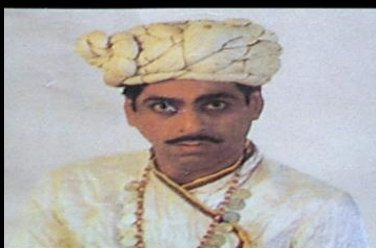
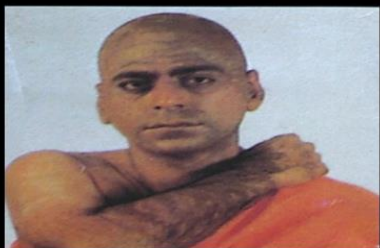
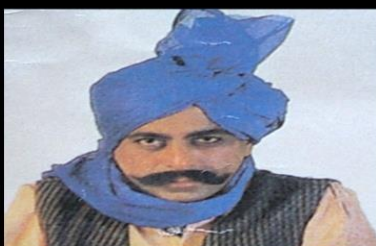
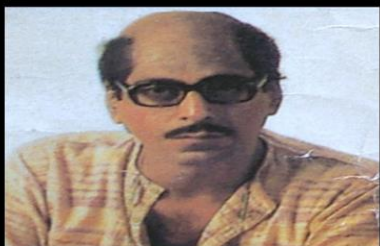
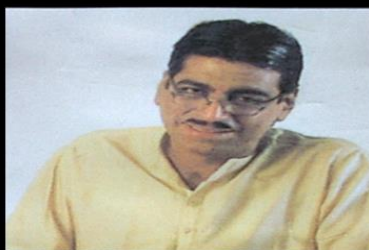
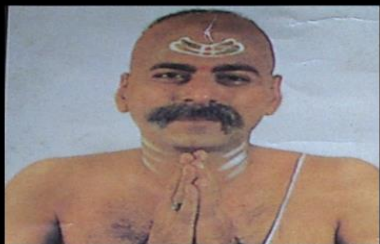


Faces Can Lie...



Fingerprints, Never.

Introduction

- The finger print is a physical biometric aspect. It is used to identify a person's identity due to its uniqueness where no two persons can share the same finger print . Besides, a finger print is unchangeable with time and can easily recognized during the whole life of the individual.
- The finger print is an impression at the top of a person's fingers. Finger print recognition is the automatic proses of comparing saved finger print pattern with the input finger print to determine human characters. Although finger print recognition was deployed from decade it become one of the most common biometric nowadays.

INTRODUCTION –Cont.

The finger print identification system is a cheap but solid mechanism at the same time. Moreover, it is a simple way to identify humans speedy and accurately. Many applications applied finger print recognition such as the military, Judiciary, Health, teaching, civic serving, mobiles, laptop log-in, and many more. Modern techniques and approaches are used recently as a substituted of old links to capture the finger print. These technologies differ in terms of accuracy, effectiveness, speed, advantages and challenges.

Finger Print Science

is a.....

- **Reliable Science**
- **Definite Science**
- **Infallible Science**

- **Finger Print is a creation of God and it is engraved as a seal in the fingers of every human being in this world to keep the individual identity.**
- **The study of palm and finger prints can be traced back from the beginning of civilization.**
- **Thousands of years before the birth of Christ finger prints were used on pottery to indicate the maker and the brand of pottery.**

FINGER PRINT SCIENCE

Finger Print Science is an art of identifying a person by comparing the finger prints of that person with his admitted prints.

METHODS OF IDENTIFICATION BEFORE FINGER PRINTS

Before finger printing was adopted as a means of identification, man has tried a variety of methods

But, none of these methods of identification was adequate until Finger printing was adopted.

SOME OF THE METHODS OF IDENTIFICATION PRIOR TO FINGER PRINT SYSTEM

- 1. MAIMING**
- 2. BRANDING**
- 3. TATTOOING**
- 4. PERSONAL DESCRIPTION**
- 5. PHOTOGRAPHS**

ANTHROPOMETRIC SYSTEM

- **MUTILATION:** Cutting the thumbs and maiming the hands and legs.
- **BRANDING:** Cheeks and fore head.
- **STRIPS:** Public places
- **TATTOOING:** Fore head, Cheeks, chest and hands
- **PORTRAIT PARLEY:** In open ground criminals were paraded before the experienced Police Officials.
- **Photography and Body measurements, Head measurements, limb measurements.**

Prehistoric

- Ancient artifacts with carvings similar to friction ridge skin have been discovered in many places throughout the world. Picture writing of a hand with ridge patterns was discovered in Nova Scotia. In ancient Babylon, fingerprints were used on clay tablets for business transactions.

History

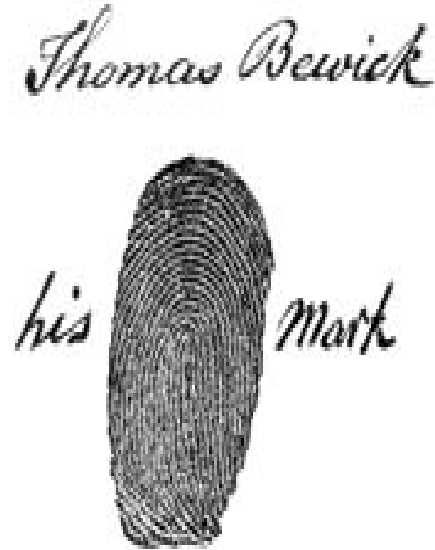
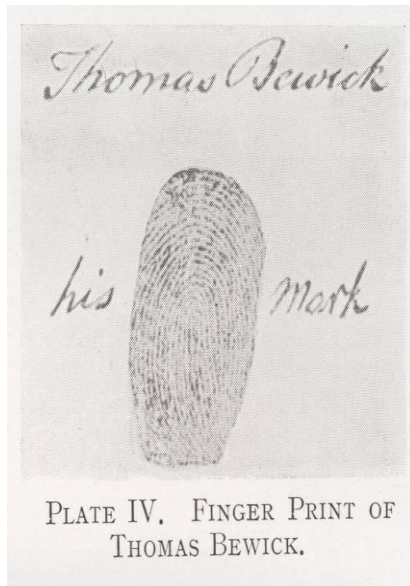
- Persian book "Jaamehol-Tawarikh" (Universal History), attributed to Khajeh Rashiduddin Fazlollah Hamadani (1247-1318), includes comments about the practice of identifying persons from their fingerprints.
- In a "Philosophical Transactions of the Royal Society of London" paper in 1684, Dr. Nehemiah Grew was the first European to publish friction ridge skin observations.
- Dutch anatomist Govard Bidloo's 1685 book, "Anatomy of the Human Body" also described friction ridge skin (papillary ridge) details.

Marcello Malpighi (1628-1694)

- In 1686, Malpighi, an anatomy professor at the University of Bologna, noted fingerprint ridges, spirals and loops in his treatise. A layer of skin was named after him; "Malpighi" layer, which is approximately 1.8 mm thick.
- **No mention of friction ridge skin uniqueness or permanence was made by Grew, Bidloo or Malpighi.**
- German anatomist and doctor J. C. A. Mayer in 1788
- wrote the book Anatomical Copper-plates with appropriate explanations containing drawings of friction ridge skin patterns. Mayer wrote, "Although the arrangement of skin ridges is never duplicated in two persons, nevertheless the similarities are closer among some individuals. Mayer was the first to declare that friction ridge skin is unique.

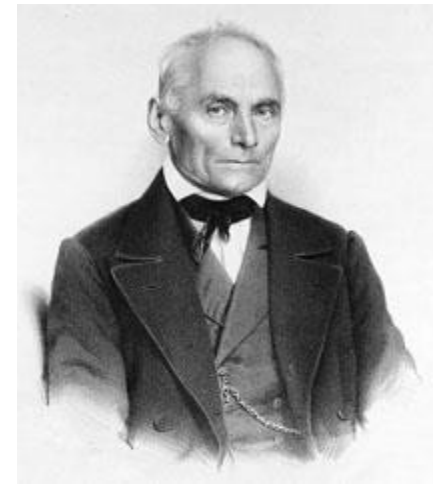
Thomas Bewick (1753-1828)

- He was an English Author and wood engraver . He engraved some of his own fingerprints and used them in ornament three of his books along with signature. This master crafts man was one of the first to recognize the individuality of a finger mark.



Jan Evangelista Purkinje

1787 - 1869



In 1823, Jan Evangelista Purkinje, anatomy professor at the University of Breslau, published his thesis discussing nine fingerprint patterns. Purkinje also made no mention of the value of fingerprints for personal identification. Purkinje is referred to in most English language publications as John Evangelist Purkinje.

Sir William James Herschel

1833-1917



The English first began using fingerprints in July 1858, when Sir William James Herschel, Chief Magistrate of the Hooghly district in Jungipoor, India, first used fingerprints on native contracts. He made a habit of affixing palm prints and later, simply the prints of the right Index and Middle fingers on every contract made with the locals as they believed that it made the contract more binding than if they simply signed it. Thus, the first wide-scale, modern-day use of fingerprints was predicated, not upon scientific evidence, but upon superstitious beliefs.

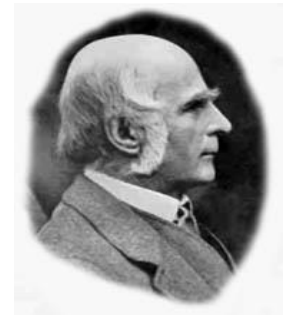
Sir William James Herschel-Cont.

In a study he recorded his own fingerprints from the age of 26yrs upto the age of 83yrs. As his fingerprint collection grew, he began to note that the inked impressions could, indeed, prove or disprove identity. While his experience with fingerprinting was admittedly limited, Sir William Herschel's private conviction that all fingerprints were unique to the individual, as well as permanent throughout that individual's life, inspired him to expand their use.

Sir Francis Galton

Father of Finger prints

1822 - 1911



- Sir Francis Galton, British anthropologist and a cousin of Charles Darwin, studied the aspect of heredity and the fingerprints from childhood to old age.
- Based on his studies he scientifically established the fundamental rules of fingerprint science.

Fingerprints never change from birth to death till decomposition sets in.

No two fingerprints will be identical unless they are taken from the same finger of the same person.

According to his findings, the odds of two individual fingerprints being the same were 1 in 64 billion.

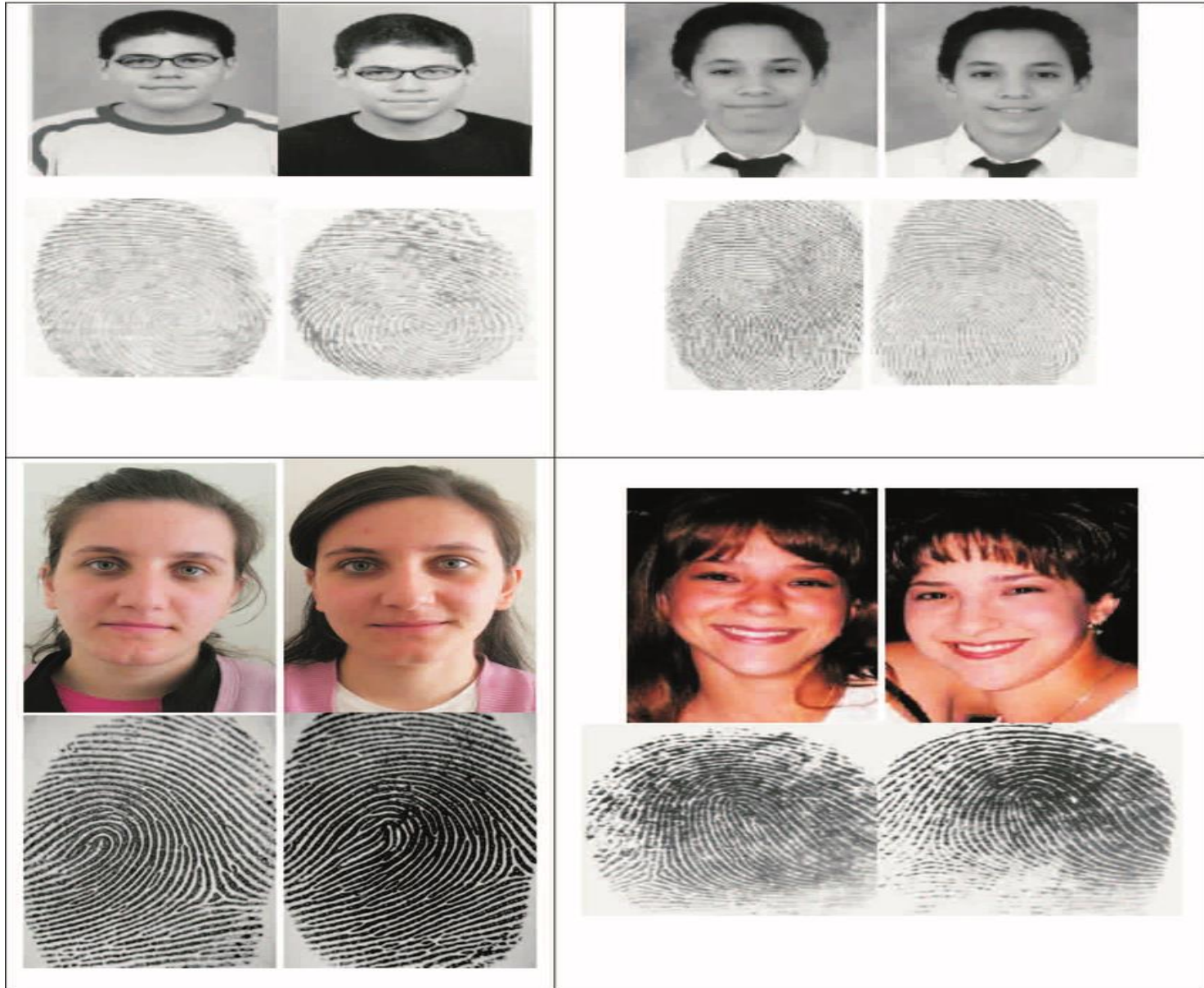
Sir Francis Galton published his book, "Finger Prints" in 1892, establishing the individuality and permanence of fingerprints. The book included the first published classification system for fingerprints. In 1893, Galton published the book "Decipherment of Blurred Finger Prints," and 1895 the book "Fingerprint Directories."

Galton identified the characteristics by which fingerprints can be identified. A few of these same characteristics (minutia) are basically still in use today, and are sometimes referred to as Galton Details.

Identical twins finger prints



Identical twins finger prints



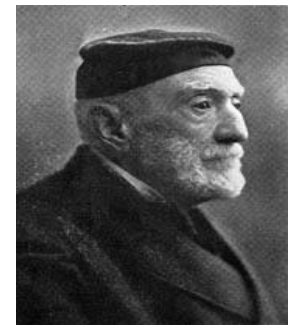
Finger print of twins

Twins



RESEMBLANCE IN THE THUMB IMPRESSIONS OF IDENTICAL TWINS
(MONOZYGOTIC TWINS)

Dr. Henry Faulds



- During the 1870s, Dr. Henry Faulds, the British Surgeon-Superintendent of Tsukiji Hospital in Tokyo, Japan, took up the study of "skin-furrows" after noticing finger marks on specimens of "prehistoric" pottery. A learned and industrious man, he not only recognized the importance of fingerprints as a means of identification, but devised a method of classification as well.
- He discussed fingerprints as a means of personal identification, and the use of printers ink as a method for obtaining such fingerprints.

- He was the first man to give the idea of tracing criminals from scene of crime prints and mentioned that when blood finger marks or impression on clay, glass etc. exists, they may lead to scientific identification of criminals.
- He suggested identification of dead bodies from fingerprints.
- In 1905, he published a book titled “Guide to Finger Print Identification”

AZIZUL HAQUE

- Azizul Haque was Born in then District of Khulna east Pakistan in
 - 1872.He Joined the Bengal Police as a Sub-inspector of Police and
 - worked in Anthropometric bureau.
-
- He helped Sir E.R.Henry to pigeon hole method of classification . He
 - was the one who devised the arithmetical rule for primary
 - classification. Then the secondary and other classifications were
 - worked and Azizul Haque played an important role in this aspect.
 - Government of India decorated him with title of ‘Khan Bahadur’ with
 - cash award of Rs 5000/-.

Rai Bahadur Hemchandra Bose

- He was trained by Sir E.R.Henry directly in Finger Print system.
- During his service in Bengal Finger Print Bureau, he helped to work
- out lettered classification. In 1926 he published a book titled ‘Finger
- Print Companion’. This book deals with Ten Digit finger print
- classification , Single Digit classification method to identify the person
- from chance prints and telegraphic Code for finger impression which
- can be telegraphed to any distant Finger Print bureau for search and
- identification of criminal.

E.A .Subramaniya Iyar

- He was an Inspector General of Police in Madras State. He went to Kolkata and got himself trained from Sir E.R.Henry . On return from his training in Finger print science, he was deputed by the department to take action to start a Finger Print Bureau. By his effective action a Finger Print Bureau was opened at Madras in Tamil Nadu on 22.08.1985.

Sir Edward Richard Henry (1859-1931)

- He was Inspector General of Police, Lower Province, Bengal, in 1891. He devised a new system of classification. Bengali officer Khan Bahadur Azizul Haque helped him to work out the numerical system and Rai Bahadur Hem Chandra Bose helped him for letter Classification. He requested the British Government in 1896 to appoint a committee for adoption of finger Print system in the place of Bertilon system other wise called Anthropometric system. A committee headed by Mr. Stragan, R.C. Surveyor General of India and Mr. Alex Pedler, F.R.S. Principal, Presidency College, Kolkata was constituted and the committee examined both the Anthropometric and E.R. Henry's system of classification.

ADOPTION OF FINGER PRINT SYSTEM

- The committee recommended the adoption of finger print system as a means of identification of the habitual criminals was recommended in March, 1897.
- And then, the first Finger Print Bureau in the world was officially established in Calcutta (India) in June, 1897.
- Finger print system was approved by the Indian Legislature in 1899 and a special act was passed amending the law of evidence to the extent of declaring relevant the testimony of those who had become proficient in Finger Print decipherments.

Failure of Anthropometric or Bertillon system

- In 1903 Will West, a negro, was convicted and sent to penitentiary at Leavenworth, Kansas, United States where he was measured and photographed according to Bertillon's system of personal identification. During his physical examination, the clerk who was measuring him said he looked familiar but Will West refused and said that this was his first time at Leavenworth. At the end of examination he was assigned a prison No. 3426 and was taken to the Chief record clerk. The chief record clerk refused to hear the words of Will West. He had shown a card by name William West, prison No. 2626, having the photograph and measurements resembling Will West. But William West was committed in charge of Murder.

Failure of Anthropometric or Bertillon system-Cont.

The photograph and measurements of both were found to be the same But when the left index finger prints were taken for both the persons, Will West left index finger had whorl type and William West left index finger had loop type. From the above there is a possibility of having same photograph and measurements of two persons. But two persons never have identical finger prints and they never changes from birth to death.

