

B.A and B.Sc

ANTHROPOLOGY

SEMESTER II, PAPER 4 PRACTICAL

DERMATOGLYPHICS

Dermatoglyphics (from ancient Greek derma=skin, glyph=carving) is the scientific study of skin patterns (fingerprints, lines, mounts, and shapes) of hands. Dermatoglyphics refers to the formation of naturally occurring ridges on certain body parts, namely palms, fingers, soles and toes.

They do not change size or shape throughout a person's life, except in cases of serious injuries that scar the dermis.

Skin begins to develop in the embryo in the 13th week, and it is formed in the 19th week (ridges are formed during the third to fourth month of fetal development).

The term was coined by Dr. Harold Cummins, the father of American fingerprint analysis, even though the process of fingerprint identification had already been used for several hundred years.

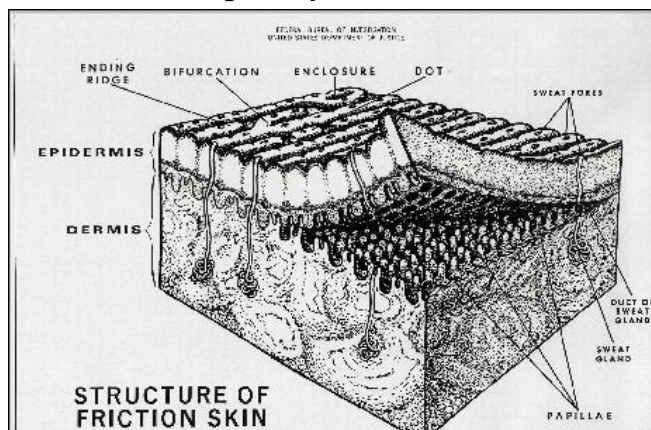
All primates have ridged each fingerprint is unique; fingerprints on the right hand will not be the same as the ones on the left hand. While fingerprints will increase in size (from childhood to adulthood).

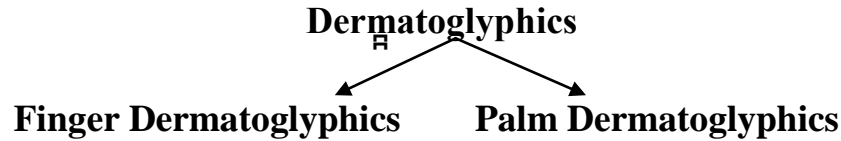
Palmer and fingerprint surface of the hands and planter surface of the feet is covered with a special kind of skin.

SKIN FORMATION

1.Epidermis

2. Dermis (deeper layer)





FINGER DERMATOGLYPHICS

Three Principals of Fingerprints

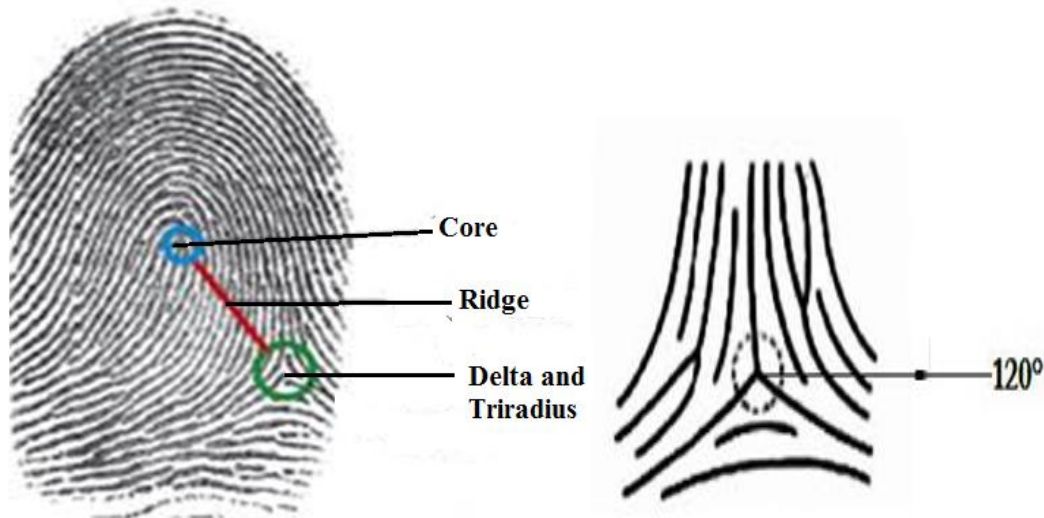
1. A fingerprint is an individual characteristic
 - a. No two fingers have the same fingerprint
 - b. Identical twins are similar but not identical
2. Fingerprints remain unchanged during a lifetime
3. Fingerprints have general ridge patterns that permit them to be classified.

