

MODULE I : History of Fingerprinting.

- * Origin and History of Fingerprints.
- * Principles of Fingerprints identification
- * Searching
- * Location and significance of fingerprints in Criminal Investigation.

MODULE II : Introduction of fingerprint & its Characteristics.

- * Biological significance of skin pattern
- * Types of fingerprints
- * Fingerprint characteristics : Class & Individual
- * Collection, lifting & preservation of fingerprints

MODULE III : Classification of fingerprints.

- * Henry's System of classification
- * Battley's single digit classification
- * Extension of Henry's system of classification.

MODULE IV : Fingerprint development technique.

- * Methods of lifting & developing latent fingerprint
 - Physical Methods :- Powder method [Black, Silver, red, yellow, fluorescent]
Iodine fuming etc.

MODULE V : Chemical development technique.

- * Chemical Method :-
 - * Ninhydrin
 - * Silver nitrate method
 - * Cyano - Acrylate
 - * Osmium tetroxide etc
- * Photography of latent fingerprint
- * Presentation of fingerprint evidence in court.

⇒ Fingerprints:

Basically fingerprint is an impression or mark made on the surface by a person's finger tip, which can be used for identifying individuals from their unique patterns.

Skin covering the interior surface of human hand and planter surface of the human foot is different in texture and appearance than the one which covers the rest of the human body.

This skin on the palmar and planter surface is continuously wrinkled with narrow minute ridges [also known as friction ridges] and it is also completely free from hair and oil glands. However, there is a profusion of sweat glands and those are relatively large in size.

These sweat glands open as dots with pore opening meant for discharging perspiration. This perspiration is largely made of water that is 98.5%, the remainder is made up chiefly of organic acids, salts [mainly NaCl], urea, and at times a very small quantity of albumin.

The study of skin patternings on fingers, palm, sole and toes is termed as dermitoglyphics.

In common parlance, the study of ridge patterning is known as fingerprinting, which is the reproduction of the friction ridges of the fingers on a surface.

The dermal coning or fingerprint appear for the first time on the human finger, palms, soles and toes between 12th and 16th week of embryonic development and their formation gets completed by the 24th week i.e. about 6th foetal month.

The ridges thus formed during the foetal development period do not change their course or alignment throughout the life of an individual, until destroyed by decomposition of skin after death.

Significance of fingerprints:

Fingerprints are universally recognized, now, it is as a source of individualisation.

The significance of fingerprints can be discussed as follows:

* Uniqueness:

- ⇒ Fingerprints of two different fingers of the same person are never be an identical.
- ⇒ The ridge pattern differs from individual to individual, and from finger to finger in every individual.
- ⇒ After a study of millions of fingerprints in the world's identification, because, no two fingerprint is ever been found to be identical.
- ⇒ Even all identical twins studied so far have stood the test of uniqueness of fingerprints.
- ⇒ All these facts pointedly established uniqueness of fingerprints.

* Infallible (error free)

- ⇒ Fingerprints are now universally recognized as an infallible means of personal identification as well as

Valuable aid to the investigating officers in the detection and prosecution of crime and identification of criminals.

⇒ They afford the best positive and infallible clue which connect the culprit with the crime.

* Durability & Permanence

⇒ A fingerprint will remain unchanged throughout the life of an individual even if the external skin is damaged due to some reasons, the ridges will disappear in the exact similar manner. When the damage is repaired.

⇒ No surgical attempt can even alter the ridges.

* Simplicity

⇒ Although the scope for the classification of fingerprint is large, but it is so simple that it can be done by any police personnel with little training.

⇒ Records of millions of persons can be kept and retrieved easily with the help of a computer (AFIS - Automatic fingerprint identification system).

- H.W * Case study related to fingerprint (in own words)
- Timeline
 - Evidence
 - Verdict

Fundamental principles of fingerprints :

The following biological principles are basic in understanding science of fingerprints and its applicability in the field of personal identification:

- ⇒ A fingerprint is an individual characteristics:
 - No two fingers have yet being observed to possess identical ridge characteristic.
- ⇒ A fingerprint will remain unchanged during an individual's life time.
- ⇒ Fingerprint have general ridge patterns that permit them to be systematically classifiable.

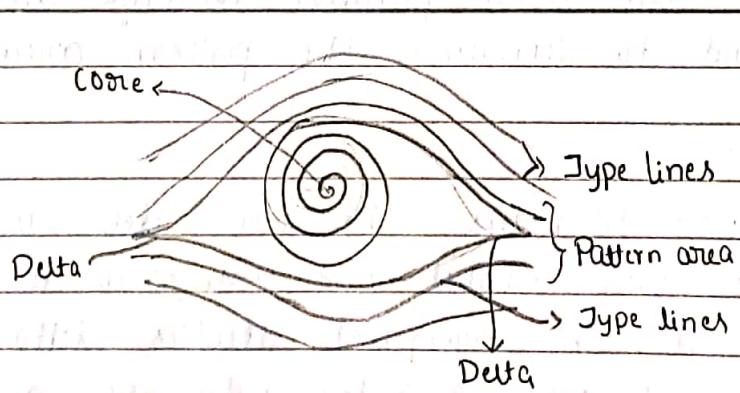
1) Arch - devoid of core / delta

2) Loop

3) Whorl Plain

4) Composite

Common characteristics feature of fingerprints



It is true that each fingerprint is different from the other yet fingerprints have common characteristics.

among themselves. They are which actually make fingerprint classification possible. The common characteristic that make up these pattern are known

- Pattern area
- Type lines
- Core and
- Delta.

Pattern Area : It is that part of loop or a whorl in which appears the core, delta & ridge with which we are concerned in classifying.

It is present in all patterns of course, but, in most arches it is undefinable.

Type lines:

- These are the ridges that determine the pattern area of loops and whorls.
- The arches lack presence of type lines
- These may be defined as the two innermost ridges which start parallel, diverge and surround or tend to surround the pattern area

Delta :

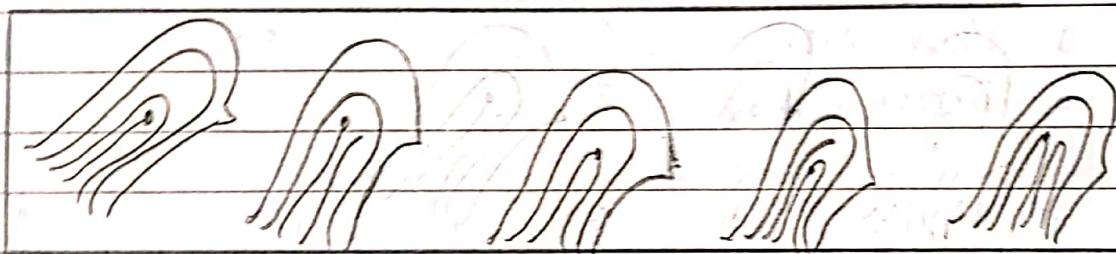
- Delta or tri-radius, the word delta is the fourth letter of greek alphabet and corresponds to english letter 'd'. In fingerprint studies, delta or tri-radius is formed when a ridge bifurcation and the two of the bifurcating ridge diverge leaving an interval within which the pattern lies

The triangular plot formed by the two diverging ridge in front of them within the interspace or the base is called as delta or bi-radius.