Adoption of finger print system

- **The committee headed by Mr.C.Strahan R.E. gave its report**
- **adopt finger print system with the concluding remarks.**
- **1.Simplicity of working.**
- **2.The cost of the apparatus is very less.**
- **3.All the skilled work can be transferred to central office.**

Adoption of finger print system. Cont.

4 .Search work can be done rapidly.

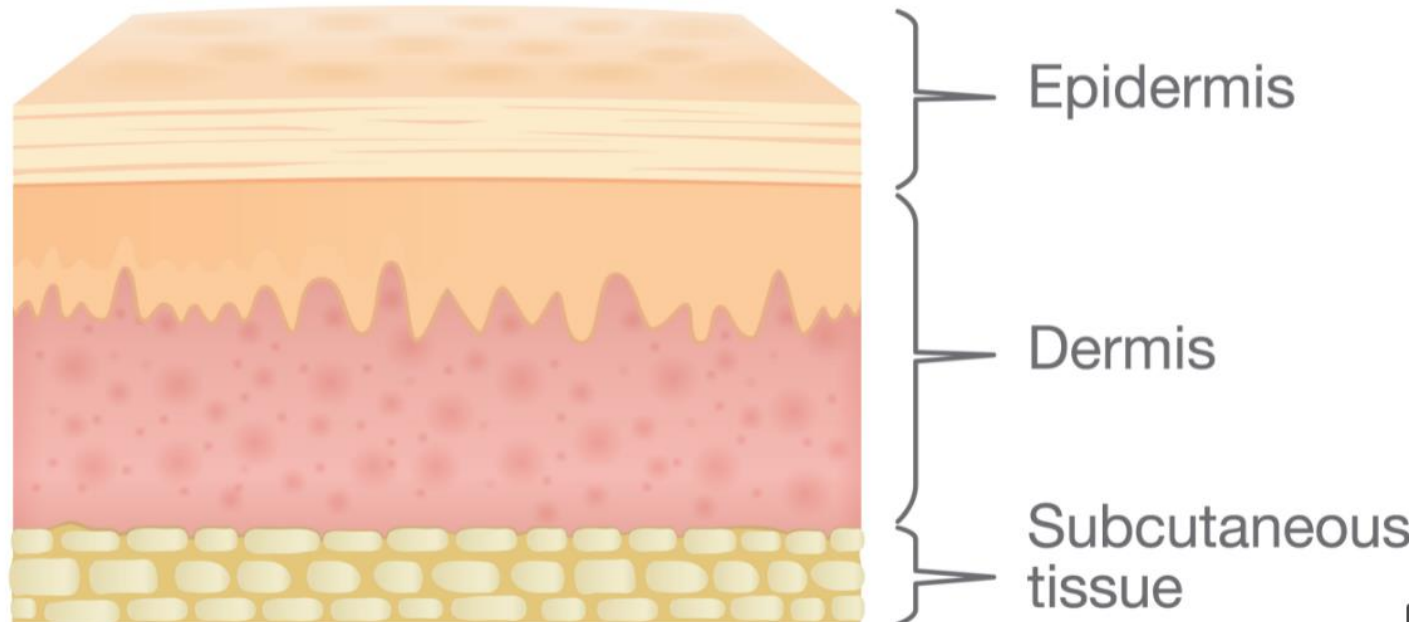
5.the results obtained from finger print identification is infallible and certain.

The Governor General in council passed a resolution to adopt finger print system for identification criminals from 12.061897.

FRICTION SKIN

The skin is made up of two super-posed layers:

1. **Epidermis:** *The epidermis is surface (outer) layer which is inked while taking the finger prints. (This layer is composed of 5 layers)*
2. **Dermis:** *The dermis is the deeper layer.*



RIDGES AND FURROWS

- Friction ridges are the raised strips of the skin by which finger prints are made.
- The palmer and planter surface of our skin is traversed by many elevations and depressions.



- The elevated lines are technically known as ridges.
- The depressions are called furrows.



- Since the palmer and planter surface of our skin serve friction, it is called friction skin, and the ridges are called friction ridges.
- Friction ridges are also called as papillary ridges and epidermal ridges.

FINGERPRINT

“Finger Print is a reproduction on some smooth surface, of the pattern or design formed by the ridges on the inside of the first joint of a finger or thumb”

Sir Francis Galton's Fundamental Principles of Finger Print Science

Finger Print Science is based on three (3) fundamental Principles.....

1. VARIETY

2. IMMUTABILITY

3.PERSISTENCY

*Sir Francis Galton has proved the basic principles of
Finger Print Science.*

Variety or Individuality

Finger Print is UNIQUE

***No two finger prints are identical unless
they are made by the same finger of the
same person***

INDIVIDUALITY OF FINGER PRINT

- Sir William Herschel the collector of Hoogly district took the finger prints of the contractors, pensioners to avoid false impersonation. He studied the finger prints of the different individuals and found that they were different from one another. So he ordered to take the Left thumb Impression in the sale deeds at the time of registration from 1877. The left thumb impression will prove the real executor on later days because they cannot be duplicated by another person.
- Sir Francis Galton tried to find out the hereditary aspect in finger print . He compared the finger prints of the individuals in the same family and other persons finger prints. He scientifically established that finger prints have got individuality. No different persons will have identical prints. He proved these facts mathematically through the theory of Probability.
- According to Dr. Robert H. Yodanis the difference exists because each person is being an incarnation of vital energy. Therefore every person is differentiated from every other. This translates into every anatomical organ and physiological functions. Hence the difference exists in formation of ridges also. Therefore we can come to a conclusion that no two persons will have identical finger prints in the world including the twins, Triples and quintuplets.

IMMUTABILITY

The finger prints will never change by the accidental injuries, ailments or any other physical changes of a person.

Immutability of finger prints

- There are two layers in human skin called epidermis and dermis. The outer layer is called epidermis. The inner layer is called dermis.
- Accidental injuries, peeling of skin, warts, creases, burns, skin diseases, old age will affect the ridge in the epidermis temporarily. After some time the affected ridges will regain their original shape.
- If the wound affects the dermis, there will be a permanent scar
- Even then the ridges free from the scar will reveal clear characteristics for comparison and identification.
- From the above observation, we can come to a conclusion that finger prints are infallible throughout human life.

PERSISTENCY/ PERMANENCY

Finger prints will persist or remain, throughout the life on an individual and even after death until decomposition sets in.

Persistency of finger prints

- The ridges on the friction skin of fingers, palms and soles are developed
- with fixed and permanent character in one and half months to two
- months of pregnancy. They are fully formed in the six month. ie: before
- 180 days. This formation remain permanent till the skin perishes to
- decomposition. During body growth of the body these formations
- enlarge according to growth. But we cannot find any difference in the
- picture except the size. The finger print pattern and the ridge
- characteristics enlarge according to growth. But we cannot find any
- difference in these stages except the size.

Persistency of finger prints-Cont.

Sir William Herschel, the collector of Hoogly district recorded his finger print in different intervals of 26th year, 44th year, and 83rd year of his age.

Sir Frances Galton an anthropologist and the cousin of famous scientist Darwin examined the finger prints of father, mother, son and grand son of the same family. He also studied the finger prints in childhood, boyhood, manhood, and old age and found that the finger prints are not produced in hereditary and the finger print of the individual remain permanent from birth to the stage of decomposition.

FINGER PRINT PATTERNS

- J.E. Purkanje classified the finger print patterns in to 9 major groups.
 - Arch
 - Tented Arch
 - Plain Loop
 - Irregular loops
 - Whorls – Almond shape, spiral shape, elliptical shape, circular and whirlpool nature

- Sir Frances Galton classified them into 3 groups. They are.....

- 1. Arches**

- 2. Loops**

- 3. Whorls**

- Sir E.R.Henry modified Galton's A L W system and classified them into 4 groups.

- 1. Arches**

- 2. Loops**

- 3. Whorls**

- 4. Composites**

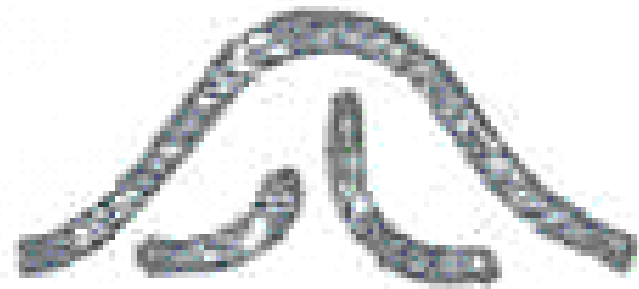
1. ARCHES



TENTED ARCH



TENTED ARCH



2. LOOPS

- In loops the ridges enter and exit on the same side of the pattern making a recurve.
- There must be at least one ridge between the delta and core.
- It has a core and delta on either side of the pattern.

MINIMUM REQUIREMENTS OF A LOOP PATTERN

1. CORE

2. DELTA

3. RECURVING RIDGE

4. RIDGE COUNT

• LOOP PATTERNS SUB DIVIDED INTO TWO GROUPS -----

1. RADIAL LOOP

2. ULNAR LOOP



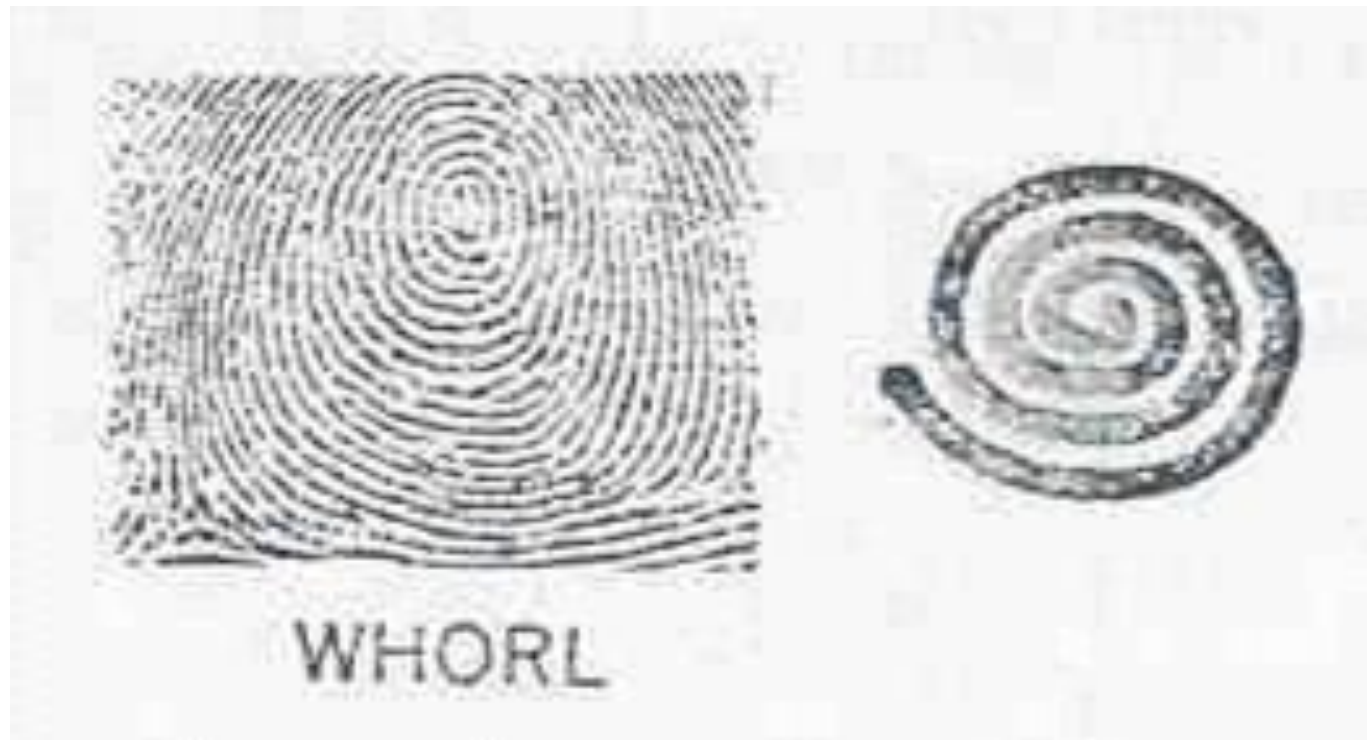
Ulnar Loops (Right Hand)



Radial Loops (Right Hand)

3. WHORLS:

- In whorls, at least one ridge must recurve and make a complete circuit around the core
- There are two deltas ordinarily.
- Whorls may be circular, spiral or oval(almond)



4. COMPOSITES

Composite pattern are combination of two or more patterns either of the same or different types in one print. They were sub-divided into four groups. They are :

Central Pocket Loop

- 1. Twin Loop**
- 2. Lateral Pocket Loop**
- 3. Accidental**

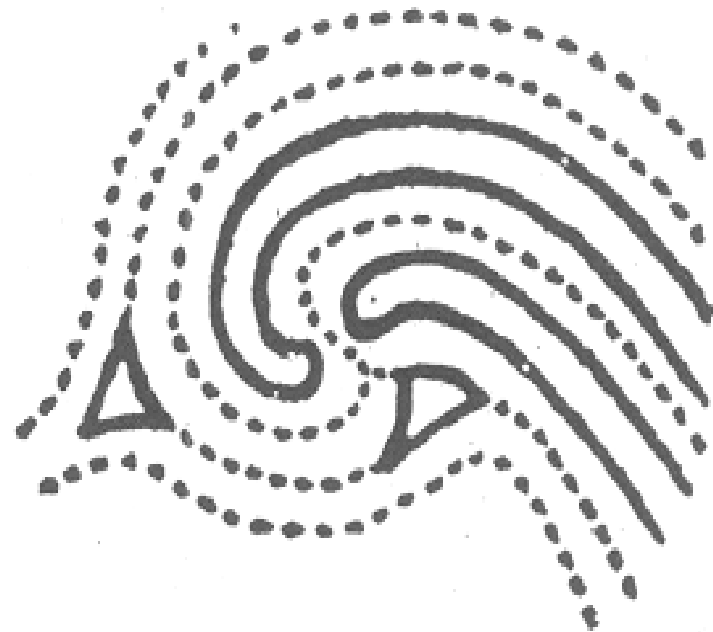
CENTRAL POCKET LOOP



TWIN LOOP



LATERAL POCKET LOOP



ACCIDENTAL PATTERNS



Frequency of patterns

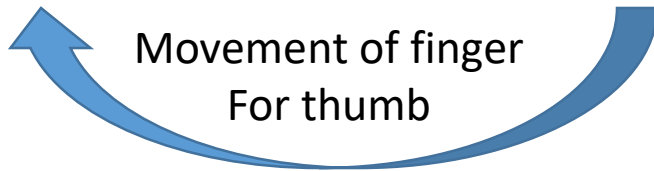
- 1. Arches -- 5%
- 2. Tented Arches --5%
- 3. Loops --60%
- 4. Whorls and Composites—30%

METHOD OF RECORDING FINGER PRINT

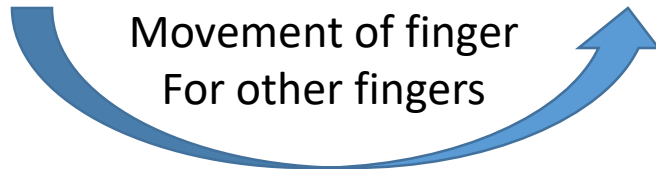
- For a fully rolled finger print impression, place the bulb of the Finger on the inked slab and roll from one nail edge to another nail edge without any twist. The finger is then rolled on the paper gently to get the full contour of the bulb of the Finger.
- For a vertically rolled finger print impression, after inking the finger, the bottom of the first phalange is placed on the form and then rolled vertically to the tip of the Finger Bulb.
- For plain impressions, the fingers are inked and are placed on the paper without rolling the fingers.

TYPE OF FINGER PRINT RECORDING

Fully Rolled Print



Movement of finger
For thumb



Movement of finger
For other fingers

Vertically Rolled Print



Plain Print





IAFIS CLASSIFICATION

Palm prints

- The palm print is related to the inner surface of the hand. The palm print mainly consists of three lines or ridges: the main line, the secondary line (wrinkles), and the epidermal line. Palm prints are unique to each individual.



Vertically rolled prints and its uses.

- After inking the finger, the bottom of the first phalange is placed on the form and then the finger is rolled vertically to the tip of the finger bulb thus vertically rolled finger prints are taken.
- It is useful to compare the chance prints and finger prints on the documents where the ridge characteristics in tip portion of the fingers are available.

Use of rolled finger prints

- 1. Full contour of the finger is present in the print to decide the pattern.
- 2. Core and delta are clearly visible for classification.
- 3. large number of ridge characteristics are available for comparison.

Importance of recording finger prints

- 1.It will be helpful to know the antecedence of the ex-convicts.
- 2.To record the previous conviction of the convict.
- 3 To compare the chance prints or latent prints to identify the criminals.
- 4. Identify out of view criminal.
- 5. Unidentified dead bodies.

Importance of recording finger prints-Cont.

6.To help the judiciary in civil criminal cases.

7. To eliminate the inmates finger prints and to identify the suspected persons.

8. In police, recruits finger print s are taken to know whether they having previous conviction or not, so that good persons are recruited in police force.

9. To compare the finger prints on any questioned documents.

RIDGE CHARACTERISTICS OR GALTON DETAILS

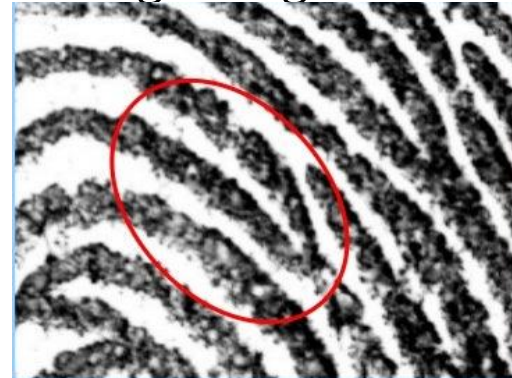
Ridge ending or Ridge termination:

- It is a sudden ending of a continuous ridge. A ridge which runs for some distance and ends suddenly without further continuation.



Ridge Bifurcation

- Bifurcation is a dividing or breaking of a single ridge into two or more branches.



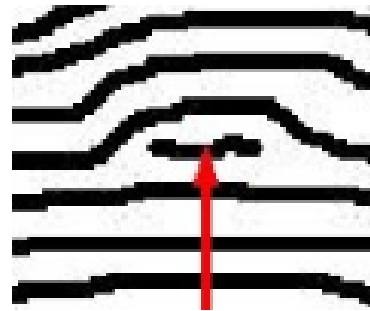
Ridge enclosure:

- When a ridge bifurcates and then joins again to the main ridge forming like an eye is called an enclosure.



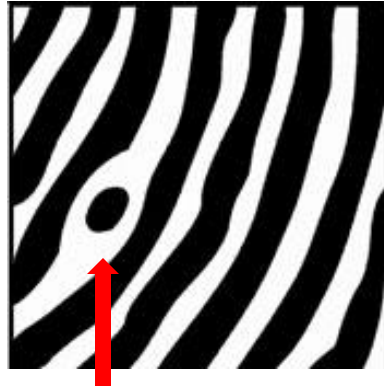
Short Ridge:

- It is a short ridge between two ridges having both free ends. It is short in length.



