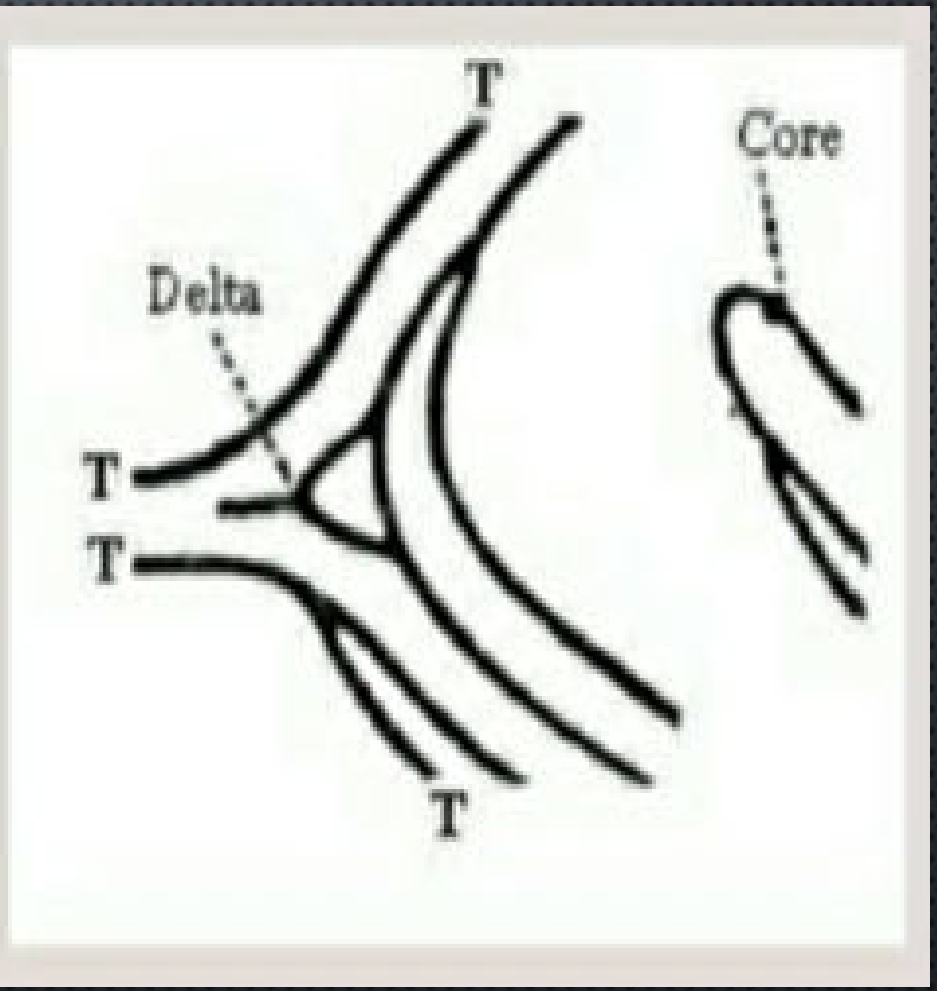
- He used it to prevent fraudulent collection of army pay and for purposes of identity on other documents.
- **Henry Faulds in 1880** wrote a comment on practical use of fingerprints for identification of criminals.

- **Francis Galton** began his observations around 1890 and published his book on fingerprints in 1892.
- He established the individuality and permanence of fingerprints and devised the first scientific method of classifying fingerprints.
- **Juan Vucetich in 1891** installed fingerprint files as an official means of criminal identification.

- The first fingerprint bureau in the world was officially established in Calcutta in June 1897.
- In 1901, fingerprinting for criminal identification was officially introduced in England and Wales.
- Edward Richard Henry, IG of police in lower Bengal did extensive study on fingerprints to develop a register for classification of fingerprints.
- The system of **Henry and Vucetich** forms the basis of modern ten digit fingerprint identification.