The Delta is the point from which to start ridge counting.

Core :

- It is the central point of the pattern. The type of core varies according to the type of pattern.
In loop pattern, they may consist of double and even an uneven number.
- To locate core



⇒

Fingerprint Characteristics : It can be divided into two categories for the purpose of preliminary and confirmatory examination of fingerprints.

- i. Fingerprint pattern (ii) Ridge pattern (iii) class characteristics
- ii. Individual characteristics (a) Fingerprint details (b) Ridge details

i. Fingerprint pattern :

They are determined by the configuration of the ridge appearing on the distal phalange of the finger. It is the shape and direction of the ridges along with the consideration of type lines, delta & core, that constitute a fingerprint pattern.

The three basic types are :

Arch, loop and whorl are subdivided for the purpose of classification.

Basic Pattern	Pattern type	Symbol	Percentage	No. of core & delta
Arches	a. Plain Arch	A	5%	Nil
	b. Tented Arch	T		
Loop	a. Radial Loop	R	60-65%	1 core &
	b. Ulnar Loop	U		1 delta
Whorl	a. Plain true whorl	W	30-35%	2 delta &
	b. Composites		1-2% (above 30-35%)	1 core
Composites	a. CPL	C	1	2 core & 2 delta
	b. Double loop		1-2%	
	i. Lateral pocket loop	S		
	ii. turned loop			
	c. Accidental	X		more than 2 core & 2 deltas

Arches : These are characterised by a single elevation (rise) in the ridges which enter on one side of the fingerprint pattern & exit on the opposite side.

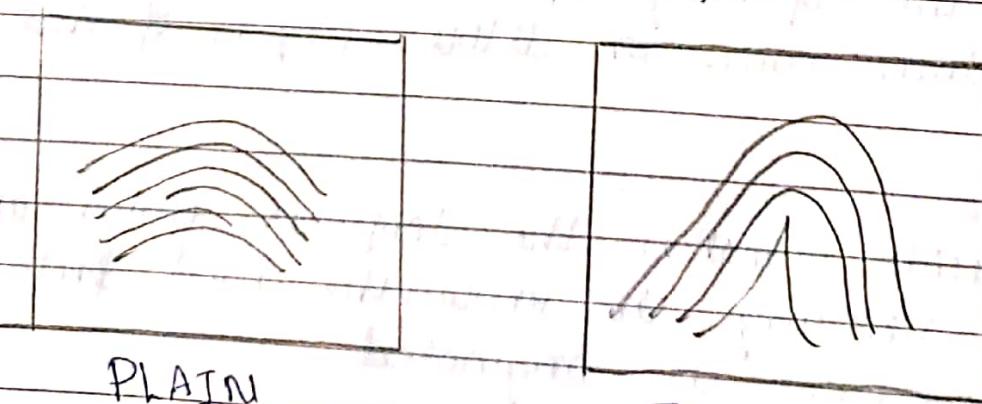
The Arches are of two types :

Plain Arch & Tented Arch.

Neither the plain nor the tented arch has a core & delta formation.

a. Plain Arch : This is a dimple of all fingerprint patterns. plain Arch is formed by the ridge entry pattern from one side flowing smoothly towards the other side of the pattern with the small rise or wave in the centre.

b. Tented Arch : In this type of pattern ridges enter from one side & in center forming either a definite angle or standing almost straight up & exit from the other side.



PLAIN

TENTED

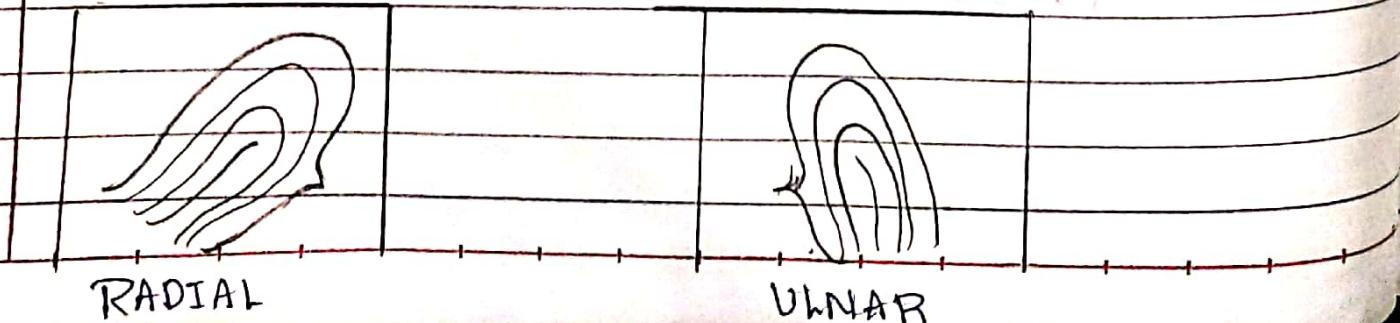
loop : The loop formed by 1 or more ridges entering at one side of the pattern continuing upto the centre of pattern & recurring around the core (v-term) to form a loop and then flowing back & terminating on the same side of the pattern from which they entered.

The loop always have a delta, core & atleast 1 ridge passing freely b/w the core & delta.

a. Radial loop : The loop is formed by ridges which enter from 1 side & flow back after recurring around the core, to the same side with opening of the loop pointing towards the radial bone or the thumb of the same hand.

b. Ulnar loop : This loop is also formed by ridges which enter from one side & flow back after recurring around the core to the same side with the opening of the loop pointing towards the ulnar bone or little finger of the same hand.

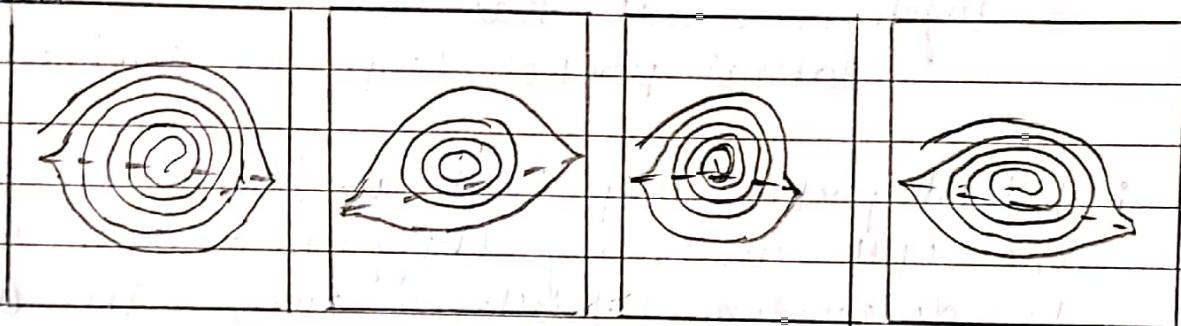
To decide whether the loop is ulnar or radial it is necessary to know the hand from which the fingerprint is originated



Whorls : The whorl is characterized by a circular pattern having 1 or more ridges that revolve around the core making a complete circle.