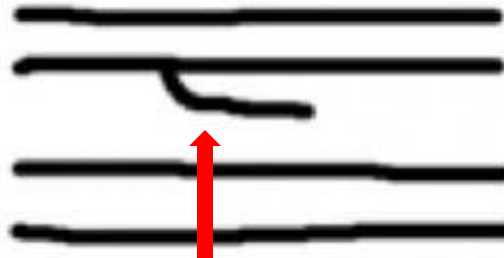
Dot or Island:

- A small ridge of the size of a dot.



Spur or Hook:

- A ridge which splits into another ridge but very short in length like a hook.



Cross Over:

- When two parallel running ridges, intersect at a point and again continue to run parallel.



Bridge:

- It is an intermediate ridge which connects the two ridges that were hither to running parallel or nearly so.



Recording of finger print on dead bodies.

- 1. Presently dead and rigor mortis has not set in. (1 to 8 Hrs)
- 2. Rigor mortis stage. (8 to 24 Hrs)
- 3. Decomposition stage. (After 24 Hrs,)
 - I. Presently dead. (1 to 8 Hrs)
- Those who have died presently and rigor mortis stage has not set in, the fingers are flexible. The fingers may be cleaned with soap or alcohol and dried thoroughly. Then inking and printing
- may be accomplished in usual manner as that of living person.

Recording of finger print on dead bodies

II. **Rigor mortis stage.**(8 to 24 Hrs)

The rigor mortis period differ in cold and hot countries.

While the body is stiff, the fingers should be cleaned with Alcohol or Benzene or soap water and submerge the hand in sufficient hot water for a short while. Then the fingers should moved rapidly to attain flexibility. Then ink may applied with small rubber roller . After inking the finger properly, a square paper of 1.5” X1.5” should be placed on a wooden pad should be rolled over the finger from one side to other and the print of the finger can be pasted on the finger print form in the respective digit.

RECORDING OF FINGER PRINT ON DEAD BODIES

- **In certain case the fingers of the dead body may be in clenched condition. Then the fingers may be straightened by force. A scalpel may be used to cut the second joint on the inner side of the finger and the fingers can be straightened by force. If the finger is bent or cramped it can be straightened by making a deep cut between thumb and index finger.(Doctors and legal authority is necessary while doing this process). Then clear finger print may be obtained by spoon or wooden pad method.**

RECORDING OF FINGER PRINT ON DEAD BODIES

III. DECOMPOSITION STAGE.

Body corpse in water: This condition will respond to plastic restoration. This is a mixture of 1 part of hot solution of Gelatine and 7 parts of Glycerine. A hot solution of Glycerinated Gelatine is injected into the finger tissues. Air is also injected to inflate the shrunken tissues. Then inking and printing may be done in usual manner.

RECORDING OF FINGER PRINT ON DEAD BODIES

B)SWOLLEN OR FLABBY FINGERS ABNORMAL SIZE.

These type of finger may be sub-merged in Formal de hyde solution for some time. The finger will get hardened and attained their natural shape. Then fingers may be cleaned and finger printed.

DRIED FINGERS AND MUMMIFIED BODIES.

- By soaking the fingers in the solution of Caustic Potash or diluted solution of sodium Hydroxide 10to 3 %, the tissue to swell or finger to swell. This may require the fingers amputated at 2nd joint, when the finger assumed normal shape by the absorption of solution. Then it is cleaned and inked and printed.

• MUMMIFIED BODIES.

- In this case shrunken tissues should be treated in 1 to 3% potassium Hydroxide or sodium Hydroxide solution. The fingers are cut at the second joint and placed in 10 separate labelled bottles. Then the fingers should be cleaned, dried, and printed.

BURNT BODIES

- **Air crash, fire accidents, burnt bodies, in self immolation and arson the fingers will be burnt and black.**
- **If the wrinkles, hot Glycerinated Gelatine should be injected in the bulb of the fingers and the finger prints can be in the usual manner.**
- **In the extremely difficult case, when the means of obtaining finger print fails, x-ray photography can be used successfully.**

BURNT BODIES

The burnt fingers may be cleaned with any solvent and the skin may be carefully cut away from the pattern area. The inner surface of the finger is covered with a coating of heavy salts such as Bismuth salt, Lead carbonate or White lead mixture with fill the skin depression. An X-Ray photography has to be taken.

Technically this process is referred as Forensic Radio Photography or Dactylospic Radiography.

Advanced stage of Decomposition

The body may be in more or less advanced putrefaction and the skin tissues so badly decomposed. The skin may be peeling away and only some portions of the pattern is available. The particles of the skin would adhere to the inking instruments. In such case the skin may be carefully cut away from the pattern area and the fragments should be placed in the bottles of Formal de-Hyde solution using separate bottle for each skin of finger and labelling them accordingly. The skin gets hardening effect on the tissues, these bits of skin may latter be placed over the technician's own finger and the rolled impressions can be taken.

Advanced stage of Decomposition-Cont.

- If the above process is not possible, the skin should be scraped until it is sufficiently thin to be flattened between two pieces of glass and photographed.
- If poor contrast is found between the ridges and furrows, it may be photographed in transmitted light.
- When the papillary ridges disappeared from the outer skin, the fragment of the skin is carefully mounted on a with internal surface tuned towards outside. Then the ridges design may be photographed. The pattern will be reversed in original appearance. The ridges will be represented by furrows of the pattern. Careful examination is needed for comparison.

FINGER PRINT CLASSIFICATION BY SIR E.R.HENRY.

- Sir E.R.Henry invented a new system of classification formula for ten digit finger print of ten digit have been classified for the purpose of keeping them in such an order that they can be taken out from a large collection of records with the least possible labour when required.
- **The classification formula is divided into six division.**
- 1. Primary
- 2.secondary.
- 3. Major.
- 4. sub-secondary
- 5. final.
- 6.Key
- The percentage of Arch, Tented arches and composites are relatively small in comparison to Loops and whorls. Hence for the purpose of classification Arch, Tented Arches have been included under loop and Composite under whorl.

IN A FINGER PRINT SLIP THE IMPRESSIONS TAKEN IN THE ORDER AS INDICATED BELOW.

1.Right	2.Right	3.Right	4. Right	5.Right
Thumb	Index	Middle	Ring	Little

6.Left	7.left	8.left	9. left	10.left
Thumb	Index	Middle	Ring	Little

The even fingers are taken For Numerator.	Right index +Right Ring+ Left thumb + Left Middle + Left Little
--	---

The odd numbers are taken Right Little+ Left Index +	Right Thumb +Right Middle +For denominator.
	Left Ring

ARITHMETIC RULE WORKING OUT PRIMARY

- Sir E.R Henry gave numerical value to the whorl patterns including composites according to their appearance in different pairs as follows.

• RT	RI	RM	RR	RL
• 16	16	8	8	4

• LT	LI	LM	LR	LL
• 4	2	2	1	1

- Whorls and composites.
- Ist pair = 16 IInd pair = 8 IIIrd pair = 4 IV th pair = 2
- Vth pair = 1
- No Numerical value was given to Arches, Tented Arches, and loops and always be '0'

SECONDARY CLASSIFICATION

- It is expressed by lettered symbols in capital representing the type of patterns in the Index fingers. Right Index finger print is taken as Numerator and left index finger print is taken as Denominator, This formula is to distribute or to separate the sets of prints having the same primary classification.
- Arch -A
- Tented Arch -T
- Radial Loop - R
- Ulnar Loop -U
- Whorls and Composite -W
- Each of the primary classification is sub divided into 25 secondary groups. The secondary classification is noted in capital after primary classification.
- **Major.** The major divisions are created by counting the ridges I loops and tracing of ridges in whorls on thumbs.

ARITHMETIC RULE WORKING OUT PRIMARY

- The total value of the first finger in each of the pair is taken for denominator and the second finger in each of the pair is taken for numerator. If the all the ten finger of a person are whorl and composite type, then we have the following primary classification.

- $16+8+4+2+1 = 31$

- -----

- $16+8+4+2+1 = 31$

If all the ten fingers of a person are Arches, Tented Arches and Loops which has no value will be as indicated below.

$$0+0+0+0+0 = 0$$

$$0+0+0+0+0 = 0$$

In the early days under pigeon hole method all the finger print slip were filed in 32 32 horizontal rows and 32 vertical rows of the cabinet.

Sub –Secondary:

Sub-secondary classification is worked out by ridge counting in loop patterns and ridge tracing in whorls pattern of the Index, Middle, and ring fingers. Sub secondary classification is noted after Major classification

Lettered Groups: 5. Final 6. Key

FUNCTIONS OF FINGER PRINT BUREAU

- **1. Furnishing the previous conviction of arrested persons.**
- **2. Adding new convicted persons finger print slip on record.**
- **3. Out of view criminals.**
- **4. Death reports.**
- **5. Identification of unknown dead bodies.**
- **6. Proving previous convictions. (proved in the court by means of Experts evidence u/s 511 Cr.P.C).**
- **7. Identification of Chance prints.**

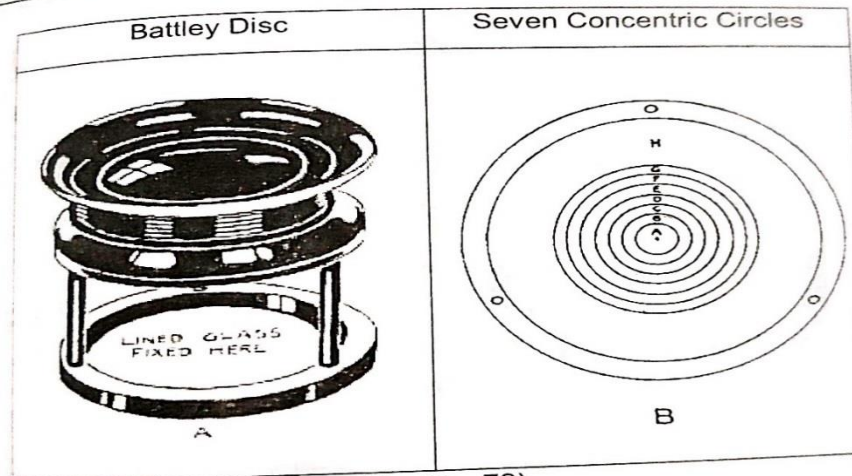
FUNCTIONS OF FINGER PRINT BUREAU

8. Movement criminals informed to I.O's.
9. Furnishing expert opinion.
10. Visiting crime scene.
11. Jail test.
12. Finger print training.
13. Finger Print certificate for immigration.
14. Interpol Finger print slip verification.
15. Verification of newly recruited persons for police

SINGLE DIGIT CLASSIFICATION SYSTEM

- Ten digit finger prints are separated and mounted on the prescribed printed forms and classified and filed in the order.
- The impressions are classified and kept in the record in the order.
- Arch, Tented Arch, Radial Loop, Ulnar Loop, Whorl including central pocket, Twinned loop, Lateral Pocket, Composite, Accidental,
- Scarred prints.
- The above patterns are Sub-classified as follows.
 - a)) Type of pattern
 - b)The formation of core.
 - c) The position of delta or deltas.
 - D)Ridge counting.
 - Ridge Tracing.
 - Other peculiarities.
- Single prints are classified with the aid of a special magnifying glass called Battley Disc having affixed focus and a window at the base.

Single digit finger print classification disc



(Figure - 72)

The method of classifying Single Digit Finger Prints according to Battley System is detailed below :

I Arch Pattern		
Pattern	Secondary classification	Sub-Secondary classification

COMPUTERISATION OF FINGER PRINT. FACTS NEW SYSTEM. FINGER PRINT ANALYSIS AND CRIMINAL TRACING SYSTEM

- This computerization of finger print system in an ordinary computer is a semi – automated one .In this system half work has been done I computer and half of the work has been done manually. In this FACTS system, the digital image Processing, pattern recognition and ridge Characteristics
- (Minutiae and relative position) can be extracted from the finger print image automatically and stored in the memory of the computer, which can be used for enquiring the finger print matching.
- The following steps are taken for automatic finger print recording and identification of questioned finger print or chance prints in the FACTS system.
- 1 Digitalization .
- 2. Feature extraction.
- 3. Minutiae editing.
- 4. Matching.
- 5. Verification
- 6. Uses.
-

Recording of finger print slip in the computer.1.0

- Digitalization is converting of the finger print impression into computer compatible digital form called digital image.
- The scanned finger print image is projected in computer in digital form.
- Then the minutiae are extracted from the digital image generated during digitalization. The minutiae extraction the image are cleared and the clarity of the ridges are enhanced. Ridges are Skeletonized and the digital image is compressed. Extracted minutiae have the following attributes.
 - a. Minutiae position.
 - b. Minutiae direction.
 - c. Minutiae Relation. Set of intervening ridge counts between a minutiae its five nearest neighbouring minutiae as a web is automatically marked by this system in the entire pattern.
- 3.Minutiae editing. 4. Matching. 5.Verification

FACTS FINGER PRINT ANALYSIS AND CRIMINAL TRACING SYSTEM

- **Upon the recommendation of the National Police commission in 1986 the Central finger print bureau first began to automate the finger print database.**
- **It began with digitizing the existing manual records through India's first Automated Finger Print identification system (AFI) in 1992, called Finger Print Analysis and criminal tracing System. (FACTS 1.0)**
- **The latest iteration, FACTS 5.0, which was upgraded in 2007 was considered to have “ out lived its shelf life “, according to a 2018report by the NCRB and thus needed to be replaced by NAFIS.**

NATIONAL AUTOMATED FINGER PRINT IDENTIFICATION SYSTEM (NAFIS)

- **The National Automated finger print identification system (NAFIS)**
- **is an Australian finger print and palm print database and matching system is now introduced in all over the states in India. NAFIS is developed by the National crime Record Bureau NCRB) at the Central Finger Print Bureau(CFPB) in New Delhi. The project is a country wide searchable data base of crime and criminal related finger prints.**
- **The Union Home Minister has inaugurated the National Automated Finger print Identification system.**
- **.**

NATIONAL AUTOMATED FINGER PRINT IDENTIFICATION SYSTEM (NAFIS)

NAFIS developed by the NCRB at the Central Finger Print Bureau in New Delhi.

The Project is a country- wide searchable database of crime and criminal related finger prints. The web based application functions as a central information repository by consolidating finger print data from all states and Union Territories.

In this year, Madhya Pradesh become the first states in the country to identify a deceased person through NAFIS. This system is also introduced in Tamil Nadu state in this year of April. Lot of un solved cases from the year 2000, House braking and serious offence cases were detected by the system

UTILITY OF NAFIS

- It enable law enforcement agencies to up load, trace, and retrieve data from the database in real time on a 24X 7.It would help in quick and easy disposal of cases with the help of a Centralised finger print data base.
- **Work of NAFIS system:**
- **NAFIS** assigns a unique 10-digit National finger print number (NFN) to each person arrested for a crime.
- This unique ID will be used for the person's life time, and different crimes registered under different FIRs will be linked to the same NFN.

UTILITY OF NAFIS

The 2020 report states that the ID's first two digits will be that of the state code in which the person arrested for a crime is registered, followed by a sequence Number.

By automating the collection, storage, and matching finger prints , along with digitizing the records of finger print data, NAFIS will provide the much-needed unique identifier for every arrested person .

It will be included in the CCTNS (Crime and Criminal Tracking Network & Systems) data base as both are connected and backend.

FINGER PRINTS A FORENSIC TOOL FOR CRIMINAL INVESTIGATION

-
- Introduction.
- **Finger prints have been the gold standard form of personal identification in the forensic community for more than one hundred year, still universal in spite of the discovery of DNA finger print. Finger prints have provided key evidence in countless cases of serious crime. When it comes to crime, criminals try to cover up evidence which within their reach. But finger prints are some thing which cannot be curtailed up easily and because of which; it plays important roll in crime.**

Finger prints a Forensic tool for Criminal investigation

INTRODUCTION-Cont.

Finger prints are universal in nature which means all the individuals carry this medium of identification. A criminal uses his hands in committing any crime and hence leaves marks on the scene of occurrence on any object, which come in contact with his hands while committing the crime. Hence there are chances of occurrences of finger prints in all crimes and these impressions work as an evidence for identification of person involved in any crime.

Prints are something which is left over on anything touched and they cannot be covered up because human finger prints are unique, difficult to alter, and durable over the life of an individual, making them suitable as life long makers of human identity.

Introduction

Finger prints can be readily used by Police or by other authorities to identify individuals who wish to conceal their identity, or to identify people who are incapacitated or diseased, as in the aftermath of a natural disaster. Without prints there would be no evidence at a crime scene that lost long enough without disappearing.

PROCEDURE FOR COLLECTING FINGER PRINTS AT THE SCENE OF CRIME.

Basically, the purpose of collecting finger print is to identify the accused, suspected or any other witness. The search of finger prints should be done in a systematic manner ie: the area suspected must be thoroughly checked. The finger prints are being found in the scene occurrence are divided in to three major parts, as Latent, Patent, and impressed (**Mould or plastic**)finger prints. A magnifying glass helps to judge the quality of finger prints. Polylight system is quite convenient for searching of finger prints because radiations are being given by this and they are in the form of strong beams leading from UV to IR. Even this system is portable and can be used elsewhere.

PROCEDURE FOR COLLECTING FINGER PRINTS AT THE SCENE OF CRIME contd.-

- Latent finger prints are the one which are invisible to the naked eyes so the powers are excellent medium to develop the latent prints. This print made of the sweat and oil on the skin surface. There are many powders which are being used such as gray for dark coloured surface. Black against light colour back ground. Fluorescent power for multi-colour surface. Metallic power like Aluminium, Copper, Brass, Gold antimony on special surfaces and mostly where the finger prints are on sticky surface. Fuming Techniques of Iodine, Cyanoacrylate and metallic vapours, Chemical Methods and Laser Development are certain other techniques which help to collect latent print.
- Patent Finger prints are the ones which are visible to human eyes as they can be formed with any contact from blood, grease, dirt, or ink, Impressed (mould or plastic) finger prints are also visible to naked eyes and they are formed by pressing fingers on tar, soap, wax, or any fresh liquid. These are three dimensional impressions.

PROCEDURE FOR COLLECTING FINGER PRINTS AT THE SCENE OF CRIME contd.-

- .
- A criminal while committing any crime touches many objects and they are
- likely to bear finger prints which can be obtained during investigation. The
- investigating officer tries to reconstruct the scene of crime and imagine himself
- as a culprit and tries to identify location which he himself have touched in
- commission of crime and by doing this the investigating officer has to be careful
- that he does not leave his finger prints on any of the article and tries to preserve
- other evidence as well.

Chance Prints

- **Finger Prints found at the scene of offence are called chance prints.**

Chance Prints are three types.