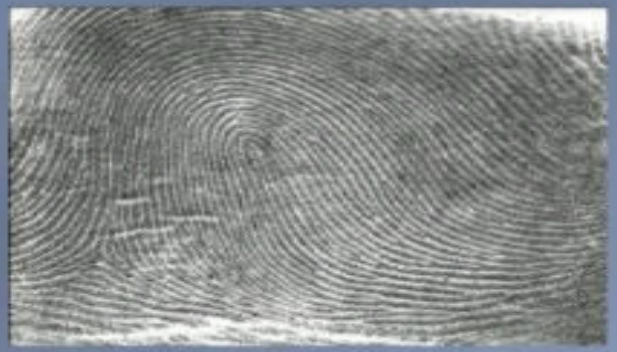


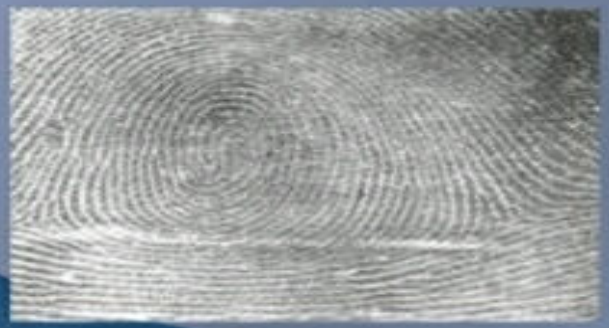


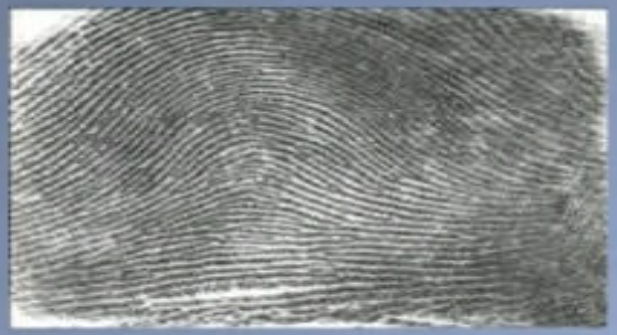
Classification of fingerprint

- Based on pattern four types are known

LOOP	67%
WHORL	25%
ARCH	7%
COMPOSITE	1%

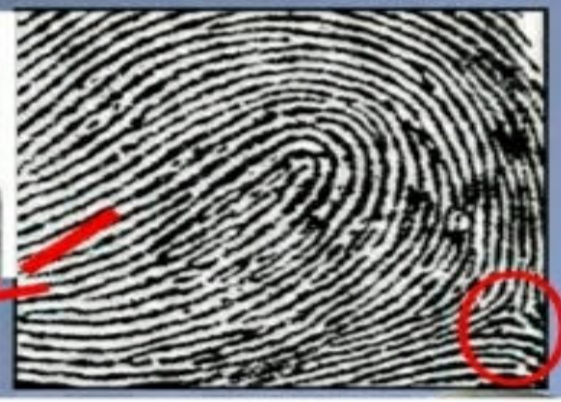






Fingerprint Patterns

- Loops
  - Ridge lines enter from one side and curve around to exit from the same side
  - It contain 1 core ,1 delta

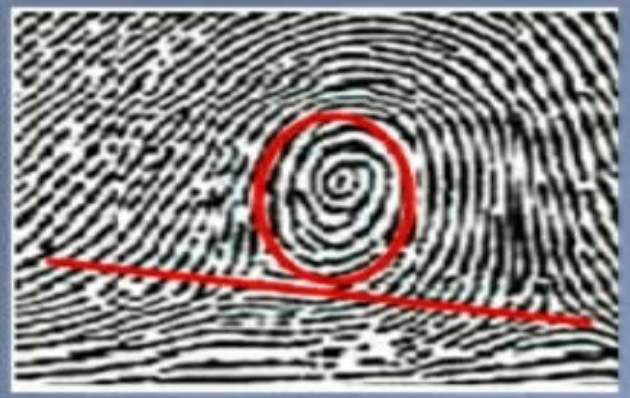


Ulnar Loop
Loop opens toward right or the ulna bone.

Radial Loop
Loop opens toward the left or the radial bone.

- Whorls
  - Ridges make a complete 360 circle around the center of print
  - Its contain 2 delta, No core

Plain Whorl

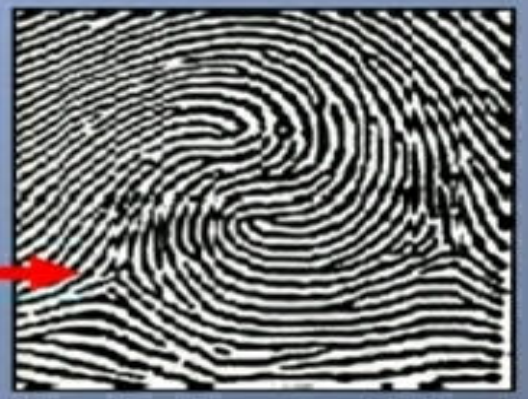


Central Pocket Whorl

Draw a line between the two deltas in the plain and central pocket whorls. If some of the curved ridges touch the line, it is a plain whorl. If none of the center core touches the line, it is a central pocket whorl.