The whorl pattern will have 3 deltas & atleast 1 ridge making a complete circuit which may be spiral, oval, circular or any variant of circle.

An Imaginary line drawn b/w the 3 deltas either touch or crossed atleast one of the revolving ridges within the inner pattern area



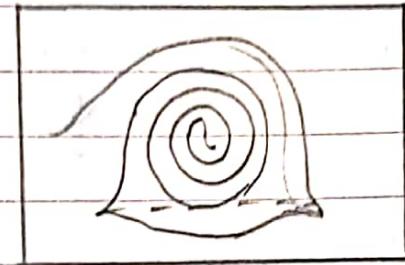
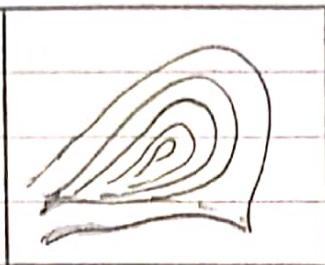
Composites : A composite prints occurs when combination of above 3 classes are found in the same print.

It is defined as a combination of p. diff patterns together.

Composites are sub divided as :

- a. **CPh :** This pattern combines features of both the loop & the whorl. In this pattern the majority of ridges have appearance of loop but in which 1 or more of the ridges within the pattern area revolve about the core, thus forming a pocket.

If an imaginary line is drawn b/w the 2 deltas, the line doesn't cross or touch any of the circular ridges in the centre of the pattern.



CPL

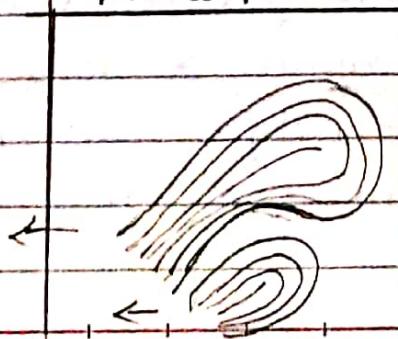
Double loops : The combination of 2 loops all together & it has 2 sub-categories i.e lateral pocket loop & twinned loop.

i. Lateral pocket loop : It is formed by 2 loops one will ascending (bigger in size) & other will be descending (smaller in size), the descending one will form a pocket formation where the descending loop will fit.

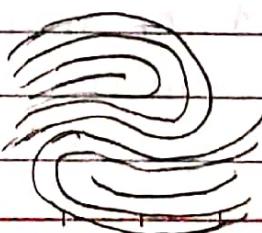
Both loop formation will flow in the same direction with 2 foot fine separate codes.

ii. Twinned loop : The pattern is clearly composed of 2 well defined & similar loop, one surrounding or encircling the other one. The opening of loop will be in 2 opp. direction.

Lateral pocket loop



Twined loop.



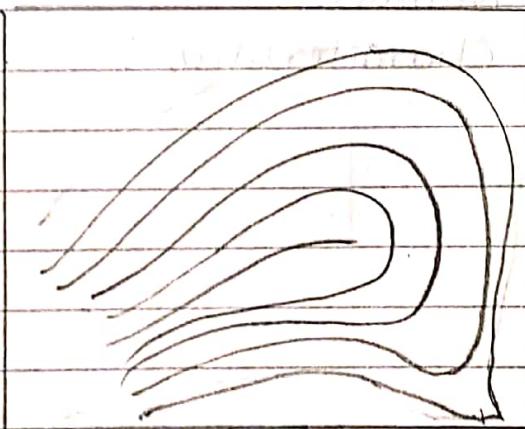
Accidental loops : Patterns which are too irregular to be placed in any of the above categories are called accidental.

In this, patterns are formed as the combinations of 2 or more different pattern coming all together which can be in the combination of loop with loop, loop with whorl and whorl with whorl.

These patterns may consist of 2 or more than 2 deltas & cores.

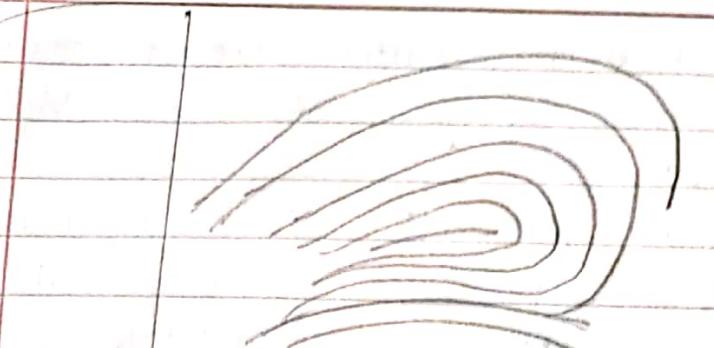
Exceptions in loop patterns

Invaded loop : This is the loop which presents the appearance as lines of ridges are swimming over the pattern coming from the delta side & threatening to engulf it from above.



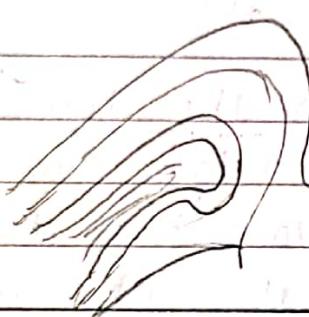
INVADED

Created loop : This is the loop which ridges swimming over the patterns are stopped along the line which they can not pass or are swept in the current of normal ridges giving the appearance of ridge above the pattern area.



CRESTED

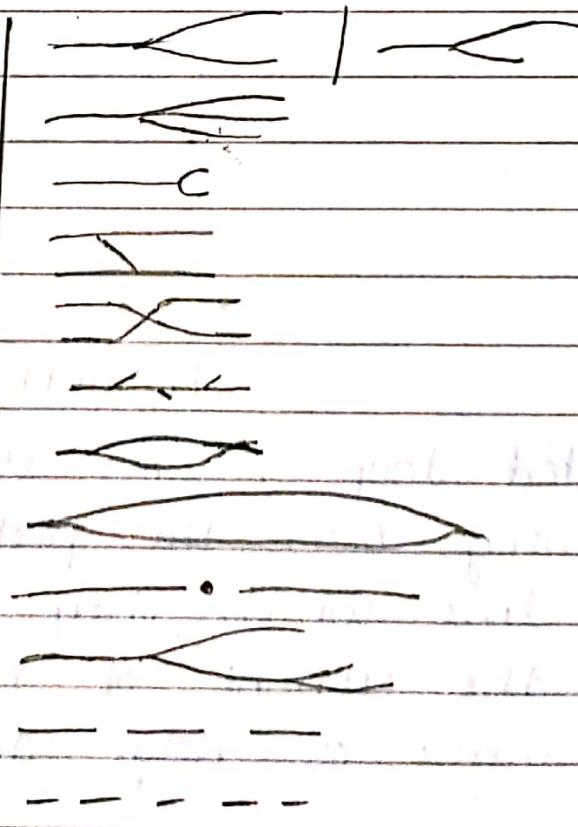
Nutant or Indented Loop: When the loop has the appearance of a sickle or a drooping flower, it is known as nutant or indented loop.