- **1) Mould or Plastic Prints**
- **2) Visible**
- **3) Latent Prints or Invisible prints**

Crime scene finger print

- **Latent print;**
- Invisible finger prints and palm prints left by oily matters exuded from the sweat pores on objects or surface which the finger and palm may touch, are termed as 'Latent prints'. It is the most important link between the crime and offender.
- Sweat:
- Ordinary sweat is generally composed of .
- Water -99%
- Urea -00.10%
- Fat and Fatty Acid - 00.40%
- Sodium chloride and other salts -00.50
- Chance prints: Chance prints are those left by offenders hurriedly at the time of their commission of offence which are left accident on the objects or surface which they handled. Chance prints are also called as ' Burglars Visiting card'

COMPOSITION OF FINGERPRINT RESIDUE

- Eccrine glands found on the surfaces of the finger produce water type of sweat, the composition of which forms basis for fingerprint residue. It is a mix of 98% sweat and 2% excretory products (Ammonia, Magnesium, Fluoride, Cobalt, AA., Fatty acid/ Cholesterol, Na lactate, Urea, Tin, Molybdenum etc.)
- Apocrine glands present in other parts of the body secrete a more oily sweat. Apocrine sweat can become part of the latent fingerprint residue if the person has touched the skin may leave the print consisting of apocrine secretions.
- Many other substances from the environment can get onto the friction ridge skin and then be deposited into latent residues.

SURFACE FOR FINGER PRINTS

Porous – paper, cardboard, unfinished wood etc.

Non porous – glass, plastic, metal etc.

Semi porous. Cloth, paper, Glassy cardboard, Glassy Magazine covers, Finished wood, Cellophane.

Factors dependent on individual – diet, age, health, metabolism, occupation and stress

Factors dependent on surface - Textured, Porosity, Cleanliness, Shape and Temperature
dependent on environment - Temperature, Humidity, Exposure to sunlight, Weather and Other factors

Locating latent finger print

LOCATING LATENT FINGERPRINT.

- Visual examination
- Fluorescence examination: using barrier filters in front of the eyes - naturally occurring components or fluorescence of some contamination (oil or grease).
- Reflected Ultra violet Imaging System (RUVIS), which can locate most non absorbent prints.



- **MOULD or PLASTIC PRINTS:**

- These are formed due to pressure of the finger on the soft and pliable material, such as Soap, candle Melted Vax, Parafin, Tar, Butter, Grease, Modelling clay, Chocolate bars etc. No developing is necessary for these Prints.

- **VISIBLE PRINTS:**

- These are formed by the fingers covered with some coloured materials such as blood, ink, dust, dyes, stains, grease oil etc.
- No developing is necessary. But these Prints should be photographed immediately.

- **LATENT OR INVISIBLE PRINTS.**

- latent prints are produced by natural moisture of the pores of the papillary skin. Since the sweat contains 99% of water and other secretions 1%. This cannot be seen with our eyes.

THE EXISTENCE AND DURATION OF LATENT PRINTS OR CHANCE PRINTS DEPENDS UPON THE FOLLOWING CONDITION

- 1. Nature of objects touched.
- 2. Physical condition of the person leaving the print.
- 3. Condition of skin leaving the print.
- 4. The amount of pressure while leaving the impression.
- 5. The atmospheric condition of the surroundings.

• **METHODS OF DEVELOPING CHANCE PRINT.**

- 1. Chemical Powers.
- 2. Liquids.
- 3. Gases and Vapours.
- **1. Chemical Powders** are used to develop the latent print to make visible and to make the latent print permanently by means of photography. For dark colours object light colour power may be used and for light colour object dark colour powers may used.
- For multi colour object the Fluorescent powers such as Urel phosphate or Anthracene or Rhodamine may be used.
- 2. Latent print on fabrics, paper sheets, old documents can be developed by using liquid method by dipping or spraying method. (Silver nitrate solution)
- 3. Gas and fumes are certain agents which can be applied to developed latent prints on papers, documents, and walls.

Objects on which various chemical powers to be used to developing chance prints.

• Chemical powers:

- 1. Manganese –di-oxide
- 2. Gay powder, white power.
-
-
- 3. Anthracene power.
-
- 4. Copper power
- 5. Lead power

Objects:

- Light colour object
- Glass tumbler, silver cup, mirror, aluminium vessels, Brass items.
- Multi colour box, currency Notes, multi colour papers
- Plantain Leaf
- Human body

TYPES OF POWDERS

TYPES OF POWDERS

- Chemical Powders – **Black** (Lamp black, charcoal, graphite, manganese-di-oxide); **Grey** (Grey powder (mix of mercury and chalk) and lead carbonate); **Orange** (Red lead oxide); **White** (Titanium-di-oxide, mixed white, universal); **Red Brown** – Ferric Oxide. – On Smooth surfaces, mostly glass articles
- Metallic Powders – **Black** (Iron Powder); **Brown** (Copper powder); **Grey** (Aluminium powder); **Gold** (Pale gold lining powder); **White** (White lead powder) - On glass, metallic surfaces, highly varnished wooden surfaces, enamelled articles, leather, plastic bags, aluminium surfaces etc. It is not suitable for wet, very rough or dirty surfaces.

Development of chance print through powers.

Development of Chance Prints through Powder



Developed with black power

Developed with Black Powder



Developed with white power



DEVELOPING LATENT PRINT BY USING LIQUIDS.

- Silver Nitrate process: Silver Nitrate – React with sodium chloride
- A solution of 1%–10% silver nitrate in distilled water is applied to the paper by brushing or dipping, remove and blot, expose to sunlight – Print visualised in reddish brown colour.
- Permanent by dipping in hypo solution
- (mercuric nitrate – 3% + water) and
- then air dry.



DEVELOPING LIQUID METHOD

Osmic acid – React with oily matter

Surface moistened with osmic acid solution,
expose to sunlight – Print visualised in black colour.

Ninhydrin – React with amino acid

Ninhydrin solution sprayed or the article is dipped, heat it in the oven at 80 – 120°C for 1-3 minutes. Print visualised in pink colour within 30 minutes, sometimes between 24-48 hours



LIQUID METHOD

Physical Developer – Reacts with fatty acid and lipid - Fingerprints on wet surfaces, adhesive tapes, currency notes, emulsion side of the photographs etc.

Object bearing fingerprints is immersed in the physical developer solution and agitated by the shaker for about 15 minutes. Print visualised as dark grey or black colored.

1,8-Diazafluoren-9-one (DFO) – Reacts with amino acid – Fingerprints on porous surfaces like paper and wood, multicolored and glossy papers. Surface bearing latent fingerprint is immersed in DFO solution for 5 seconds, dried, re-immersed for 5 seconds and heated at 110° C for 10 minutes. Print visualised as pale pinkish-purple (visible) and is also luminescent.



Indanedione - Reacts with the amino acids - Degrade DNA.

Solution is sprayed on the paper or the paper is dipped, heated in an incubator at 100°C for 20. The fingerprints it produces are both visible – pink colour and also fluorescent



Small Particle Reagent method (SPR) - Suspension of fine molybdenum disulphide particle

in detergent solution – React with fatty acids – Acts best on wet surfaces.

The suspected article is dipped in the SPR solution or the reagent is sprayed, air dry and lift

from the surface. Sometimes with fluorescent dye – Print visualised in black colour (visible).



VAPOUR METHOD

- Iodine fuming
- Mercuric Iodide fuming
- Bromine vapour
- Osmic tetroxide vapour
- Ruthenium tetroxide vapour
- Hydrochloric acid vapour
- Cyanoacrylate fuming/superglue fuming.

Iodine Fuming – Reacts with fatty acid and residual water

- The suspected material is placed in an enclosed cabinet along with iodine crystals. Crystals are heated, the vapors fill the chamber and combine with constituents of the latent print making it visible – Brown colour. Prints fade once the fuming process is stopped. Fixed with a 1 percent solution of starch in water - applied by spraying. The prints turns blue and lasts for several weeks to months



Cyanoacrylate/Superglue Fuming - Prints on non porous surfaces such as metals, electrical tape, leather and plastic bags etc. React with chloride.

Fumes created when superglue placed on absorbent cotton treated with sodium hydroxide/ by heating the glue in a closed chamber for up to six hours. Print visualised in white colour.



VACCUM METAL DEPOSITION

- Vacuum metal deposition - On smooth non porous surfaces, plastic materials, polythene, leather, photographic negatives, photographic prints and glass – Reacts with fat.
- Gold is evaporated under vacuum which forms invisible layer on the surface. A second layer of Zinc deposited in the same manner. Gold coats print while zinc coats the region between in and around the ridges. Ridges appear transparent where as the furrows and the background are dark



PRINTS ON ARTICLE IMMERSSED IN WATER

- Article taken out and dried and then developed by grey powder or black powder. The oil matter in the sweat will not be washed when article is in water, thereby assisting in visualisation of the print.
- The latent prints on articles will be washed in running water and there is no possibility for development.

FINGERPRINTS ON OILY SURFACE

- Powder suspension
- Cyanoacrylate fuming
- Natural yellow – 3 (cur cumin)
- Sudan black – Porous, non-porous and semi porous surfaces – Print visualised in blue colour.
- Vacuum metal deposition.
- Oil red O – Porous surfaces

FINGERPRINTS ON SKIN

- Body is first fumed with Cyano-acrylate fumes and then dusted with Rhodamine coated magnetic powder – visualised under laser light.
- Fine lead powder dusted on the area, high power X-ray used to photograph the print.
- Surface dusted with iron powder and then lifted with bromide paper. Fixed with hypo solution.

BLOOD FINGERPRINT

- Visible print
- Enhanced by application of luminol – reacts with iron in haemoglobin.
- Application of amido black – Blue colour
- Application of Leucomalachite green + ether + Glacial acetic acid + Hydrogen peroxide – Green colour

APPLICATION OF LASER IN FINGERPRINTS

LASER stands for

**Light Amplification by Stimulated
Emission of Radiations.**

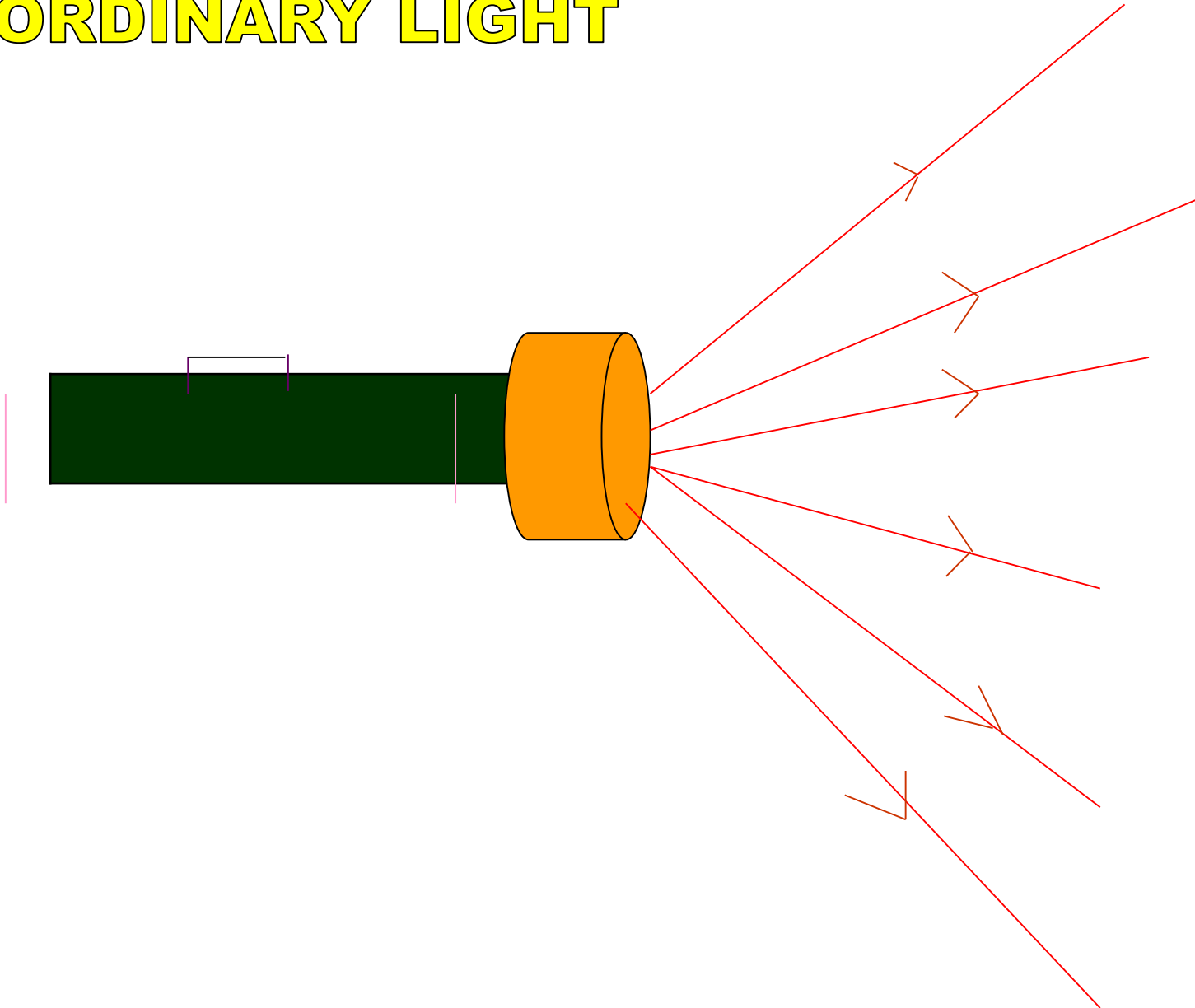
WHAT IS LASER

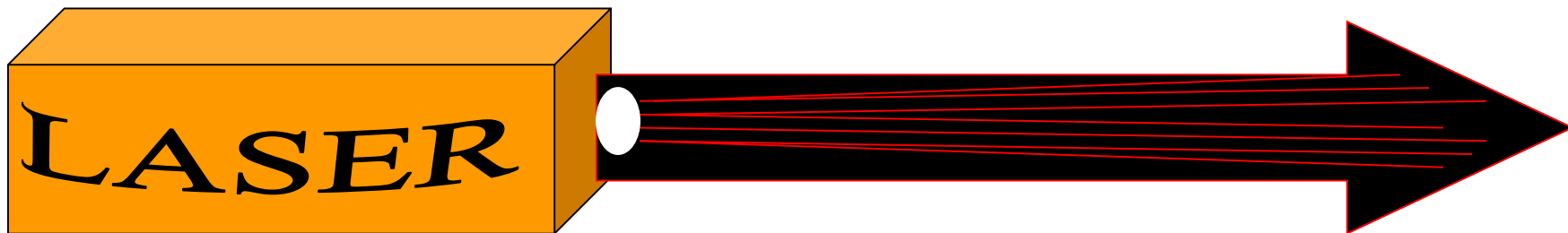
A LASER is a device that amplifies (strengthens) light. A laser produces a thin intense beam of light.

CHARACTERISTICS OF LASER

- 1. LASER light has four characteristics that distinguish it from the light produced by other sources e.g. an electric bulb, a fluorescent lamp or the sun.**
- 2. The LASER light is highly directional. In other words it travels only in one direction. In contrast the light from bulb , fluorescent bulb or sun travels in all directions. Laser light travels in a narrow beam, the sides of which stay almost parallel.**
- 3. LASER light is coherent. In other words light from laser consists of one frequency.**
- 4. LASER light is of single colour.**
- 5. LASER light is very bright.**

ORDINARY LIGHT







Application of LASER Technique for Development of Latent Prints

- **The application of LASER for the detection of latent finger prints, initiated in 1976, in U.S.A. has already become instrumental in a number of criminal investigations and can be anticipated to develop into highly valuable forensic tool.**
- **Indeed several law enforcement agencies now use LASER for latent finger print detection and others are in the process of acquiring for this purpose.**
- **The detection of latent impressions is by illumination, though of exhibits by Argon LASER light and observation through suitable filters. These prints, once observed via luminescence, are photographed, again through appropriate filters.**

Application of LASER Technique for Development of Latent Prints

- **The residue of the latent fingerprint will absorb LASER light and will fluoresce back so well that it can easily be seen and thus photographed or video recorded. Special filters, goggles are provided to allow this phenomenon to be witnessed.**
- **The optical properties of finger prints residue itself are the avenues for finger print detection. Fingerprint residue contain riboflavin and pyridoxine. When viewed under LASER light these fluoresce the exhibit is illuminated with a blue green light beam from a Argon Laser.**
- **The LASER beam is expanded with a lens to illuminate an area large enough to cover a whole fingerprint. Argon laser usually operates at blue green wave lengths. Once a fingerprint is located it is photographed.**
- **Inspection and photography are of course carried out in darkened room.**

Application of LASER Technique for Development of Latent Prints

- **LASER beam technology is used to develop latent fingerprints on surfaces which are not amenable to conventional methods. Finger prints deposited on variety of substances such as paper, plastic, glass, cloth, living skin, metal etc. can be detected with laser technology.**
- **Prints as old as 40 years are reported to have been successfully developed with the help of LASER beam (Trifa case). This technique is reported to be 500 times more effective and can develop chance prints on surface where conventional methods have failed.**
- **The LASER beam is reported to be useful for determining the age of the latent fingerprint also. Result suggest that the colour of fingerprints luminescence changes with fingerprint age which show that laser method is useful for the determination of age of fingerprint also.**
- **It is possible to develop latent finger prints without staining either the print or the exhibit with the help of laser technique.**

LIFTING METHOD

Lifting method should be used where the photography of chance print are not possible (curved surface beam etc). For lifting chance print, the following precautions are necessary.

1. Print should be developed with metallic powders.
2. Cello tapes should be covered over the print without twist and leaving no air bubbles.
3. Lifted prints should be pasted on a thick smooth paper, giving color contrast to the powder used.
4. While lifting and pasting the print, the cello tape should not be slipped.
5. It should be done in the presence of fitness.

AGE OF THE LATENT PRINT :

1. Nature of object touched
2. Physical condition of the person.
3. Condition of the surface
4. Amount of Pressure
5. Atmospheric condition

DEVELOPING LATENT PRINT ON SKIN

- Body is first fumed with Cyano-acrylate fumes. Dust the body with Rhoda mine coated magnetic powder. Examine with Laser light source. Then the latent print becomes visible which should be photographed immediately.
- Fine lead powder should be dusted on the suspected area of the skin and using high power xray, prints can be developed and photographed.
- Suspected portion of the skin is dusted with Iron powder and the prints are lifted with Bromide paper and fixed in Hypo solution.

FINGER PRINT PHOTOGRAPHY

- 1. Diapostive method (To get while ridges as black)**
- 2. Direct photograpghy of the ridges on the friction skin**
- 3. Ultra - Vilolet (Ray) Light photography**
- 4. Laser Printer finding**
- 5. Photgrapghy of latent print on mirror**
- 6. Transmitted light photography**
- 7. X -ray photography**
- 8. Oblique light photography**
- 9. Infra Red Photography**
- 10. Photographing thumb impressions on revenue stamp.**

DEVELOPED CHANCE PRINTS

- **The developed chance prints will be got photographed.....**
- **Where the photography is difficult, the chance prints will be lifted through lifting process.**
- **The positive photo copies of the chance prints will be compared with the inmates.**

DEVELOPED CHANCE PRINTS-Cont.