Double Loop Whorl

Delta



Double loop whorls are made up of any two loops combined into one print. Typical S shaped pattern.

Accidental Whorl

Accidental whorls contain two or more patterns or does not clearly fall under any of the other categories.

Arches

-Ridge enter from one side with slight bump in center and exit out the other side

-No core ,no delta

Spike or tent

Plain Arch
Ridges enter on one side and exit on the other side.

Tented Arches
Similar to the plain arch, but has a spike in the center.

Fingerprints at Scene of Crime

May be found in three state

1)Latent print

- These prints are either invisible or barely visible at scene of crime.
- These impressions are left over surface or articles due to sebaceous and sweat gland secretions.
- These prints have to be made visible by developing with reagents for matching.
- If such prints are obtained by chance, then they are called as **chance fingerprints**.

2) Plastic print(3D- print)

- Found on malleable, soft and sticky surface such as soap, wax, clay, cheese etc.
- Also known as indented or melded prints

- 3) Patent(Visible) print
- These are the fingerprints left at scene when the fingers are smeared with or contaminated with blood, paint, oil, grease, dust, secretions etc.

Recording of Fingerprints

- The fingerprints are taken over unglazed white paper using printer's ink.
- Before taking prints, hands are washed and dried.

1)Plain method

- Inked fingers are brought in contact with unglazed paper and impressions are taken.
- It is quicker and easy to do but larger surface area is not obtained for comparison.

2) Rolled method

- Fingerprints are taken by rolling the fingers on paper from outward to inward direction in such a way that an impression of whole tip is obtained.
- it gives impression of a large area than plain method.
- Somewhat difficult procedure and may blur the prints.

Fingerprints in Dead Bodies

- If the skin is degloved as in advance decomposition,the skin should be removed, preserved in formalin and impressions can be taken from that degloved skin.
- If the degloved skin is lost, still prints can be taken from dermis.
- In mummified bodies fingertips or skin is immersed in weak alkali solution to make them swell-up and then prints are taken.

LATENT FINGERPRINTS

- There are three common techniques used to visualize latent fingerprints:
- Powders- adhere to both water and fatty deposits. Choose a color to contrast with the background
- Grey or black Surfaces- produce contrast
- Florescent Multi-colored or dark surfaces
- Magnetic Shiny surfaces or plastic baggies or containers.




Fuming

- Superglue(**Cyanoacrylate**) -superglue fumes react with water and other fingerprint constituents to form a hard, whitish deposit.

- **Iodine fuming**- fumes react with oils and fats to produce a temporary yellow-brown color.

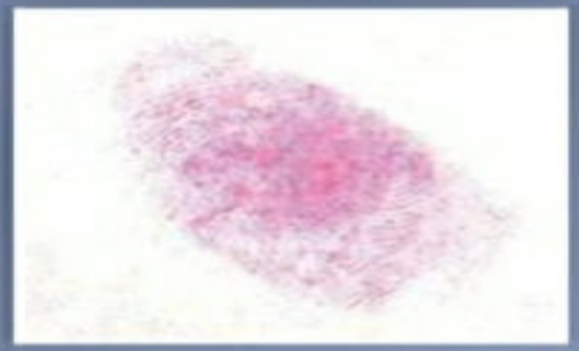



Dips or Sprays

Ninhydrin

Ninhydrin is a chemical that bonds with the amino acids in fingerprints and will produce a blue or purple color.

It is used to lift prints from surfaces such as paper and cardboard.



$AgNO_3$

- Reacts with chloride to form silver chloride, a material that turns gray when exposed to UV light.
- Good for wood products, paper products, leather, and many metal surfaces (including ammunition and casings)
- Silver nitrate is generally used as a last resort technique

Alternative Light Source

- Also called high intensity light source
- Fingerprints are treated with chemical which makes them fluoresce or give off light
  - DFO(Diazoflurenone, derivative of ninhydrin