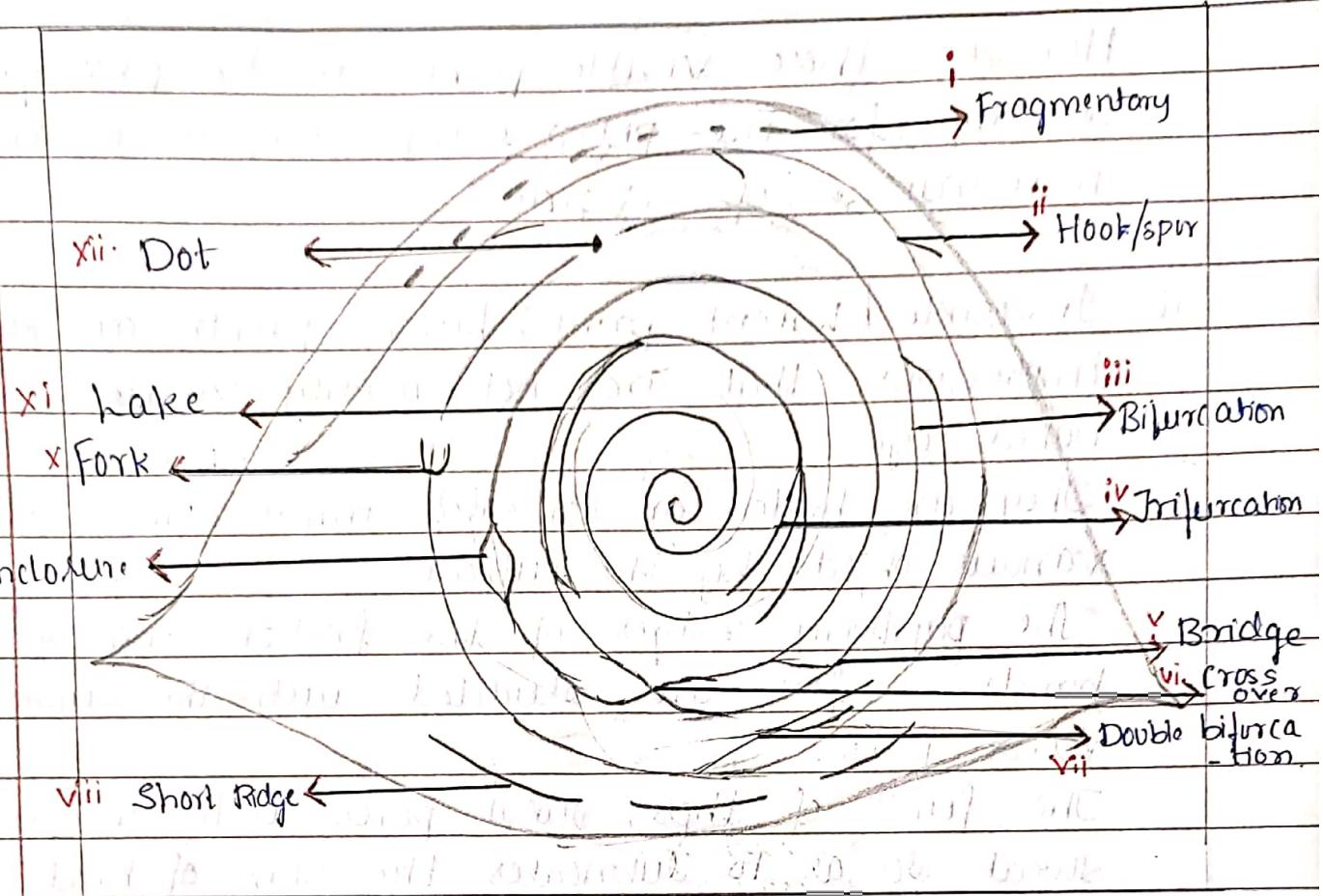


NUTANT

Individual Characteristics:

1. Bifurcation
2. Trifurcation
3. Fork
4. Bridge
5. Cross over
6. hook / spur
7. Enclosure } smaller size
8. hole } larger size
9. Dot
10. Double Bifurcation
11. Short Ridge } size
12. Fragmentary } different





FINGER PRINT SAMPLE

Varieties of fingerprints found at scene of crime

Visible / patent print: Fingerprints which are visible to naked eye are called as visible print. These may be found when visible or colour contaminants are present on fingers of the culprit. It will leave a visible print. e.g.: blood print, ink print, coloured print, paint print or dirt print.

Fingerprints of this kinds may or may not have identification value depending upon the distinctive characteristics friction ridges left on the surface of the material or object touched.

However, these visible print can be photographed directly for the purpose of comparison & maintenance of records.

ii Invisible / latent print: latent prints are such impressions that are not readily visible to the naked eye.

They are hidden or concealed impressions left on various objects by the culprit.

The papillary ridges of the friction skin of hands & feet are studded with the numerous sweat pores.

The function of these sweat pores is to secrete sweat so as to lubricates the skin of hand & feet & keep it smooth & soft.

Whenever fingers are the palmer surface come in contact with any smooth surface, they leave an invisible impression on the surface due to perspiration.

iii Plastic Prints: Plastic prints are formed when the finger or the palm come in contact with the plastic body or surface such as soap, butter, wax, soft putty, tar, greeze, freshly painted surface or any other material that form a mold of the fingerprint when touched.

iv. Chance fingerprint: The most imp/ evidence found at a crime scene is chance prints.

Only fingerprint identification has prove to be inevitable

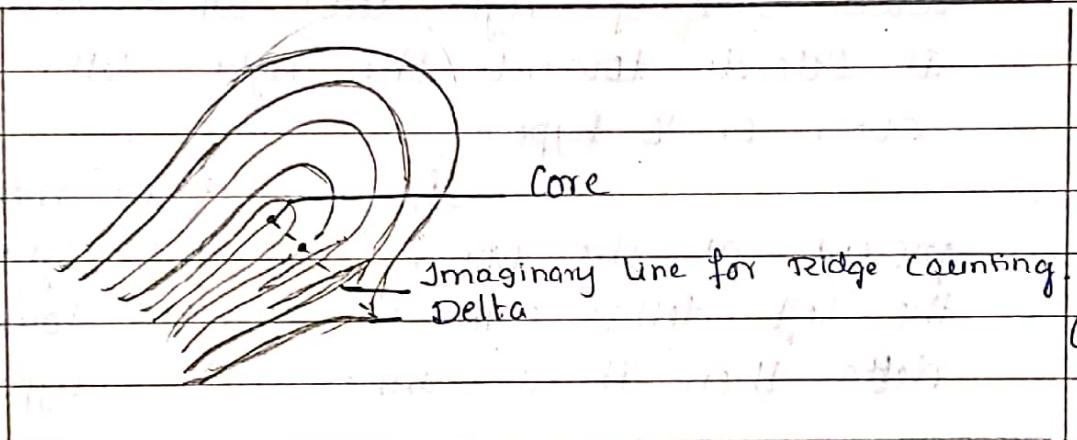
It is the only clue which leads an investigator to the criminal identification & conviction 100%.