- **The remaining chance prints will be compared with the finger prints of the suspects supplied by the I.O.**

and

On the criminal database, maintained by the State Finger Print Bureau....

and then to neighboring state FPBs.....

Thumb impressions on the Documents

- **If any person disputes, that the thumb impression on a particular document is not affixed by him, then it is called a disputed thumb impression.**
- **The document which contains disputed thumb impression is called disputed document**

COMPARISON OF FINGER PRINTS

- **Disputed thumb impressions on the documents are compared with the admitted and specimen thumb impressions of the particular person.**
- **Chance prints developed at the scene of crime are compared with the finger prints of suspected persons and finger prints of the criminals available on records at Finger Print Bureau.**

FOUR FACTORS OF COMPARISON

- 1. General likeness of the pattern
(i.e. type of pattern)**
- 2. Quality of the finger print.
(whether it is clear for comparison)**
- 3. Quantity of the finger print
(whether it is revealing sufficient number of ridge characteristics)**
- 4. Location of the ridge characteristics**

DOCUMENTS INVOLVED FOR EXAMINATION **OF DISPUTED FINGERPRINTS**

- **Sale Deeds**
- **Agreements**
- **Wills**
- **Withdrawal forms**
- **New Account opening forms**
- **Deposit forms**
- **Specimen signature cards**
- **Power of Attorney**
- **Postal savings forms**
- **Business documents**
- **Service Registers of employees, etc**

COMPARISON OF LOOP WITH LOOP



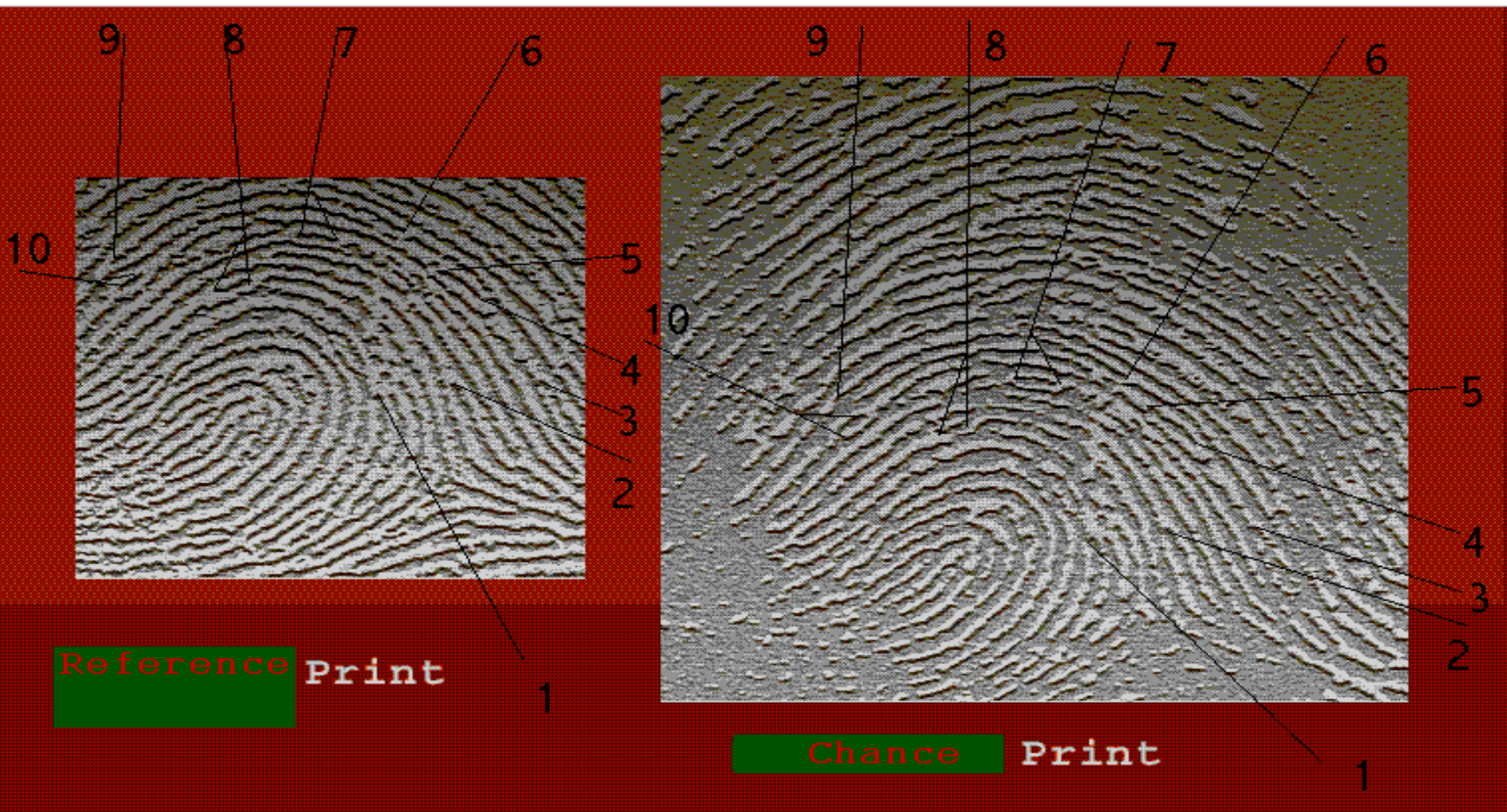
COMPARISON OF LOOP WITH ARCH



COMPARISON OF LOOP WITH WHORL



IDENTICAL WITH THE SAME FINGER OF THE SAME PERSON





crossover

core

bifurcation

ridge ending

island

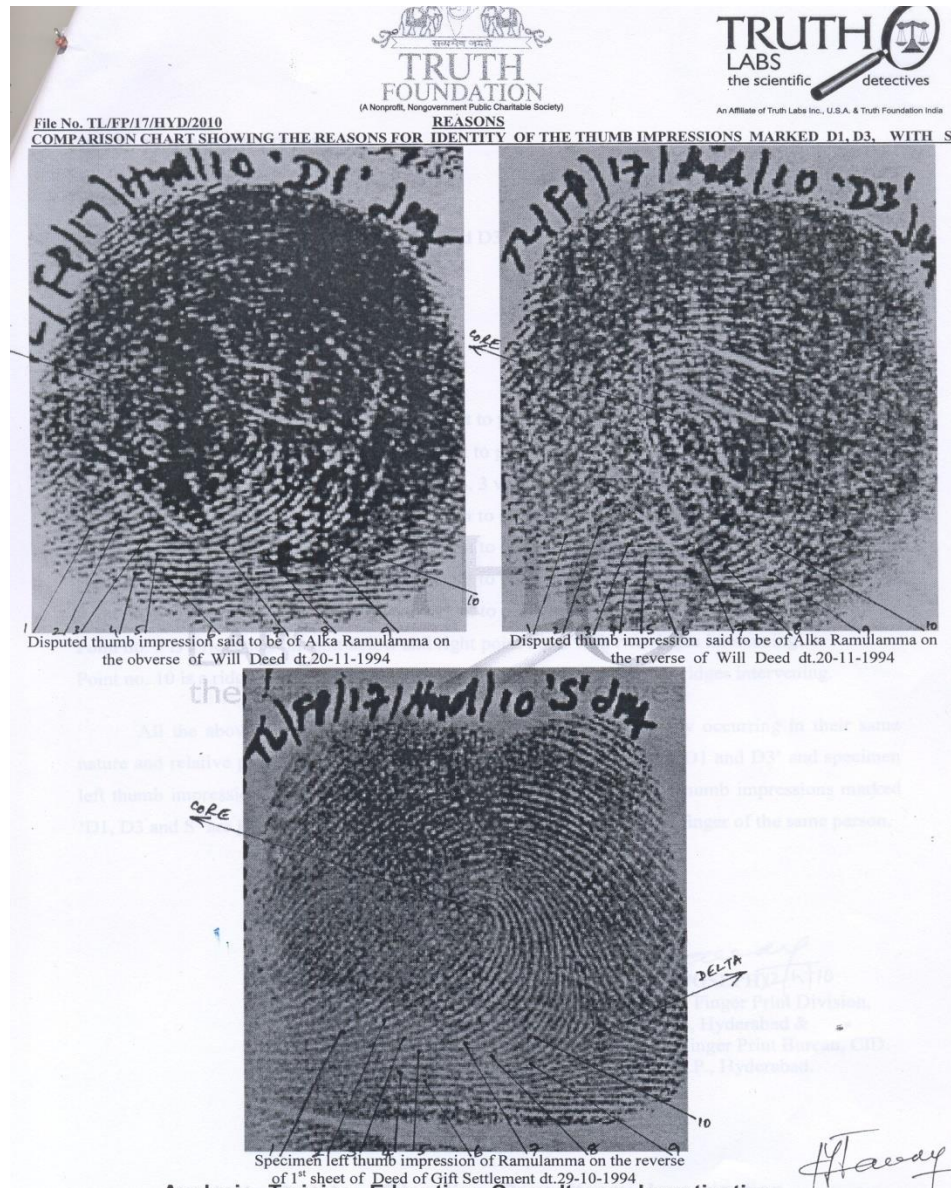
delta

pore

Some of the cases examined at Truth Labs

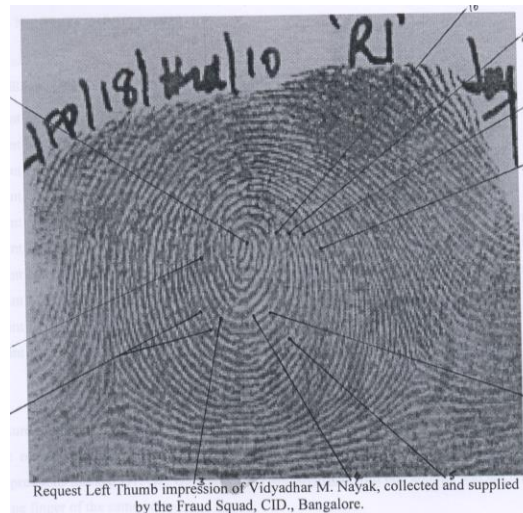
CASE DETAILS

Partial prints can also be examined if they reveal sufficient clear data

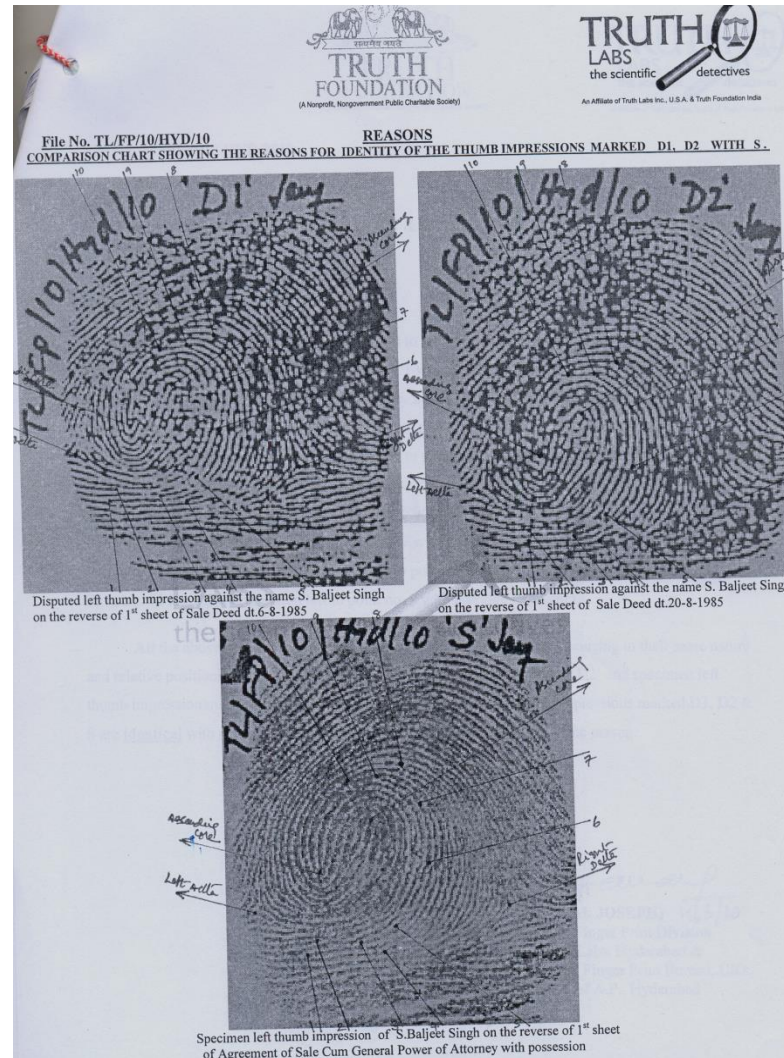


Case of impersonation.

An amount of 40 Crore were involved in this case.



Xerox copies can also be examined if they reveal sufficient data



Some mischief's

(the ridge structure was disturbed by rubbing on the print)

**TRUTH FOUNDATION**
(A Nonprofit, Nongovernment Public Charitable Society)

**TRUTH LABS**
the scientific detectives
An Affiliate of Truth Labs Inc., U.S.A. & Truth Foundation India

File No. TL/FP/014/HYD/2010

REASONS

COMPARISON CHART SHOWING REASONS FOR IDENTITY OF THE THUMB IMPRESSIONS MARKED D AND S.

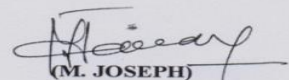


Disputed Thumb impression against the name Kallam Rukminamma on the Promissory Note dt.24-6-06.



Admitted left thumb impression of Kallam Rukminamma on the reverse of 1st sheet of Registered Partition Deed dt.30-12-2004

Pattern: The disputed thumb impression marked D and the Admitted left thumb Impression marked S are Whorl Patterns


(M. JOSEPH)

Mischief - Disputed finger print completely disturbed by rubbing on the print



File No. TL/FP/18/HYD/2010

REASONS

COMPARISON CHART SHOWING THE REASONS FOR IDENTITY OF THE THUMB IMPRESSIONS MARKED Q1, WITH S1



Disputed thumb impression against the name Koppisetty Narayudu on the Promissory Note dt.9-9-2004

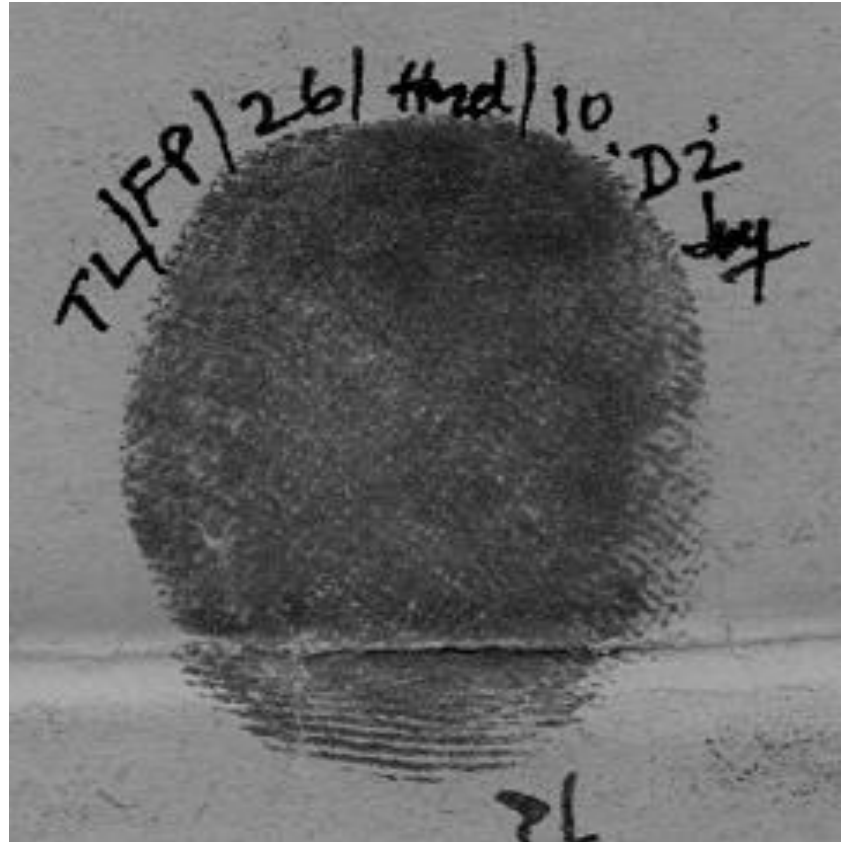


Specimen left thumb impression of K.Narayudu obtained on a plain sheet of white paper in open court on 22-3-10

Pattern: The disputed thumb impression marked Q1 and the specimen left thumb impression marked S1 are Loop Patterns

(Signature)
(M. JOSEPH)

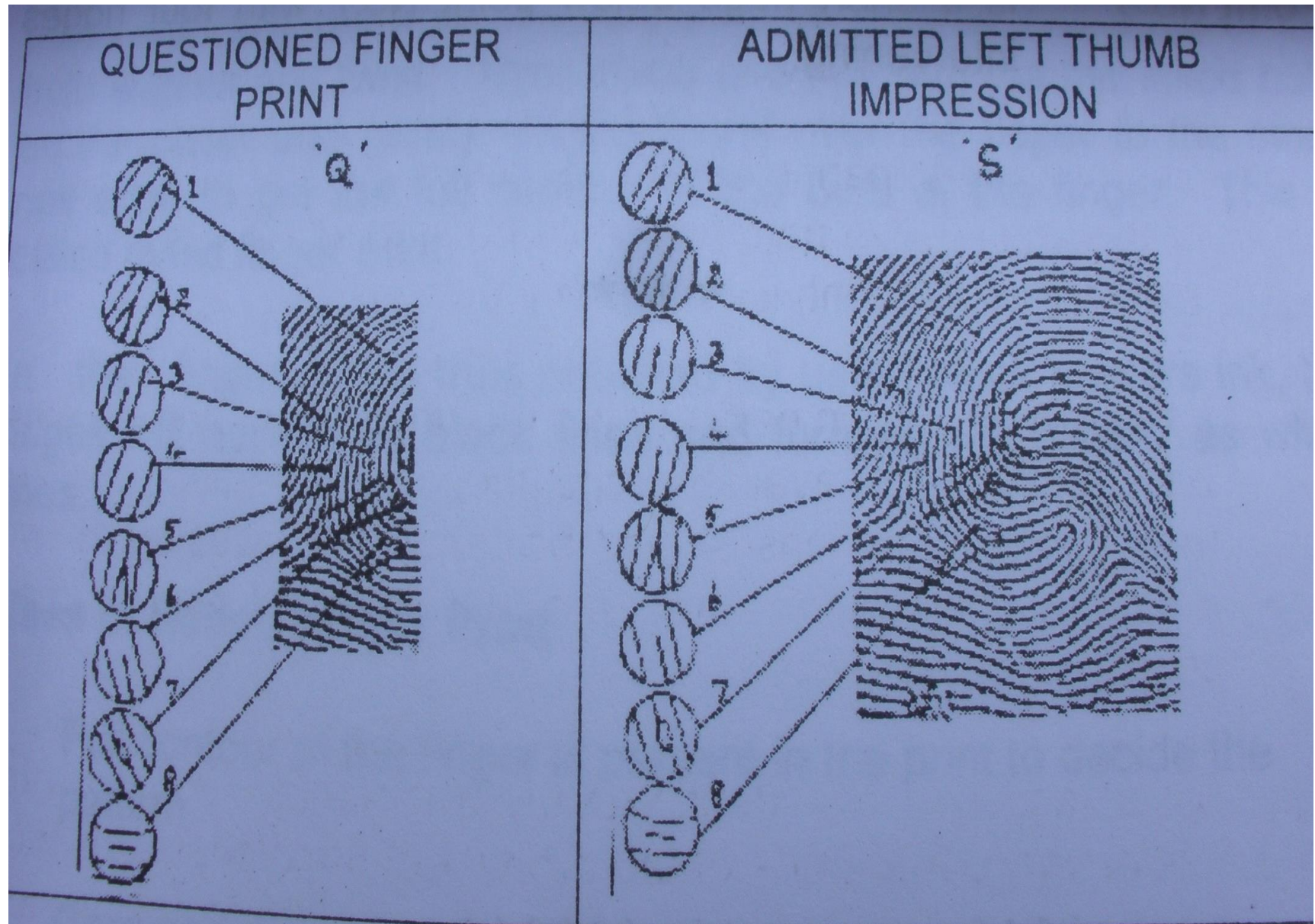
Mischief — Both the disputed prints are completely disturbed. (no opinion furnished)