TERMS OF FINGERPRINTS

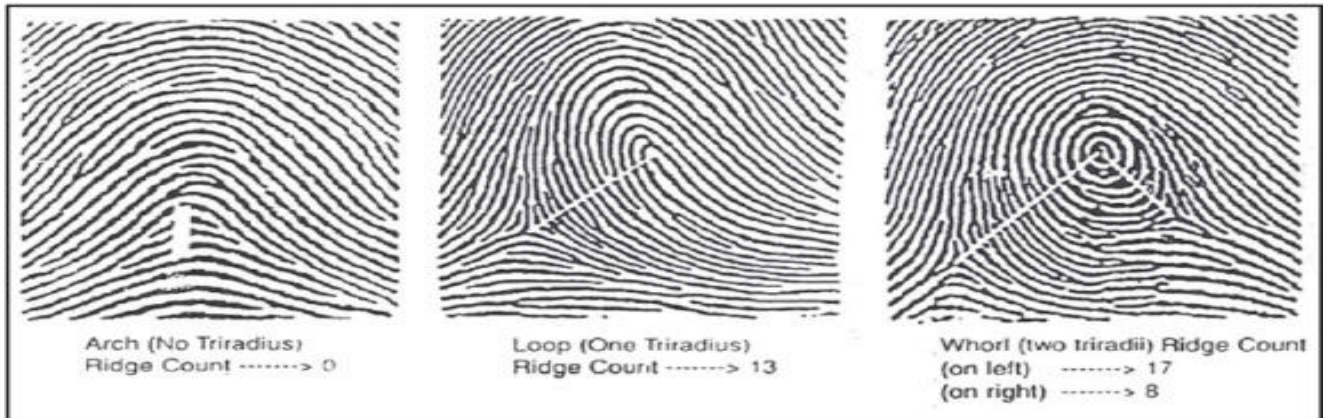
Ridge: A ridge is fine elevated ribs on skin surface separated by narrow grooves.

Core: core is a ridge that is surrounded by a field of ridges. Core can take the shape of a short straight ridge, a hooked shaped ridge, a circle etc.

Triradius or delta: A triradius is a point at which three groups of ridges coming from three directions meet at angle 120 degree.



Galton classified three basic types of ridge patterns



ARCH: The structure is hill-shaped, curved at the top. The ridges flow from one margin to the other. It has no triradius.



TENTED ARCH: The structure is in the form of tent, which is sharp at the top. Tented arch appears to have a triradius. The ridges flow from one margin to other in form of tent.

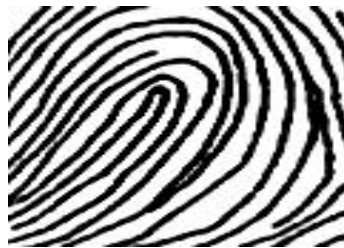


LOOP: A loop is characterized by the presence of one triradius. In this case, the ridge curve around only one extremity of the pattern where the head of the loop is formed . A loop may be further distinguished on the basis of the opening of the ridges as ulnar or radial.

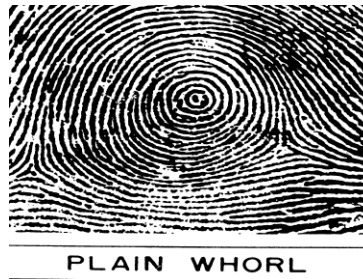
ULNAR LOOP: If the ridges of the loop open on the ulnar margin. It is called ulnar loop.



RADIAL LOOP: If the ridges of the loop opens on the radial margin. It is called radial loop.



WHORL: whorl is characterized by the presence spiral or circular pattern. Whorl consist of two triradius.



Henry has classified the various finger patterns into four main types. The whorl is of following type:

1. Lateral pocket loop whorl
2. Central pocket loop whorl
3. Double loop whorl
4. Accidental whorl

LATERAL POCKET LOOP WHORL: lateral pocket loop whorl occurs when two loops are formed to make a whorl. These two loop are interlocked with two independent core. In this the ridges around the two cores emerge of the same radial or ulnar margin.