Chance prints are generally invisible prints but can be visible & plastic as well.

Chance prints are usually found at unexpected places or hidden or conceal places which may get out of consideration for an investigator at scene of crime.

Ridge Counting:

It is usually done for the loop pattern but can be perform on the whorl as well.



These steps which can be adopted for ridge counting as follow:

1. It is performed by drawing an imaginary line from core to delta [In Indian population, max ridge is 21 & min is 8]
2. Core & delta will not be included in ridge counting
3. All the ridges & ridge characteristics ^{falling} on the imaginary line will be given a count.
4. Two separate ^{arm of} bifurcation, enclosure, fork, and 3 separate arms bifurcation must be given a separate count if full on the imaginary line.

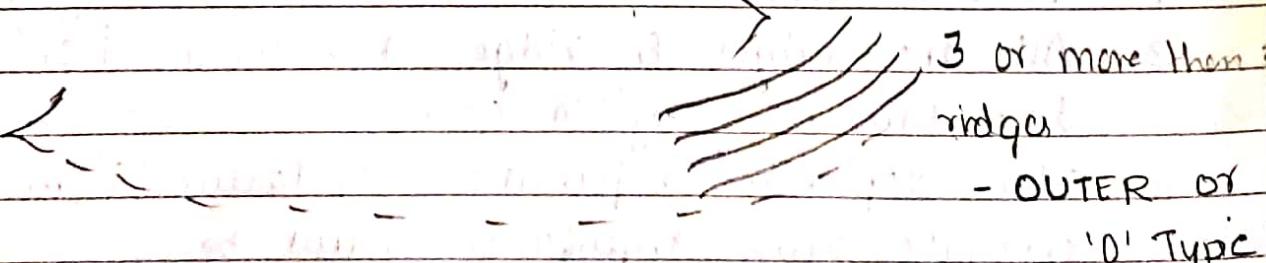
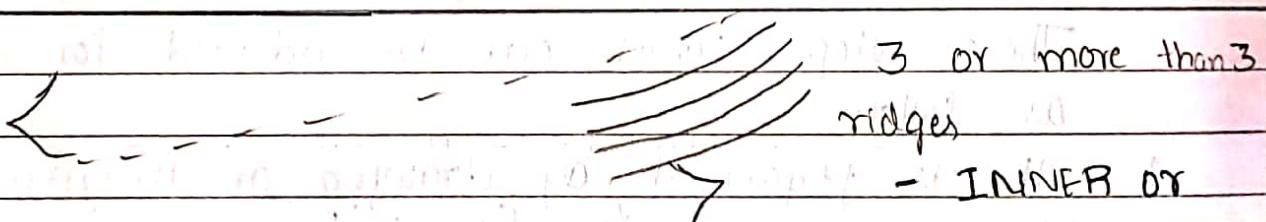
5. Any short ridge, dot, hook must also be included in counting if they fall on imaginary line
6. The point of enclosure, bifurcation, trifurcation, fork spur should be given a single count.

Ridge Tracing:

It is always performed for whorl patterns. For ridge tracing one has to extend the lower arm of left delta up to right delta, so as to decide the pattern whether it is inner, outer or meeting.

If minimum 3 or more ridge at the lower side of right delta when the arm of left delta is extends towards the right delta, then it is outer or 'D' type.

If min/ 3 or more ridge are present at the upper side of right delta. When the left delta's arm is extended towards to right delta then it is inner or 'I' type.



While excluding the criteria of inner & outer in which the ridges b/w the extended the lower arm of left delta & right delta is less than 3 in upper side or lower side then it is meeting or 'M' type.



Meeting 'I'm' type

17 | 01 | 18

HENRY'S 10-DIGITS CLASSIFICATIONS SYSTEM.

1. PRIMARY CLASSIFICATION : [1-10 for all fingers]

PRIMARY CLASSIFICATION: Patterns are first divided into numerical & non-numerical value.

<u>Numerical value - '1'</u> [For all <u>whorls</u> & <u>composites</u>]	<u>Non-Numerical value - '0'</u> [For all <u>arches</u> & <u>loops</u>]
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All rolled impressions are numbered on a fingerprint slip or card or chart from 1-10 in following order.

Right Hand	Left Hand
1. Right thumb - 16 (W) (1)	6. Left thumb - 2x4 (A) (0)
2. Right Index - 16 (L) (0)	7. Left Index - 2x2 (W) (1)
3. Right Middle - 8 (A) (0)	8. Left Middle - 2x2 (L) (0)
4. Right Ring - 8 (C) (1)	9. Left Ring - 2x1 (C) (1)
5. Right Little - 4 (W) (1)	10. Left Little - 2x1 (W) (1)

- All even number finger should be kept in numerator and all odd number finger should be kept in denominator.
- To obtain classifications, all values in numerator are totalled and one is added. Similarly, all values in denominator are totalled and one is added.
- The reason for adding one numerator & denominator is to obtain a formula consisting atleast $1/1$ rather than %.
- For each finger, there is two pattern possibilities: numerical or non-numerical pattern.
- Each fingerprint slip contains 10 fingers, hence the total combination will workout to be 2^{10} i.e 1024
i.e $1/1$ to $3^R/3^R$
- If any particular finger is deformed by any reason the pattern cannot be identified in that vacant space or in the place of this particular finger is labelled according to the type of pattern occurring on corresponding finger of other hand.

P. MAJOR CLASSIFICATION : [Thumbs]

It is based upon the pattern present in thumbs only :

RT taken as Numerator
LT taken as denominator

- If the pattern is loop then the ridge counting
- If the pattern is whorl then the ridge tracing

- For loops :- Converting ridge count into ridges trawng, as by
- If ridge count is equals to 1-12 then the pattern is decided as INNER.
 - If ridge count is equals to 13-19 then the pattern is decided as MEETING.
 - If ridge count is equals to 20 or above then pattern is decided as OUTER.

Many possibilities are associated, if ridge counting & ridge trawng is done, but, if keep denominator is some & changing the numerator following results are possible:

1.	RT : <u>I</u> <u>M</u> <u>O</u>	LT : <u>I</u> <u>M</u> <u>I</u>	9 Possibilities
2.	RT : <u>M</u> <u>I</u> <u>O</u>	LT : <u>M</u> <u>M</u> <u>M</u>	6 Possibilities
3.	RT : <u>O</u> <u>M</u> <u>I</u>	LT : <u>O</u> <u>O</u> <u>O</u>	3 Possibilities



18/01/18

3. SECONDARY CLASSIFICATION :- [Index] (for all pattern)
In this classification, the pattern of Index / finger is considered:-

RI is taken as Numerator $\Rightarrow \frac{RI}{RI}$
RT is taken as Denominator $\Rightarrow \frac{RT}{RI}$

For, the purpose of classification, all the patterns will be given the symbol as follow.