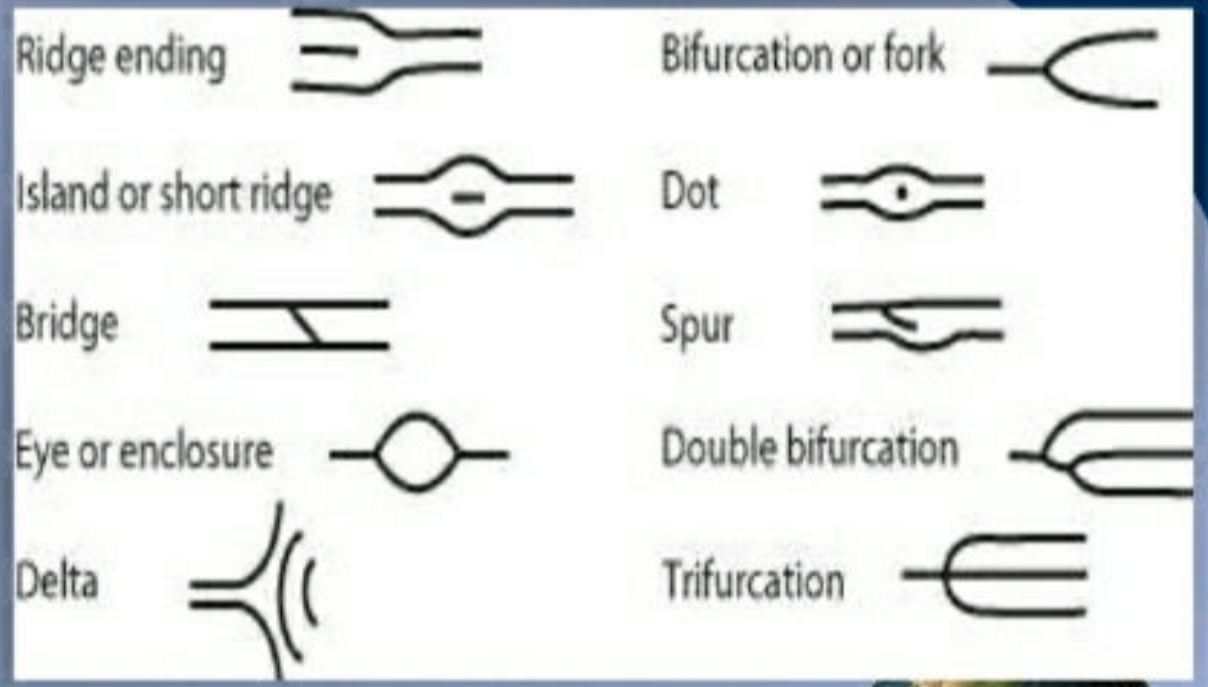

RUVIS
Reflected UV Imaging

- Reflected Ultraviolet Imaging System- locates prints on nonabsorbent surfaces without chemical or powder treatments.
- When UV light strikes the fingerprint, light is reflected back to the viewer- differentiating the print from its background surface.
- UV light is converted into visible light by image intensifier.