CENTRAL POCKET WHORL: It consist of at least one recurving ridge or an obstruction at right angles to the line of flow, with two triradius. Central pocket loop whorl ridges make one complete circuit which may be spiral, oval, circular or any variant of a circle.



CENTRAL POCKET LOOP

DOUBLE LOOP WHORL: Double loop whorl occurs when two loops are formed to make a whorl. These two loop are interlocked with two independent core. In this the ridges around the core emerges on opposite margin.



DOUBLE LOOP

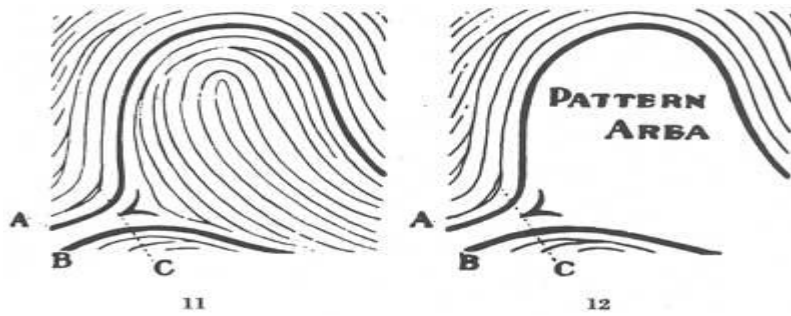
ACCIDENTAL WHORL: This loop has two or more triradii. It is a complex pattern formed as a result of combination of two or more usually unrelated configurations.



ACCIDENTAL

Ridge counting

Ridge is counted by drawing a straight line from core to triradius and then counting them under the magnifying glass using a needle.



PALMS

There are four anatomical directions in the palm. These are PROXIMAL, DISTAL, RADIAL and ULNAR. Surfaces have specific landmarks and certain configuration in specific regions.

Interdigital intervals, the clefts between digits, are numbered in sequence beginning with the interval between the thumb and index finger. The palmer surface is divisible into dermatoglyphic areas or configurational fields. There are a series of 6 elevations or interdigital pads (*a, b, c, d, thenar and hypothenar*) Configurational areas. There are 6 configurational or pattern areas.

1- HYPOTHENAR AREA:- Situated on the radial side of the hand.

II, III & IV INTERDIGITAL AREAS The configurational area lying between digital

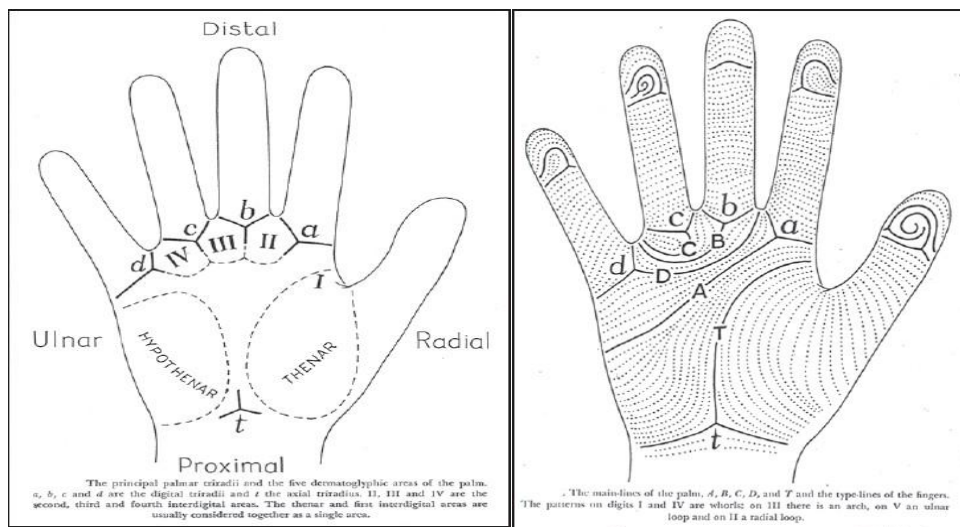
2- triradii 'a' and 'b' is interdigital II, that between

3- triradii 'b' and 'c' is interdigital III, and area between

4- triradii 'c' and 'd' is interdigital IV. The configuration

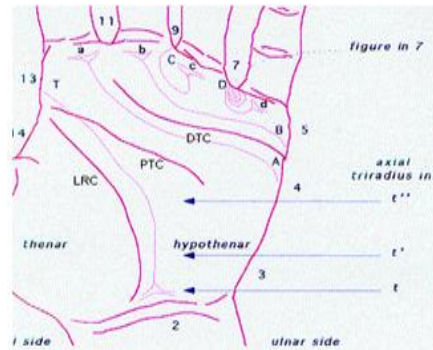
5- may be a true pattern (whorl or loop), a vestige or an open field.