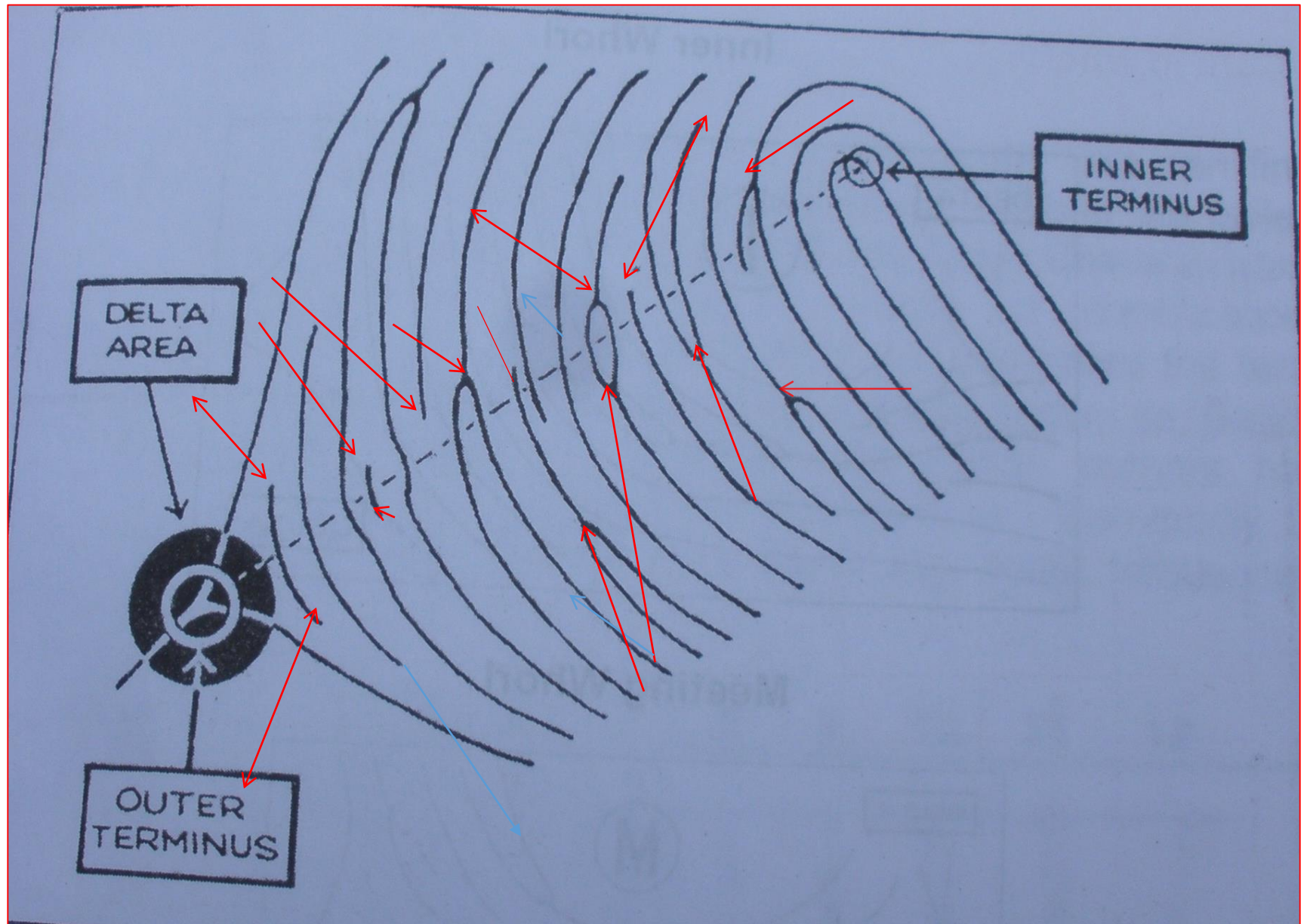
OPINION OF FINGER PRINT EXPERT

- The opinion of the Finger Print Expert is the same any where in the world
- If it is identical..... identical any where
in the world...
- If it is not-identical ... not-identical any
where in the world..
- If it is not comparable.. Opinion will be
Unfit for comparison

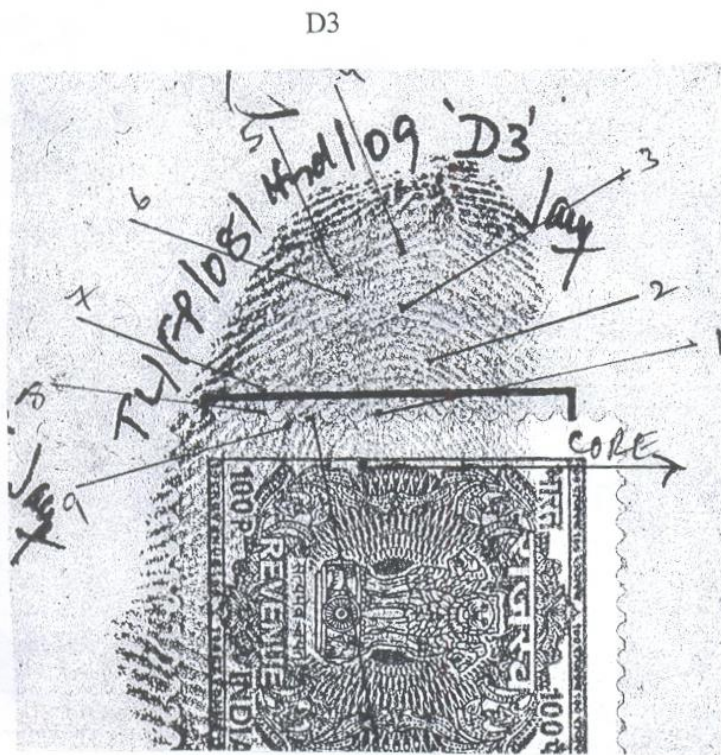
Points of identity



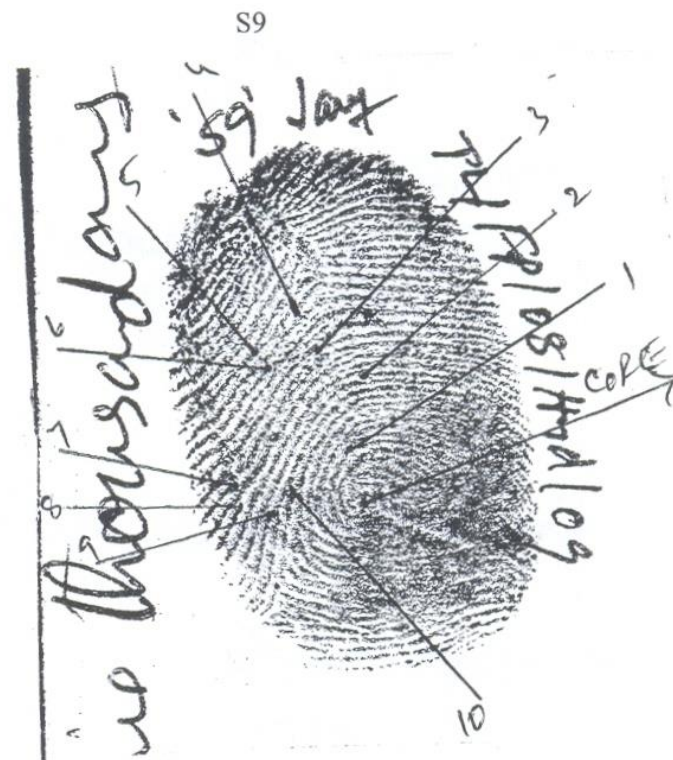
RELATIVE POSITIONS OF CHARACTERS



- ANY PORTION OF IMPRESSION WITH REQUIRED POINTS WOULD BE ENOUGH TO PROVE IDENTITY BY COMPARISON



Disputed thumb impression against the name Muthyala Ushenaiah on the receipt dt 26-05-05.



Specimen thumb impression of Hshenaiah on the obverse of form of Bank Right to cancel limits

Pattern: The disputed thumb impression marked D3 and specimen thumb impression marked S9 are of whorl patterns.

D1

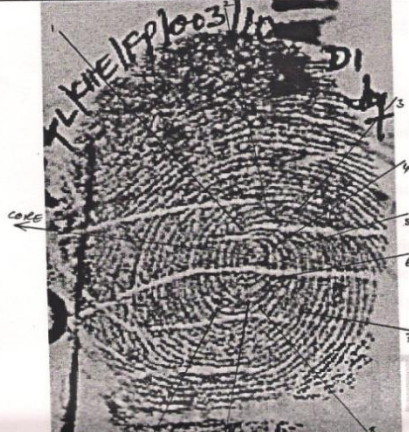


D2

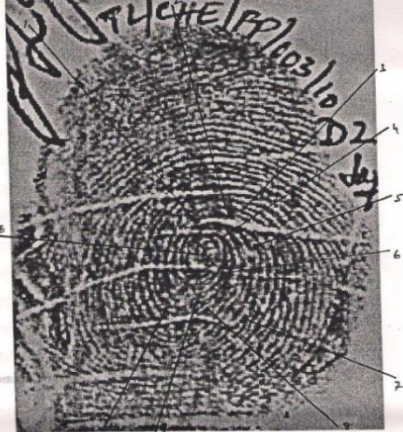


File No. TL/CHE/FP/003/2010

COMPARISON CHART SHOWING THE REASONS FOR IDENTITY OF THE THUMB IMPRESSIONS MARKED D1, D2, WITH S.

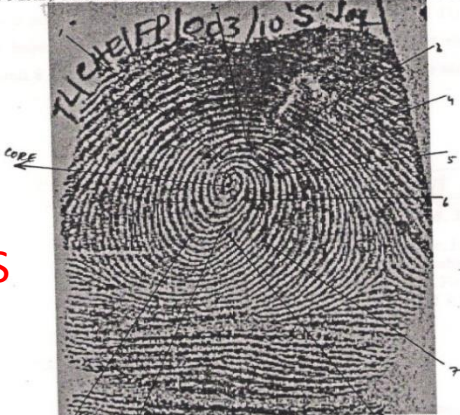


Disputed left thumb impression said to be of P. Loganathan on the reverse of Regd. Settlement Deed dt. 10-5-2002, Doc. No. 1343/2002



Disputed left thumb impression said to be of P. Loganathan on the reverse of Regd. Settlement Deed dt. 10-5-2002, Doc. No. 1344/2002

S



Specimen left thumb impression of P. Loganathan, photo copied from the Register of Sub-Registrar's office, Vandavasi.

M. JOSEPH

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Branches: Delhi - +91- 9711779779 Chennai - +91- 9568011665 Bangalore - +91- 9449030933

INDIA'S FIRST INDEPENDENT PEOPLES' FORENSIC SCIENCE LAB ISO 9001 CERTIFIED

The disputed thumb impressions on the settlement deed were found to be **IDENTICAL** with the standard impression collected from the Sub-registrar's office.

L. 1. 204 (1)

- Bombay ● Bangalore ● New Delhi ● Madras ● Calcutta
- Secunderabad ● Kochi ● Coimbatore ● Madurai
- Visakhapatnam ● Baroda ● Mysore ● Jamshepur
- Pune ● Pondicherry ● Lucknow

fp/001110
Q, 25/6100

1.1.204

8, 25/5/10
29/10/10

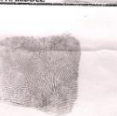
- Bombay ● Bangalore ● New Delhi ● Madras ● Calcutta
- Secunderabad ● Kochi ● Coimbatore ● Madurai
- Visakhapatnam ● Baroda ● Mysore ● Jamshedpur
- Pune ● Pondicherry ● Lucknow

CVF

SOME OF THE EMPLOYEES OF EBAY PAYPAL INDIA PVT LTD COMPANY'S, FINGER AND PALM PRINTS WERE COLLECTED FOR COMPARISON

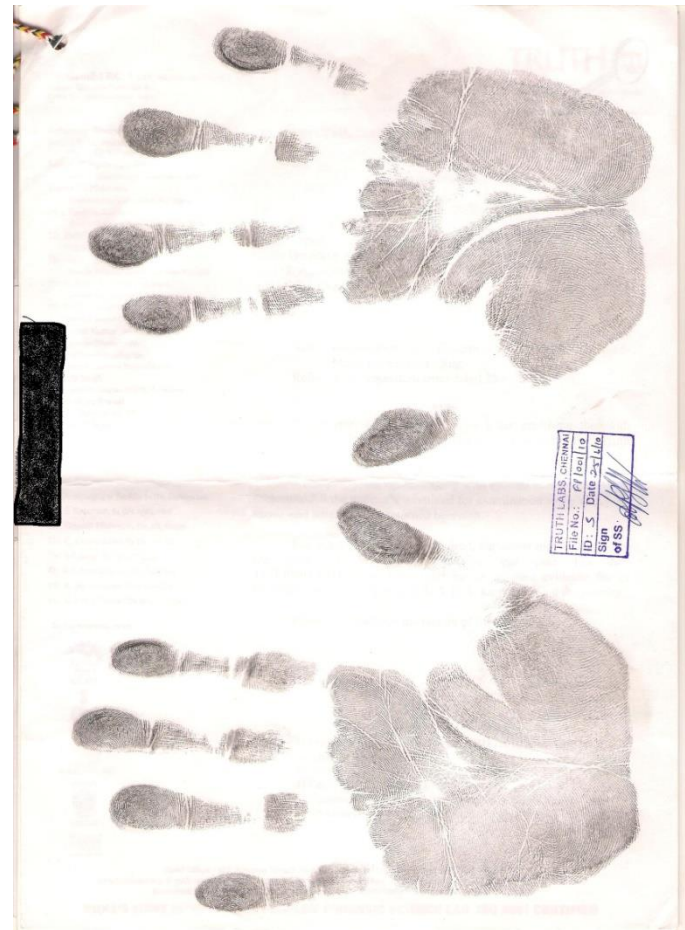
GLOBE DETECTIVE AGENCY (P) LTD.
Zonal Office : Agurchand Mansion, 152, Anna Salai, Chennai – 600 002.
Tel (+91 44) 42919500 – 599, Fax (+91 44) 42919555
E-mail : chennai@globedetecive.com / chennalsecurity@globedetecive.com
Website : www.globedetecive.com

NAME OF THE PERSON FINGER PRINTED : [REDACTED] Date of Birth : [REDACTED] Age : *32 yrs.*
Sex : *Male*
ADDRESS OF PERSON FINGER PRINTED : *'S'*
Phone No. / Mobile No. : [REDACTED]

				
1. R. THUMB	2. R. INDEX	3. R. MIDDLE	4. R. RING	5. R. LITTLE
				
6. L. THUMB	7. L. INDEX	8. L. MIDDLE	9. L. RING	10. L. LITTLE
				
LEFT FOUR FINGERS TAKEN SIMULTANEOUSLY		L. THUMB	L. RING	RIGHT FOUR FINGERS TAKEN SIMULTANEOUSLY

SIGNATURE OF OFFICIAL TAKING FINGERPRINTS : [REDACTED]

TRUTH LABS, CHENNAI
File No. *FP/oc/10*
ID : *S* Date *24/1/10*
Sign of SS : *[Signature]*

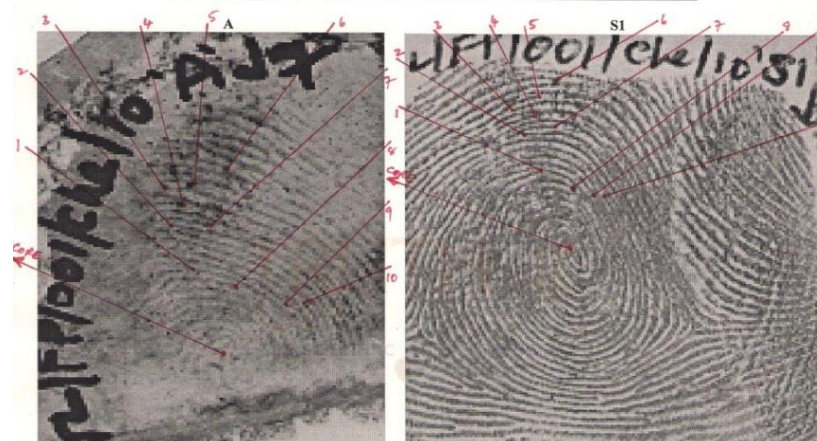


One of the suspects fingerprints **matched** with the chance prints developed and lifted from the crime scene.