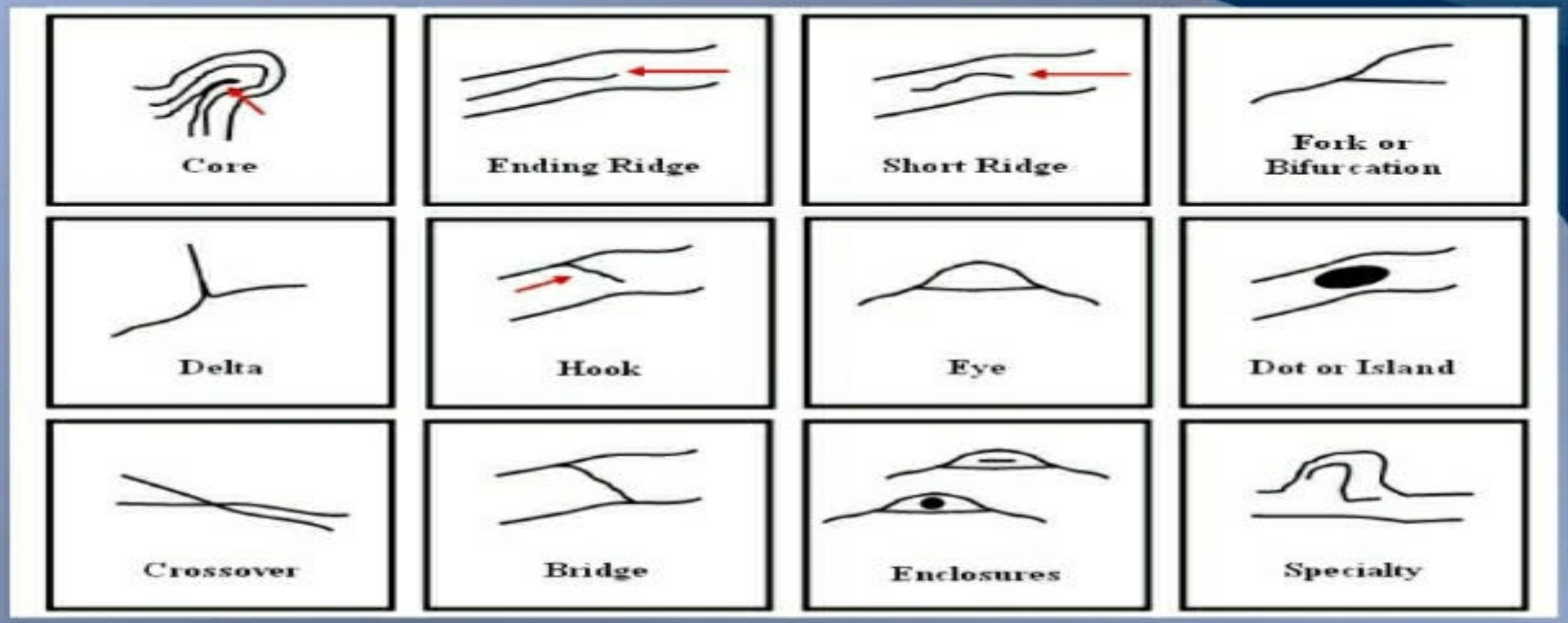
COMPARISON OF FINGERPRINT

- Identification is done by comparing many detail characteristics (minutiae).
- 1973 International Association for Identification concluded “it is the responsibility of the examiner- based upon experience and knowledge to establish positive identification.
- About 150 different characteristics on average print.

- **Minutiae**—characteristics of ridge patterns
- Ridge ending
- Island or short ridge
- Bridge
- Eye or enclosure
- Delta
- Bifurcation or fork
- Dot
- Spur
- Double bifurcation
- Trifurcation



Ridge Characteristics



The more points you can find in common, the better the match!

Scar

Points Necessary for Establishing Complete Identity

- There is no fix rule ,different country use different number of point for positive identification.
- Generally 16-20 points are accepted as proof of identity.

country	points	country	points
France	16	Interpol 12,	12
Australia	12	US 7-12,,	7-12
Japan	12-14	Isreal 10-12	10-12
Canada	10-16	New Zealand	8-12
Spain	10-12	INDIA	8

- The identification process is composed of three separate stages, referred to as ACE-V
- Analysis
- Comparison

The details present in the crime scene impression are compared with suspects fingerprint.

- Evaluation

Based on the quantity, quality, and clarity of detail in the two impressions, a conclusion of either identity or nonidentity is reached

- Verification

A colleague of equal or greater qualifications and experience must verify conclusions of identity

ALTERATION OF FINGERPRINT

Alteration of fingerprint may be

Natural Alteration

1. Change of distance b/w the ridge
   Acromegaly ,Infantile paralysis, Rickets
2. Complete loss of pattern
   Burn, Celiac disease
3. Permanent impairment of fingerprint
   Electrical injury, radiation injury, Leprosy
4. Rigde alteration
   Acanthosis nigricans, Scleroderma, Eczema

- Occupational alteration

In manual labourers working with cement, gravel, limes, sand fingerprint ridge may get damaged.

- Intentional alteration(Mutilation)

Used by criminals, illegal immigrants and refugees to avoid detection by police.

1. Abrading by sand paper/hard surface
2. Burns
3. Corrosive
4. Cauterisation/self inflicted wound/grafting

MLI of Fingerprint

- Identification of

1. Criminals/Deserters
2. Person suffering from amnesia
3. Person involved in accidents
4. Decomposed body
5. Accidental/Intentional exchange of babies
6. Burnet body

- To maintain attendance /identity record
- Authentication of documents like DL, Passport, Aadhar card etc.

- Prevention of impersonation

Extra precaution on cheques, bank notes and legal documents in addition to manual signature.

- Drugs like cannabis, cocaine, methadone and nicotine can be identified from their fingerprints.
- Recognition of impressions left at scene of crime
- Identification of weapon used for crime

AFIS

- The Automated Fingerprint Identification System —a computer system for storing and retrieving fingerprints
- Established in the 1970s, AFIS enables law enforcement officials to: Search large files for a set of prints taken from an individual
- Compare a single print, usually a latent print developed from a crime scene
- By the 1990s, most large jurisdictions had their own system in place.
- The problem: A person's fingerprints may be in one AFIS database but not in others.

IAFIS

- IAFIS—the FBI's Integrated Automated Fingerprint Identification System,
- which is a national database of all 10-print cards from all over the country
- The IAFIS maintains the largest biometric database in the world

-Containing the fingerprints and corresponding criminal history information for more than 47 million subjects in the Criminal Master File.

- The fingerprints and corresponding criminal history information are submitted voluntarily by state, local, and federal law enforcement agencies.

THANKS