Arch - A	Whorl - W	Accidental X
Jented Arch - T	CPh - C	
Radial loop - R	Twinned S, J - S	
Ulnar loop - U	Lateral loop,	

There are 81 possibilities of combination by keeping denominator is same at one time & changing the numerator, as by doing so, 9 combinations of ^{one} possible & we have 9 patterns, do in that way the no. will come out to be i.e. $9 \times 9 = 81$

Eg: 1. RI = $\frac{A}{W}, T, \frac{R}{W}, \frac{U}{W}, \frac{W}{W}, \frac{C}{W}, \frac{S}{W}, \frac{S}{W}, \frac{X}{W}$

H. Sub-Secondary:

It is further divided in 2 categories

- i. Sub-Secondary I
- ii. Sub-Secondary II

- i. Sub-Secondary I: It is further divided into:
- a. Sub-Secondary I (a) &
 - b. Sub-Secondary I (b)

- a. Sub-Secondary I (a): [Thumb, Middle, Ring, little]

In this classification, the very common pattern such as Radial loop, plain arch & tented arch are considered.

When they are present at fingers other than Index i.e. T, M, R, E, L, & these patterns are symbolized

- by:
- | |
|-----------------|
| Radial loop - r |
| Plain arch - a |
| Tented arch - t |

	Thumb	Middle	Ring	little
RH	r	-	-	a
LH	-	t	-	-

b. Sub-Secondary I (b): [Index, Middle, Ring]

It is based upon ridge counting & ridge tracing for the loop & whorls present in the index, middle & ring fingers.

Fingers of the Right hand will come in numerator & Fingers of the left hand as denominator.

$$\therefore \frac{\text{RH}}{\text{LH}} = \frac{\text{RI}}{\text{LI}}, \frac{\text{RM}}{\text{LM}}, \frac{\text{RR}}{\text{LR}}$$

According to the modified classification, the conversion of ridge counting to ridge tracing for sub-secondary I (b) will be done as follows:

	Inner	Meeting	Outer
Index	1-5	6-12	13 or more
Middle	1-6	7-13	14 or more
Ring	1-7	8-14	15 or more

iib. Sub-Secondary II: [Middle, Ring]

In this classification, the pattern present in the middle & ring fingers are considered & symbolized by small letters.

Arch	t	twinned loop	g
Tented arch	t	Lateral pocket loop	g
Radial loop	r	Accidental loop	x
Minor loop	u	Crested loop	k
Whorl	w	Nutant loop	n
CPh	c		

The fingers of RH are taken as Numerator & left hand
as denominator. i.e

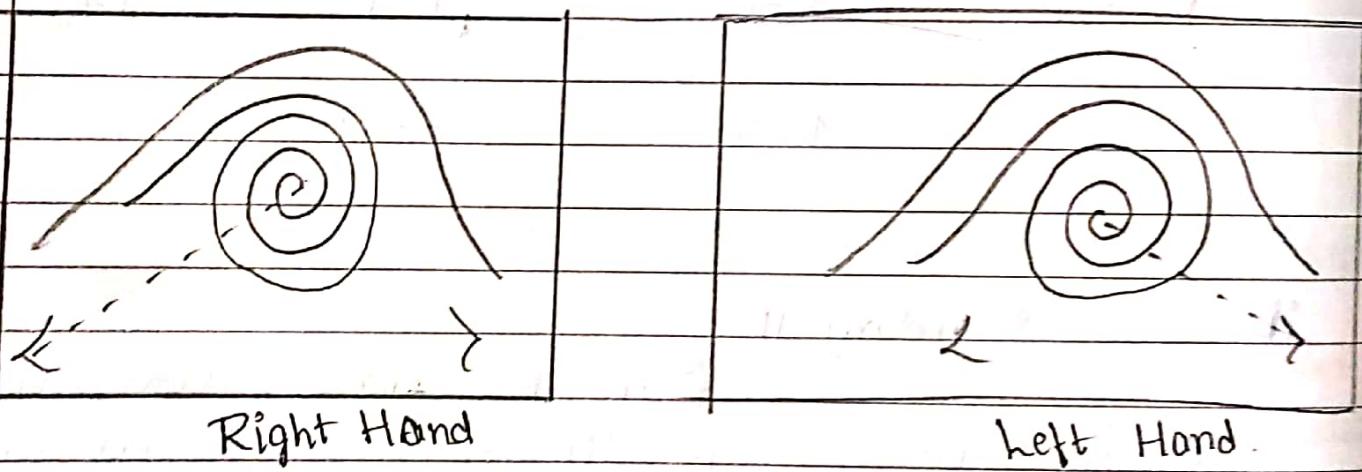
$$\frac{RH}{LH} = \frac{RM}{LM}, \frac{RR}{LR}$$

5. FINAL CLASSIFICATION: [little fingers]

In this classification, the little fingers of both the hands are considered & only ridge counting are performed both the loops & whorls.
Right little as 'N' & left little as 'D'.

$$\frac{RH}{LH} = \frac{Rh}{lh}$$

- * In case of Whorl of right hand, the left delta & core are joined for ridge count - E, in case of
- * The whorls of left hand, right delta & core are joined for ridge counting.



In case of double loops, specifically for lateral pocket loop of RH, the left delta & core of ascending loop are consider.

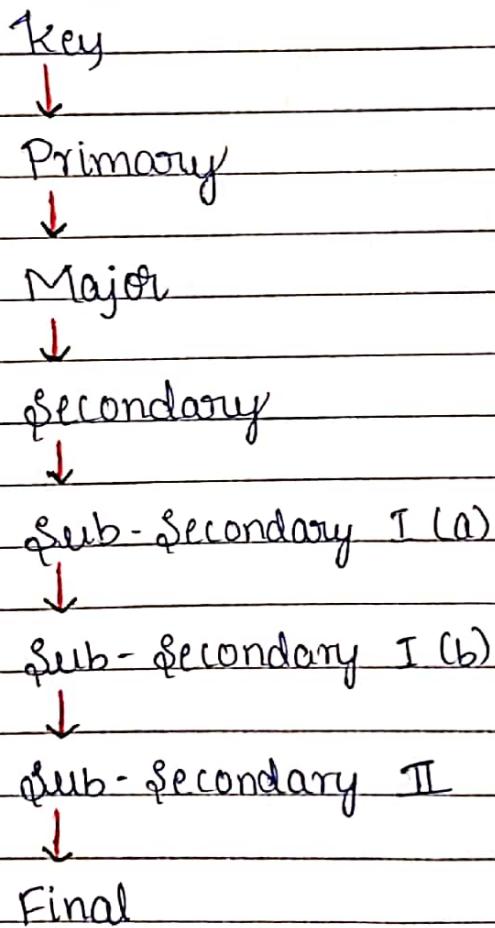
In case of left hand, right delta & core of ascending loops are consider.

6. KEY CLASSIFICATION:

In this classification, only RT is consider for both whorl & loop patterns ridge counting is done followed by the pattern symbol in small letter.

Eg: $7u$, $7r$, $7w$ etc

According to the classification of law, the sequence of writing the results of the classification as follows:



single digit classification (Battley's)

In single digit classification, the records of the criminals involves in theft, burglary, robbery, dacoity etc are maintained digit-wise.

The objective of the system is to provide means of rapid ^{identification} of "chance prints". Chance prints left behind by the criminals at the scene of crime

Several systems of classifying single fingerprint have been divided.