File No.TL/FP/001/CHE//10

REASONS

COMPARISON CHART SHOWING THE REASONS FOR IDENTITY OF THE CHANCE PRINT MARKED 'A' WITH THE SPECIMEN RIGHT INDEX FINGER IMPRESSION MARKED 'SI'



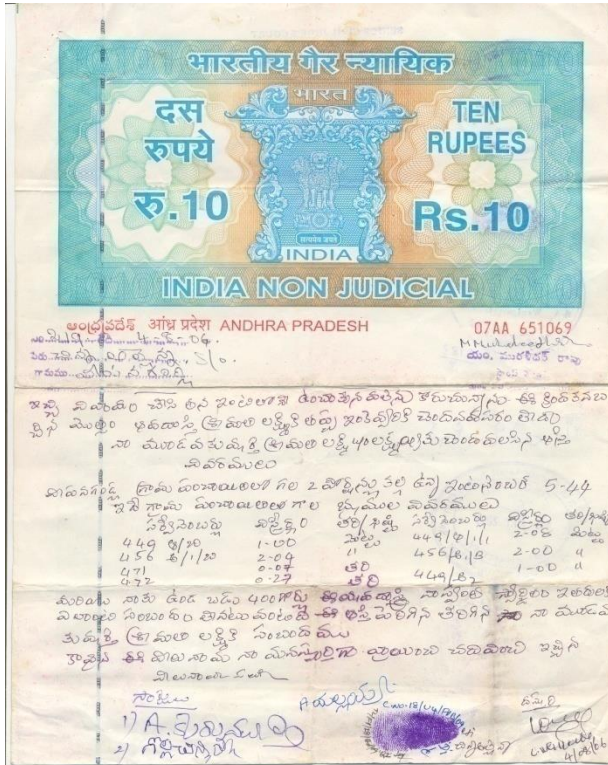
Lifted chance print on the card no. I.1.204 (1)

Specimen right index finger impression on the F.P.Slip marked S of Rahul Kaul.

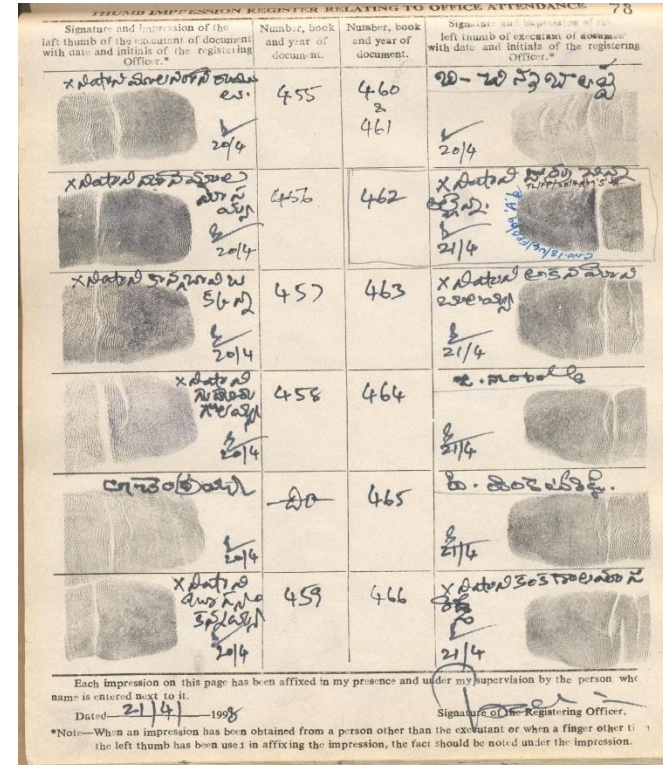
Pattern: Chance print marked A and specimen right ^{index} finger impression marked SI are whorl patterns.

M. Joseph
(M. JOSEPH)

IDENTIFICATION OF DISPUTED FINGERPRINT WITH ADMITTED FINGERPRINT



IN THE ABOVE WILL THERE IS A DISPUTED THUMB IMPRESSION



A SPECIMEN THUMB IMPRESSION FROM THE REGISTRAR'S OFFICE, KOLHAPUR, MAHABUBNAGAR DIST., WAS MADE AVAILABLE TO ASCERTAIN THE IDENTITY OF THE PERSON

TWO IMPRESSIONS TO BE IDENTICAL

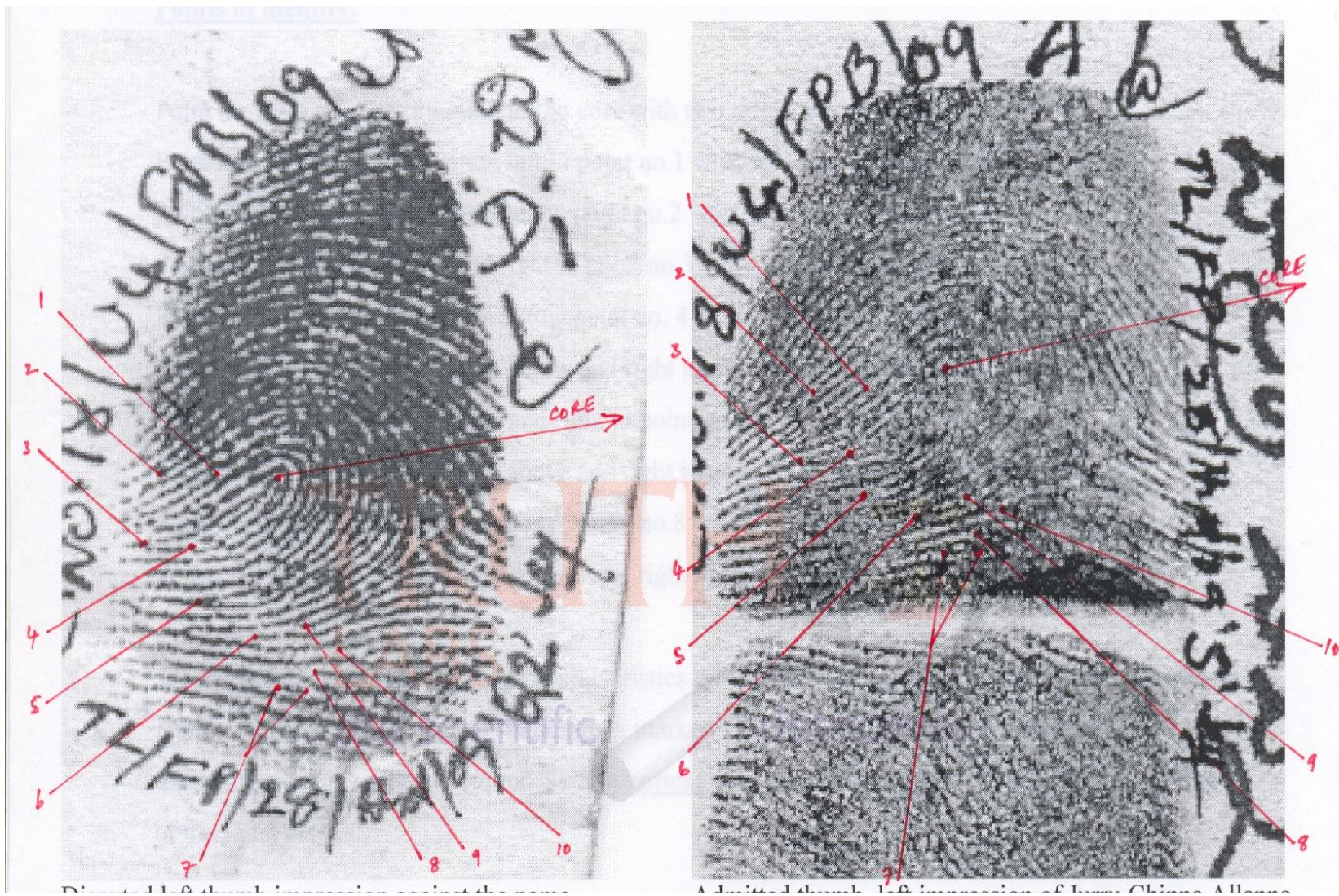
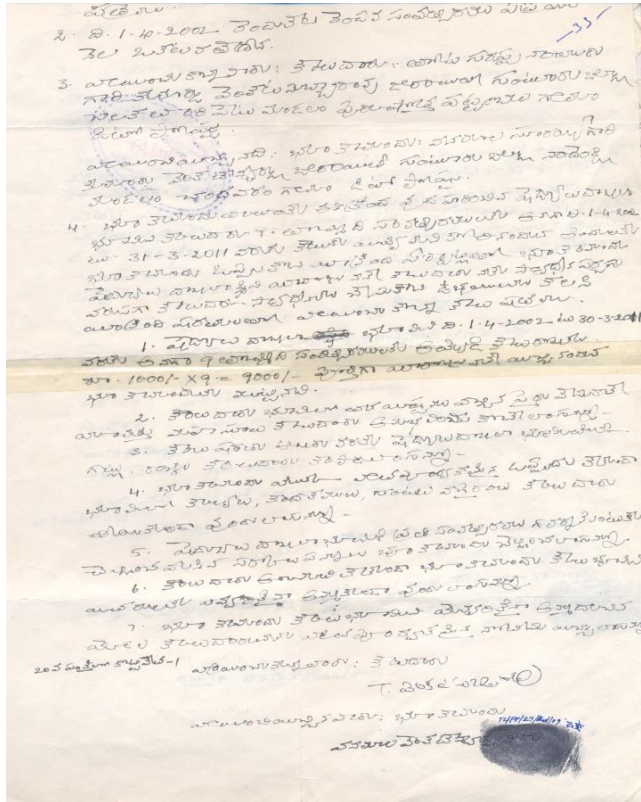


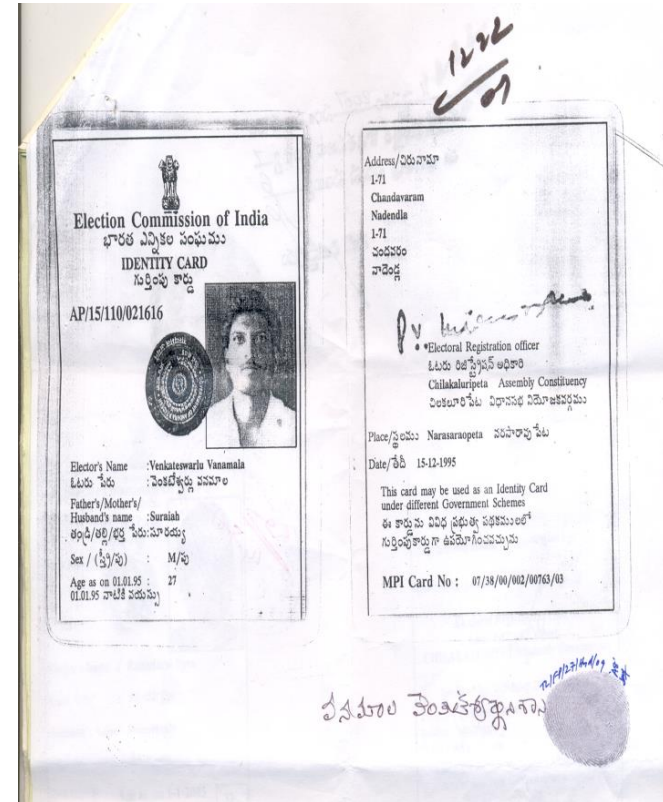
Figure 11.8 thumb impression against the name

A admitted thumb left impression of Larry Chino Allene

IDENTIFICATION OF DISPUTED FINGERPRINT WITH ADMITTED FINGERPRINT



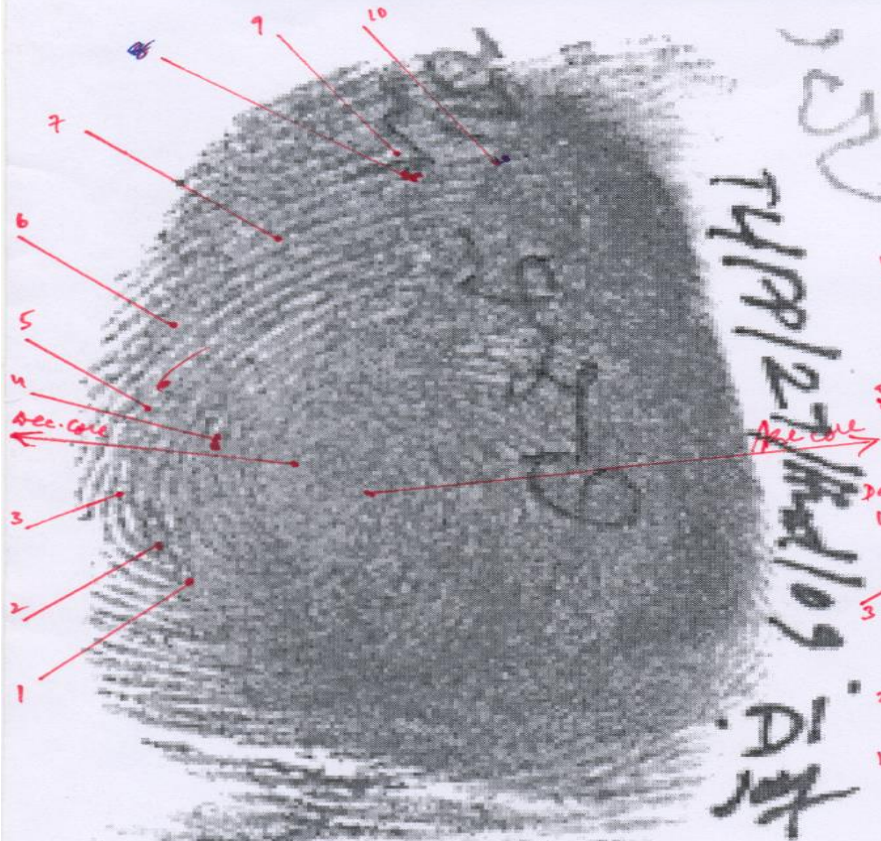
IN THE ABOVE WILL THERE IS
A DISPUTED THUMB
IMPRESSION



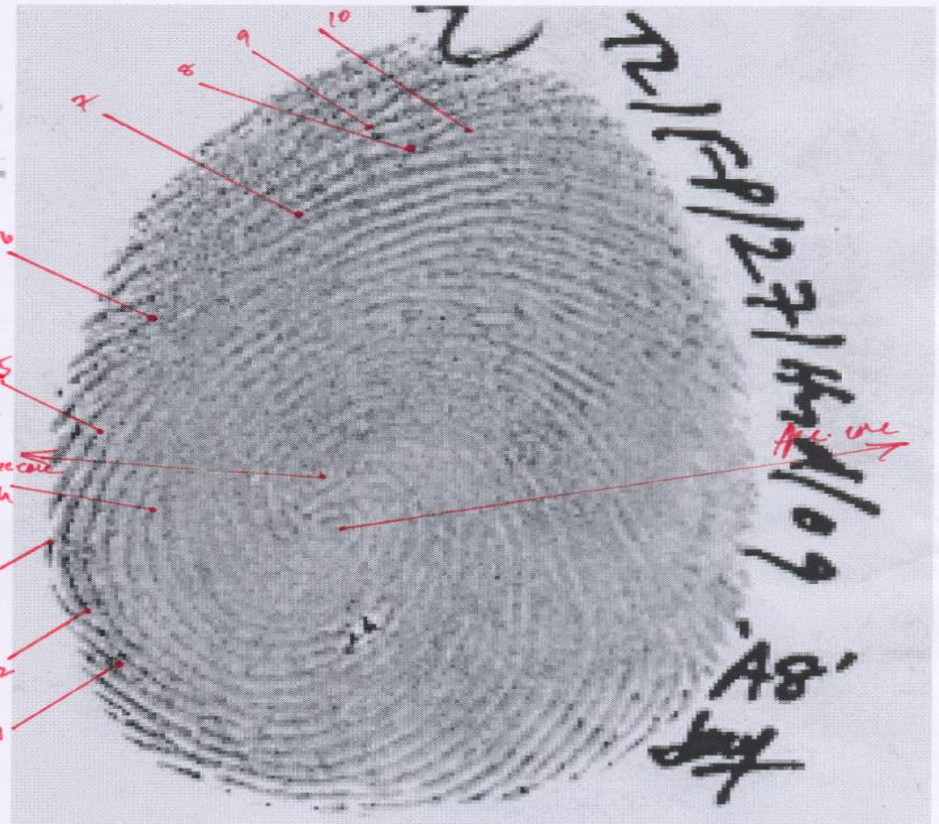
A SPECIMEN THUMB IMPRESSION
FROM THE XEROX COPY OF ELECTION
COMMISSION OF INDIA'S IDENTITY
CARD TO ASCERTAIN THE IDENTITY OF
THE PERSON

REASONS

COMPARISON CHART SHOWING THE REASONS FOR IDENTITY OF THE THUMB IMPRESSION MARKED D1 WITH A8



Thumb impression against the name Vanamala Venkateswarlu on the 1st sheet of Lease Agreement



Thumb impression on the Xerox copy of Election Commission of India-Identity Card of Vanamala Venkateswarlu

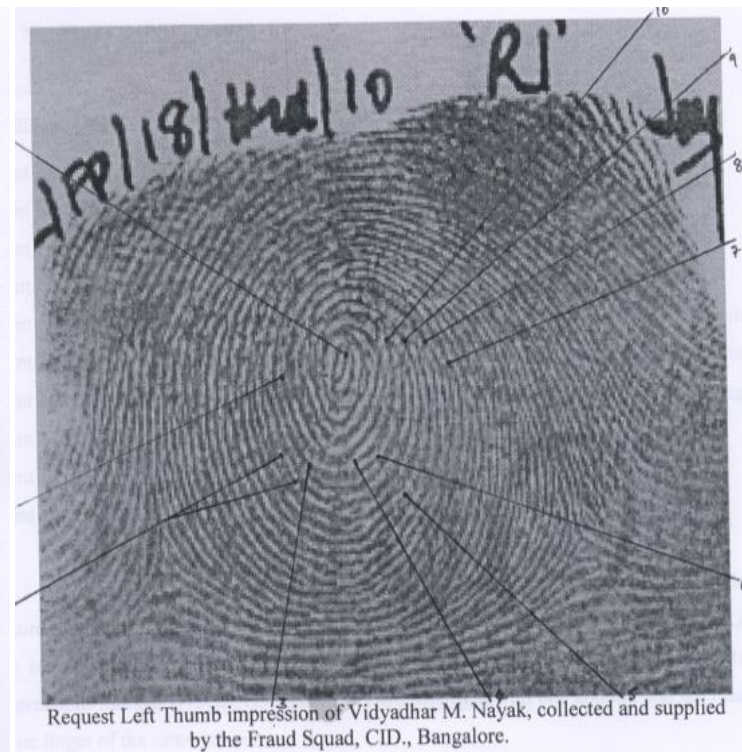
Pattern: The thumb impressions marked D1 and A8 are Twin Loop patterns.

Case of impersonation - AN AMOUNT OF 40CRORES WERE INVOLVED IN THIS CASE.