6- THENAR AREA:- Situated on the ulnar side of the hand.



AXIAL TRIRADIUS ('T')- This triradius is located at or near the wrist (proximal margin) of the palms, in the interval between thenar and hypothenar eminences. basically 3 triradius found t, t' or t'' Triradius is usually observed at a

higher region of the ulnar side of the palm due to 'autosomal trisomy'. Therefore there is no exact location of 't'.



Main line formula

The palm is divided into 13 regions for the purpose of making the palmer main lines. The area covered by the Thenar eminence on the radial side is numbered as 1. Area below the axial triradius is numbered as 2. The area covering from the position 2 to the midpoint on the ulnar border around the proximal margin of the Hypothenar eminence is numbered as 3. The midpoint on the ulnar border is numbered as 4. From position 4 to the triradial point 6 is numbered as 5, which is divided into two equal halves the proximal half is numbered as 5' and the distal half is numbered as 5''. The digital areas are numbered as 6, 8, 10, 12 and interdigital areas are numbered as 7, 9, 11, 13 in the radio-ulnar sequence. The proximal radiant of a digital triradius is directed towards the interior side of the palm by making the symbol of termination. This line is called the palmer main line. Thus, four main lines being obtained being named as A, B, C, D. the symbols of the four terminating regions of the 4 main lines develop the main line formula which can be recorded as in order of D, C, B, A. for eg 9, 7, 5'', 1

Main line index

Main line formula indicates the direction of flow of ridges. Cummins (1916) observed that the termination of two main lines A and D are adequate to determine the direction of flow of ridges. From this observation the proposal of main line index based on the sum of termination of two main lines A and D. if the resulting value is low then it indicates vertical alignment, whereas high value indicates horizontal alignment. Thus the main line index is an expression of the direction of a neutral line. In main line index the numbering of palm of main line formula

undergoes renumbering like In case of number 5” which is assigned the value of 6, and in case of number 6 is assigned the value of 1, 7 is assigned the value of 2, 8 is assigned the value of 3 and this goes on till the value of 8. Main line index can be recorded as D+A i.e. $6+5=11$.

MATERIAL :- Cumins & Midlow has use the ink method & following are the material used :-

1. Duplicate ink.
2. Roller.
3. Soap / water / hand wash.
4. Smooth glaze
5. White paper.
6. Pressure pad.
7. Magnifying lens
8. needle

To take image of palm & fingers, wash it properly with spirit. The surface should be plain & smooth where we put the glass.



METHODS :-

1. Good quality paper using suitable ink .
2. In order to get decipherable (clear images).
3. Material required to obtain a print, it is analysis are ink , inking slab, roller, printing card, magnifying glass and counting lens & cotton.
4. Roller is required to spreading ink.

5. Inking slab is a plain surface made up of glass back wood where ink is spread.
6. Printing card is piece of paper which should be good and quality based.
7. The magnifying glass helps in efficient reading of the pattern type.
8. Ridges counting lens are essential pointer ridge count.
9. Small quantity of ink is placed on the inking slab and spread evenly either by a roller.
10. For proper impression of finger the ball can be applied in the ink film.
11. Roller print ensures registration of the complete impression of the ball of the finger.
12. For an impression of the palm, ink should be evenly spread over the entire palmer surface by the cotton pad.

RULES FOR RIDGE COUNTING :-

All counts are made straight line drawn from point to the point of core.

Ridge that cut or touch the straight line drawn from triradical point to the point of core counted

Ridge which terminates short of touching the line is not counted.

Point of bifurcation where the line cuts on that case only two ridges are counted.

The higher count is taken one from each triradical point to the core.

Application of dermatoglyphic

- Passport
- Banking
- Driving licence
- Electronic voting
- Competitive examination
- Personal identification
- Racial variation
- Forensic science
- Medical science

PERSONAL IDENTIFICATION =Fingerprints is necessary for personal identification. It is important for legal and social reason.

2.ELECTRONIC VOTING =It can be helpful for voting if it is integrate with the voting machine.

3.BANKING =It helps you to withdraw cash without the ATM