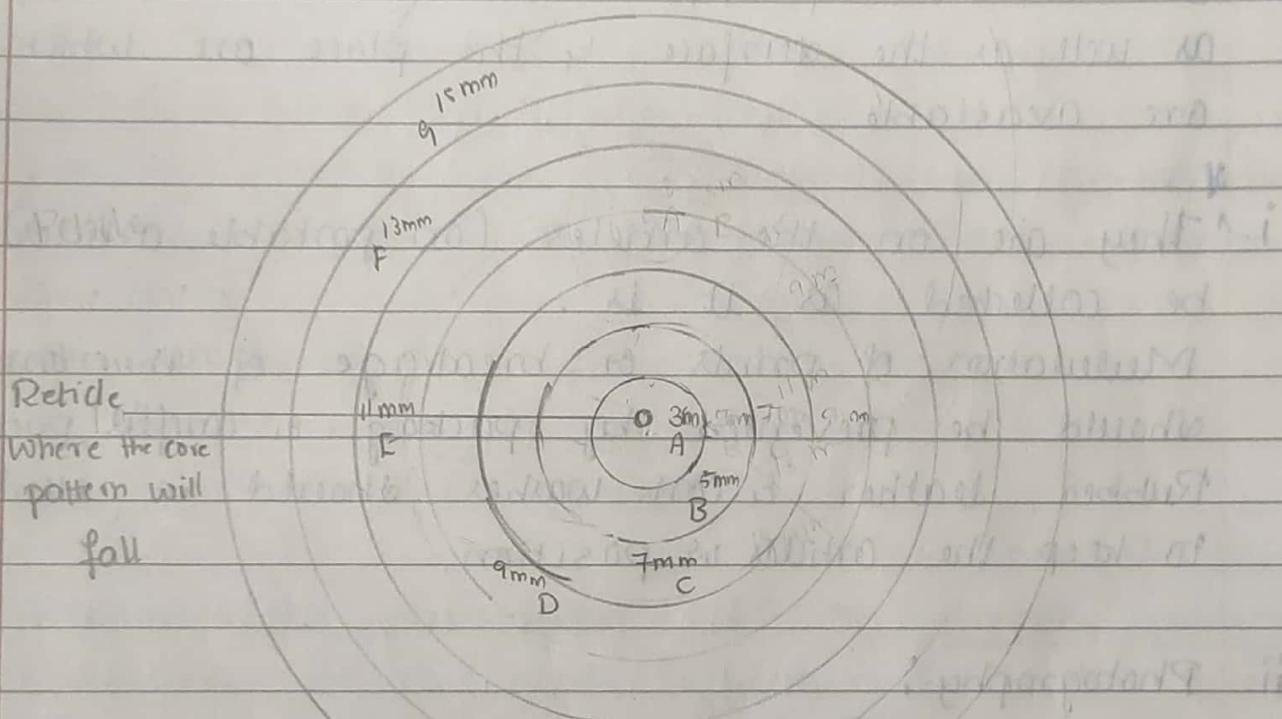
The one commonly used is the Battley's system. Most of the states ^{have} beside 10-digit bureau, single-digit bureau which employs B-single-digit sys coz it is found to be the most practical & accurate method of handling single fp.

In the Battley's system prints are taken as 1 finger per drawer on 3x5 card size that contain a rolled print of one finger. For examination of the print the system requires the using of a magnifying lens provided with a reticle, reticle in the centre of reticle the dot (core) of the pattern is kept.

Around the reticle, there are concentric circles with the radii of 3, 5, 7, 9, 11, 13 & 15 mm respectively. A letter starting with the centre (which is called "A"), reading outward ~~outward~~ - presents the area of each circle with succeeding letter as B, C, D, E, F, G & H respectively.

In interpreting pattern, Battley's system uses a special code which is the area of inter-space in reticle. In loops & whorls, the special core,

is kept on the core of these patterns & these co-centric circle which is cutting the delta of the pattern is noted.



Reticle

Where the core pattern will fall

Collection of finger prints.

Collection of fingerprints evidence as a specialized job can be done by f.p experts but can also be collected by police personnel with proper training for collection of latent & other f.p from the crime scene.

The collection of f.p varies acc to nature of evidence as well as the surface & the place on which they are available.

of

- i. They are on the articles (on portable articles) it can be collected as it is.

Mutilation of prints or breakage of the article should be prevented by packag & careful packing. Rubber, leather & cork washers should be used freely to keep the articles in position.

ii. Photography:

Print should be photograph in all cases whenever possible as photograph will record f.p permanently. In case of the damage the original article there proof to be useful evidence. The latent fp can be made more conspicuous by oblique lighting & shading the surface from the diff light. 3 photographs, 1) the one which is showing the questioned fp over the object along with the surrounding. 2) showing the print on the object & 3) containing the details of print should be taken. A fp camera that takes up 1:1 photograph is being used by some police forces. It does n't cover all the field situation, & can be used as a supplementary device.

Development Techniques for finger prints:

There are 2 general methods for developing fingerprint i.e physical & Chemical.

⇒ Physical methods are based on the fact of Adherence of perspiration & greasy matter retains certain substance without fusion.

Eg: Powder dusting & Iodine fuming.

⇒ Chemical tech alter the components of perspiration directly causing the reaction that gives rise to be contain coloration Eg: ninhydrin, silver nitrate etc.

Physical Methods:

i Powder-development method:

This is one of the oldest method for developing FP on smooth, non-porous substance. It is quite effective & widely used.

The powder should be fine enough, ground & of a colour that give enough contrast with the background.

Some of the powders are as follow:

a. Black Powder:

It consist of lamp-black, graphite & charcoal. It can be utilized for non-porous surfaces like light colour wood surface, smooth & painted one metal surface, China dishes. & It can also be used for porous & semiporous ones, such as papers, wall, wallpaper, cardboard etc.

b. White or grey powder:

The grey powder consists of mercury & chalk whereas white powder consist of Titanium dioxide, Zinc oxide and gum arabic.

Both grey & white powder are suitable for dark coloured glassware, certain metals, plated & painted surfaces.

c. Red powder:

It is finely powdered red resin from the fruit of a palm. A fine print is appear when it is applied on a paper consisting fresh prints on it, after gentle heating but can be utilized all the surface for making contrast. It is also termed as Dragon's Blood.

d. Silver powder:

The basic ingredient of this powder is ^{fine} aluminium dust, this is most suitable for dark surface that are painted, polished or varnished in order to get best results the surface & object should be completely dried.

ii. Fluorescent Powder

Anthracene & Rhodamine-B are some of fluorescent powder which are used to develop FP on dark areas, multicolor surfaces & reflecting surfaces. They develop prints on cartons, Calendars, magazines, tin, glasses, mirror. The dark area when treated with fluorescent powder are expose to UV-light & thus they

fluorescence & can be photographed

iii. Jodine - Fuming Method:

This method is useful on porous surfaces such as paper, cardboard & plaster wall but can be utilized on non-porous surface as well, where the fats & oils of greasy prints can get absorbed by porous surface & yellowish-brown print is developed after treating with Jodine fumes.