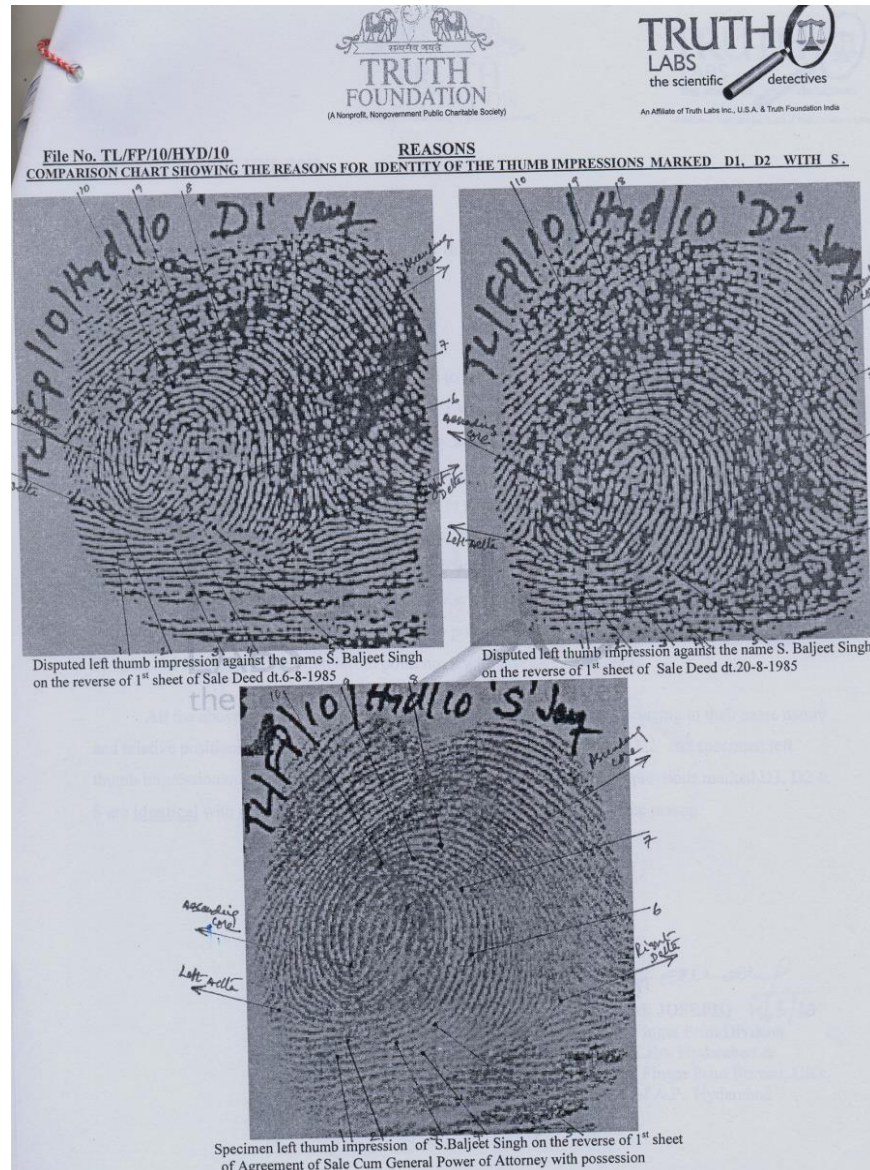
Disputed thumb impressions



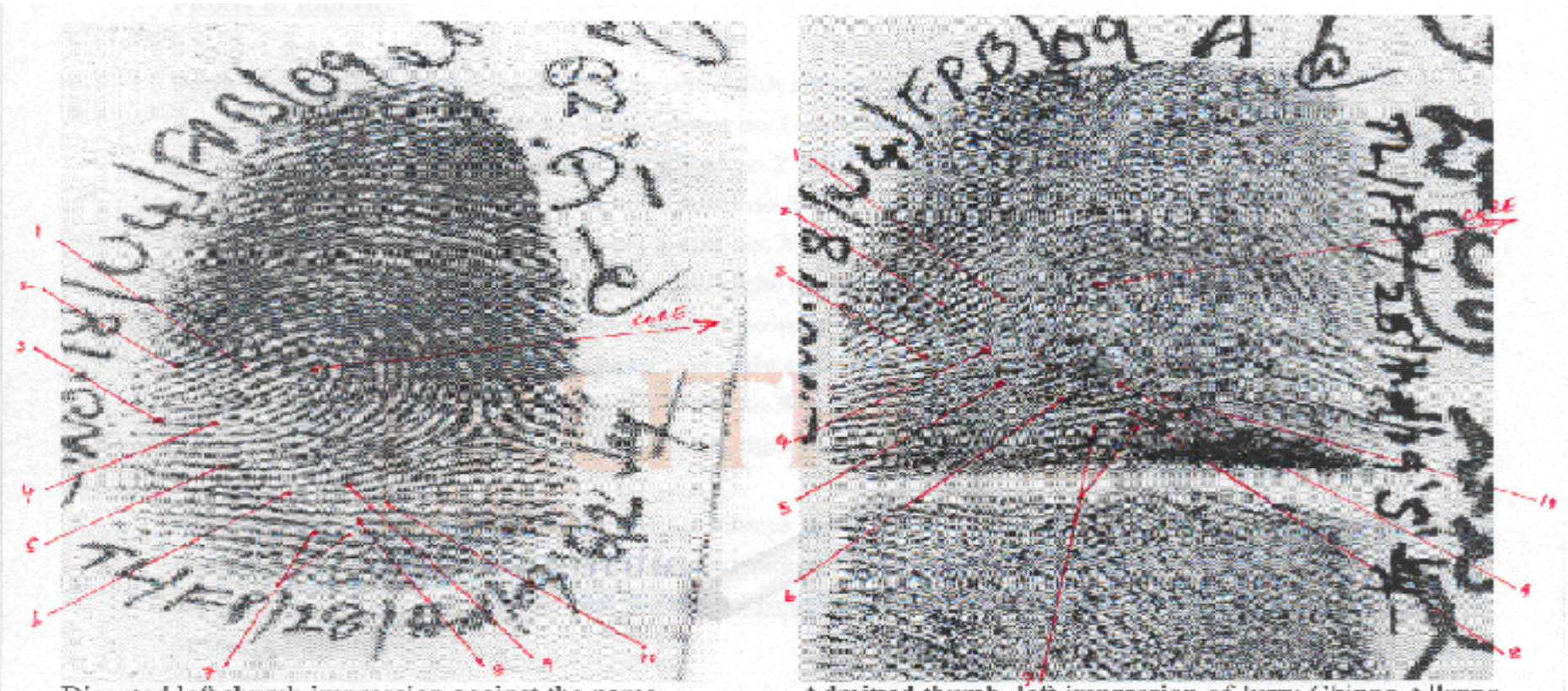
Admitted thumb impression



XEROX COPIES CAN ALSO BE EXAMINED IF THEY REVEAL SUFFICIENT DATA

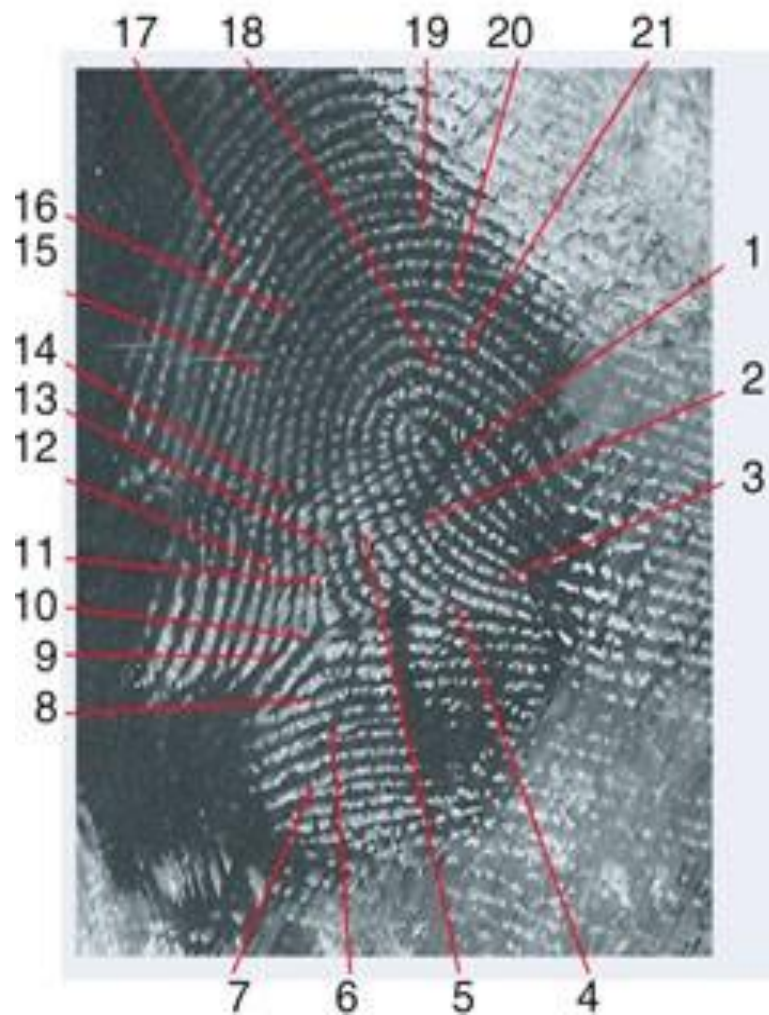


Truth Labs solved a number of cases found **not possible/feasible** for examination/identification/comparison/evaluation by Central and State Govt. Forensic Institutions thereby facilitating the delivery of justice



FINGER PRINT COMPARISON

Latent



Comparison print



USES OF FINGER PRINTS IN VARIOUS DEPARTMENT

In the modern world finger prints are not only used in the detection and apprehension of criminals but it is daily used in many ways:

- **1.In Banks and Postal Savings Accounts.**
- **2.In connection with the issuance of Passports.**
- **3.In education field to prevent fraudulent transfer of degrees and Diplomas .**
- **4.In hospitals to prevent exchange of new born babies.**
- **5.Controlling servant theft in the house and private offices and Industries by using finger Prints.**
- **6.Issuing pension.**

USES OF FINGER PRINTS IN VARIOUS DEPARTMENT

7. In false property transactions.

8. Issuing Licenses.

9. Cyber theft in Computer.

10. Safeguarding most important places and vital defense installations by using finger print.

11. Air port, To avoid entry of Plane hijacker, terrorists, International criminals, and most wanted criminals known to the SBCID in the police department. Their Finger Print should be kept in the computer records. Before entry in to the Air port their Finger Print should scanned and verify with the previous records.

LAW REGARDING FINGER PRINT

Under section 3 of identification of Prisoners act 1920, the station house officer and the investigation officer are empowered to take the finger prints of every person who has been convicted of any offense punishable with regress imprisonment for 1 year.

Under Section 4 of identification of Prisoners act 1920, the station house officer and the investigation officer are empowered to take the finger prints often on convicted person who have been arrested in connection with an offense punishable with RI for a term of 1 year or more.

A 1st class magistrate can direct to give the FP's of any person arrested in or for the purpose of any investigations proceedings under CRPC under section 5 of identification prisoners act 1920.

LAW REGARDING FINGER PRINT

Under section 8 of identification prisoners act 1920, GO (Ms) No .1668 Home (prison 1)

The Finger expert or a police officer of the rank of police constable or above empowered to take finger print.

The evidence of finger print expert is admissible in trial before court of law U/S 45 & U/S 73 of Indian evidence act.

While giving evidence in the court, an expert man refresh his memory by refreshes to professional treaties U/S 159 of Indian evidence act.

U/S 60 of Indian Evidence act, if oral evidence refers to an opinion or to the grounds on which that opinion is held, it must be the evidence of the persons who holds that opinion on those grounds (i.e: expert need not present in the court)

CONSTITUTIONAL RIGHTS REGARDING TAKING FINGER PRINTS.

- **A question may arise whether taking of finger print of the accused and using them as evidence against him is violation of article 20(3) of the Constitution of India. Regarding this many judgements, views are expressed in various courts.**
- **It was held by the Madras High court AIR 1956 Madras:632, Madhya Pradesh High Court in AIR 1957 MP: 73 as well as Allahabad High Court AIR 1958 AU 119. These three are in similar view ie : Asking the accused to give his thumb impression would amount to asking him to furnish to furnish evidence against him which is prohibited under Art 20(3).**

CONSTITUTIONAL RIGHTS REGARDING TAKING FINGER PRINTS.

The Madras High court held that the thumb impression of the accused during the course of investigation which was later produced, at the trial, did not violate Art.20 (3).

The Allahabad High court held in AIR 1961.456 that where in pursuance of an order directing him to furnish his finger prints Voluntarily, with out protest, the provision of Art.20 (3) would not be violated.

CONSTITUTIONAL RIGHTS REGARDING TAKING FINGER PRINTS.

The Kolkata High Court also held similar view both in AIR. 1960 Cal.32 and AIR 1960 Cal.318.

Kerala High Court however banned the use of finger prints obtained during the course of investigation AIR196 Ker 29 as also Ker 1960 392

In view of the conflicting decisions of various courts , it was felt that this question should be settled once for all by the Highest judiciary of the Union. To the relief for all, this particular point was unequivocally decided by the full bench of Supreme Court cases of State of Bombay VS Kathi Kalu-Oghad (AIR 1961 Sc1808) Cr.L.1961 (2) 856.Their Lordship decided beyond controversy that the direction by the Magistrate to accused person to give thumb impressions, Finger print to be used for comparison with some other thumb impressions, finger prints , which the police may require in the course of investigation, will not amount to compelling the accused persons to be witness against themselves .

CONSTITUTIONAL RIGHTS REGARDING TAKING FINGER PRINTS.

Their Lordships made the following observations.

The taking of impressions of an accused person very often become necessary to help the investigation of crime and it must be assumed that constitution makers were aware of existing Law for example section 73 of Indian evidence act or section 5 and 6 of identification of Prisoners Act(XXXIII of 1920.

The statement of accused whether oral or written can be said to be a personal testimony may be produced or refused. But the finger prints are not testimony because are unchangeable. They are neither oral or documentary evidence nut belongs to the third category of material evidence which is outside the limit of testimony.

CONSTITUTIONAL RIGHTS REGARDING TAKING FINGER PRINTS.

The Supreme court thus set at rest the controversy of taking finger prints and strengthened the hands of the Law enforcing officers to carry on the duties in the most efficient and effective way to assist court to arrive at the conclusion of the innocence or the guilt the accused.

Conclusion:

The science of finger printing is century old discovery. One of the basic importance of finger prints is that helps in establishing identity of a person with minimum time and efforts; and then enabling speedy investigation. The finger print evidence has been referred to as reliable piece of evidence. They are also permanent and do not under go any change. It is necessary for the courts to form an opinion only after discussion or after concerning with the Expert. These opinions made by experts help the court in drawing the final conclusion regarding the facts. Over the years finger prints has played a crucial role in identifying the accused and awarding them punishments.

LANDMARK COURT RULINGS
ON
FINGER PRINTS

DIVERSE ASPECTS

- ✓ **Evidential value of finger prints.**
- ✓ **Convictions on the basis of uncorroborated testimony.**
- ✓ **Validity of opinion on 8 points of identity.**
- ✓ **Finger printing of accused vis-à-vis constitutional provisions.**

EVIDENTIAL VALUE

Orissa High Court Ruling Of 1957 :

[Bhaluka Behra & Others Vs. State AIR 1957 Orissa 172]

“The science of comparison of finger prints has developed to a stage of exactitude. But the main thing to be scrutinized is whether the expert’s examination is thorough, complete and scientific.”

Supreme Court Ruling Of 1972 : [AIR 1972 SC 975]

“The comparison and identification of finger prints has developed into a science and the results derived there from has reached a stage of exactitude. As long as the report shows that the opinion was based on observations which led to a conclusion , such opinion can be accepted.”

“Unless there is a doubt as to the correctness of the opinion, the report of the examiner may be accepted without examination of the expert.”

EVIDENTIAL VALUE

MP High Court Ruling Of 1978 : [Cr.L.J. 1978 MP 1220]

“If photographic enlargements are kept side by side and their markings compared, it becomes much easier to follow the reasoning of the expert about the points of similarities and thus the correctness of his conclusion.”

Supreme Court Ruling of 1979 :

[Jaspal Singh Vs. State of Punjab AIR 1979 SC 1708]

“The science of finger print identification is an exact science and does not admit of any mistake or doubt.”

Supreme Court Ruling Of 1980 :

[Murarilal Vs. State of MP AIR 1980 SC 531]

“The science of identification of finger prints has attained near perfection and the risk of an incorrect opinion is practically non-existent.”

UNCORROBORATED TESTIMONY

- **Calcutta High Court Ruling Of 1931 :**
- **[Harendranath Sen Vs. Emperor AIR 1931 Cal.441]**
- **“ It cannot be laid down as a rule of law that it is unsafe to base a conviction on the uncorroborated testimony of a finger print expert. The true rule seems to be one of caution.”**

Bombay High Court Ruling Of 1936:

[Fakir Mohd. Ramzan Vs. Emperor AIR 1936 Bombay 151]

“ It is in my opinion , going too far to say that the court must insist upon corroboration of the evidence of a finger print expert.”

UNCORROBORATED TESTIMONY

Orissa High Court Ruling Of 1957 :

[Bhaluka Behra & Others Vs. State AIR 1957 Orissa 172]

“ The court cannot refuse to convict a person on the evidence of a finger print expert, merely on the ground that it is unsafe to base a conviction upon such evidence.”

VALIDITY OF OPINION ON 8 POINTS OF IDENTITY

Supreme Court Ruling Of 1978: [Mohanlal Vs. Ajit Singh AIR July 1978 SC 1183]

The Hon'ble Supreme Court ruled that an opinion based on 8 identical ridge characteristics was fully justified and conformed to the views expressed in scientific books on the subject.

“Nothing substantial has been urged to challenge the opinion of the Director of the FP Bureau and all that has been argued is that as there were only 8 points of similarity , there was not enough basis for the expert's opinion about the identity of finger prints .

Reference in this has been made to B.L.Saxena's 'Identification of handwriting , disputed documents , finger prints , foot prints and detection of forgeries' 1968 edition page 247, Walter R. Scott's 'Finger print mechanics' page 62 and M.K.Mehta's 'The identification of thumb impression and the cross examination of finger print experts' second edition page 28.

VALIDITY OF OPINION ON 8 POINTS OF IDENTITY

We have gone through these books but they do not really support the argument of the learned counsel for the respondent. While referring to the old practice of looking for a minimum of 12 identical characteristic details , Saxena has admitted that the modern view is that 6 points of similarity are sufficient to establish the identity of finger prints.

Walter Scott has stated that as a matter of practice most experts who work with finger prints constantly satisfy themselves as to the identity with 8 or even 6 points.”

FINGER PRINTING OF ACCUSED & CONSTITUTIONAL PROVISIONS

Supreme Court Ruling Of 1961 : [State of Bombay Vs. Kathikalu Oghad AIR 1961 SC 1808]

A thumb impression of an accused taken by the police in course of investigation which was later on produced at the trial did not amount to testimonial compulsion under Article 20(3) and was not on that account inadmissible. It held that the application of finger prints in the identification of persons does not violate the fundamental rights under Article 20(3) of the constitution.

Supreme Court Ruling Of 1961 : [State of Bombay Vs. Kathikalu Oghad AIR 1961 SC 1808 (Contd...)]

It was further held that to be a witness in its wider sense means giving an oral or written statement but does not amount to exposing a part of the body for the purpose of identification.

- THANK YOU,
- with regards,
- K.Jegadeesan, Phone: 9791035191.
- Director, Finger Print Division, Truth lab, Chennai
- Formerly Inspector of Police (FP)/ Finger Print Expert , Tamil
- Nadu Police, Tamil Nadu.