Since Jodine is volatile at ordinary temp it get evaporates at ordinary, same applies for the Jodine crystal which get converted into vapours through the process of sublimation.

The develop print may get faded with due course of time, ∴ They should be photographed immediately

iv. Magnetic brush & Powder

The magnetic brush works with magnetic powder only which are available in many colors i.e grey, black, red, yellow & silver etc. The brush used is magnetic rod which is pushed in or out of a small cylinder to create a mag/ field which causes the magnetic powder to adhere at tip of the pen to form a brush like appearance & allows the process of development of latent print.

The mag/ brush & attracting powder are quite useful in dusting over head & sloping surfaces for development of latent prints. The brush can be used in locating latent fingerprints in paper, tinfoil, light wood, leather, cardboard boxes, glass, plastic & other allied materials.

Chemical methods:

i. Silver Nitrate Method:

In a chance print, the grease & moisture will dissipate with the passage of time but the salt from the perspiration persist indefinitely. If in aq. soln of silver nitrate about 3% with ethanol is allowed to act on a latent print, a chemical rxn occurs b/w NaCl & AgNO_3 , producing a photosensitive AgCl_2 .

Don't
forget

The dried object when expose to light source shows a dark developed print. The developed print can remain for many years. This method is particularly useful for paper, cardboard & even unpainted surfaces (wood).

This rxn can be alter named as de-silvering or exposing the surface to excess amount of NaNO_3 by which exchange of ions will takes place resulting into NaCl & AgNO_3 , which can be removed after drying.

ii. Ninhydrin:

With the help of this method very old prints can be develop specifically for the surfaces where powder, iodine fuming, & sigma methods are unable to visible latent finger prints. In this method, ninhydrin is dissolved in methanol and the solution applied to the surface bearing the latent print AS, amino acids are components of sweat, they are lightly reacts with ninhydrin solution giving rise purple or pink coloured print.

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The development of the print is hastened by the application of heat by a hot plate or iron. This method has been used almost exclusively prints on latent surfaces.

Ninhydrin method and after the iodine fuming method if required

iii. Osmium tetroxide :

This method is based on a chemical reaction b/w fats & Osmiumtetroxide. When a reagent is applied to a latent print Osmium tetroxide is reduced to Osmium leaving behind a black coloured print.

iv. Cyanoacrylate method :

In some cases, powder can not be used due to stickiness of the surfaces or for some other reasons. In such situations cyanoacrylate fuming proved to be an effective method to develop prints on skin, fabric, plastics & other surfaces.

The cyanoacrylate fluid is kept in a closed pouch will be transfer to a paraffin which is placed in a closed chamber or container & will be heated slightly.

Within the container the exhibits kept & left closed with the cyanoacrylate for about 12 hrs.

The fume reacts with amino acids producing chalky white prints, with the help of this method the prints can be developed on pouches carried by drug peddlars as well as all the pillows &

bed sheets of the crime scenes or rape cases

Metal vapour fuming Method (gold)

Phase-transfer

Laser Method

Small particle reagent (semi-porous surfaces)

Some other techniques:

i. Laser Method:

Finger print residues such as oils, paints, ink etc fluorescence under the laser finger print show luminesces under suitable filter by passing a continuous wave argon-ion laser. Such prints can be photographed by using special filters.

Very old prints even as old 10 years can also be developed using this method found on surfaces like plastic, rubber, painted wallpaper, wood, leather, metal, glass, carpets, couches, etc even on skin of the living or dead persons. It is highly sensitive free from any time limitation.

∴ Capable to develop latent print that cannot be develop by any other method.

ii. Electro-Magnetic Method:

It can be employed to develop latent f-p on diseased skin in homicidal cases involving threatening or rape followed by murder. In this method the suspected area are dusted with fine powder of lead & the surface is bent irradiated with hard x-ray beam.

The rays are pass through the series of filter like, Cu & Al to remove the soft component.

irradiated X-ray.

The e⁻s emitted by lead atoms affect the X-ray film placed on the suspected area for the purpose of developing print.

iii Metal-vapour fuming:

It is an addn tech which is useful in fresh prints on polythene & similar exhibits such as plastic surfaces.

The metal like Au, Zn & their alloys are evaporated in a heated chamber in vacuum

When vapours come in contact with the surface bearing latent print they get deposited & thus reveal the print.

History of Finger Prints :

>> During Hammurabi's reign in ancient Babylon fingers seals were used on contracts there is more definite proof of Chinese using f.p impression as seals on documents & contracts as early as 3rd century B.C.

The first to propound the theory that arrangement of friction ridges is never duplicated in 2 individuals was J.C. A Mayer of Germany in a study published in 1788.

In 1823, professor J.E. Purkinje published the thesis in which he described friction ridge patterns & classified f.p into 9 categories.

In 1858, Sir William Herschel, a British administrator in Bengal started the practice of recording hand prints of natives on contract, that modern f.p science came into life but he did not publish any of his findings.

In 1874, Dr. Henry Fauld working at Tsukiji hospital of Tokyo ~~lead~~ to believe that finger imprints ^{may} lead to the scientific identification of criminals & published his findings in nature in 1880. It was only then William Herschel came out with his findings made earlier.

They thus both claimed to be the originators of modern finger print science.

Sir Francis Galton, an English scientist & cousin of Charles Darwin in 1872, the first text book named F.P. in which he scientifically established that "No two fan F.P. can be alike" & described the system of classification of F.P. by adapting idea of Herschel & Fauld.

Professor Joan Vucetich, a contemporary of Sir Francis Galton simultaneously conducting his study of F.P. identification in Argentina later adapted in many Latin speaking countries.

Sir Edward Richard Henry working in India has IHP in Bengal developed interest in the work of Herschel & Galton. He succeeded in developing more workable classification which was 1st adapted in India in 1891, later in Scotland, London. In 1901 to this date with certain modification & extension is used in many countries including USA & Canada.

Extension of Henry's system of classification is final & key classification.

Significant contributions was made by Bengal police officers name Khan Bahadur Azizul Haque & Roy Bahadur Hem Chandra Bose, [x]

In the classification system which come to the known as Henry 10-digit classification system

Azizul Haque contributed to the perfection of 10-digit method of classification & rewarded with personal title, Khan Bahadur.

Similarly, Hemchandra Bose who received early training from Sir Edward Richard Henry evolved the system of sub-classification & a method of single-digit classification & conford the title of Rai Sahib in 1960.

- (3rd century BC) Hammurabis → Used as a seal on contracts & documents
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Sir William Herschel & Dr. Henry Fauld are the originators of modern finger print science.]
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- 1892 Sir Francis Galton → Published 1st f.p. science text book which scientifically established "No 2 f.p. are alike." & describe the system of classification of f.p.
* Father of f.p. science.
- ↓
- Juan Vucetich → conducted his f.p. study in Argentina
- ↓
- 1897 Sir Edward Richard Henry → Developed more workable classification
Significant contribute with Henry, there were 2 Indians named Azizul Haque & Hemchandra Bose
- This come to known as Henry 10-digital classification