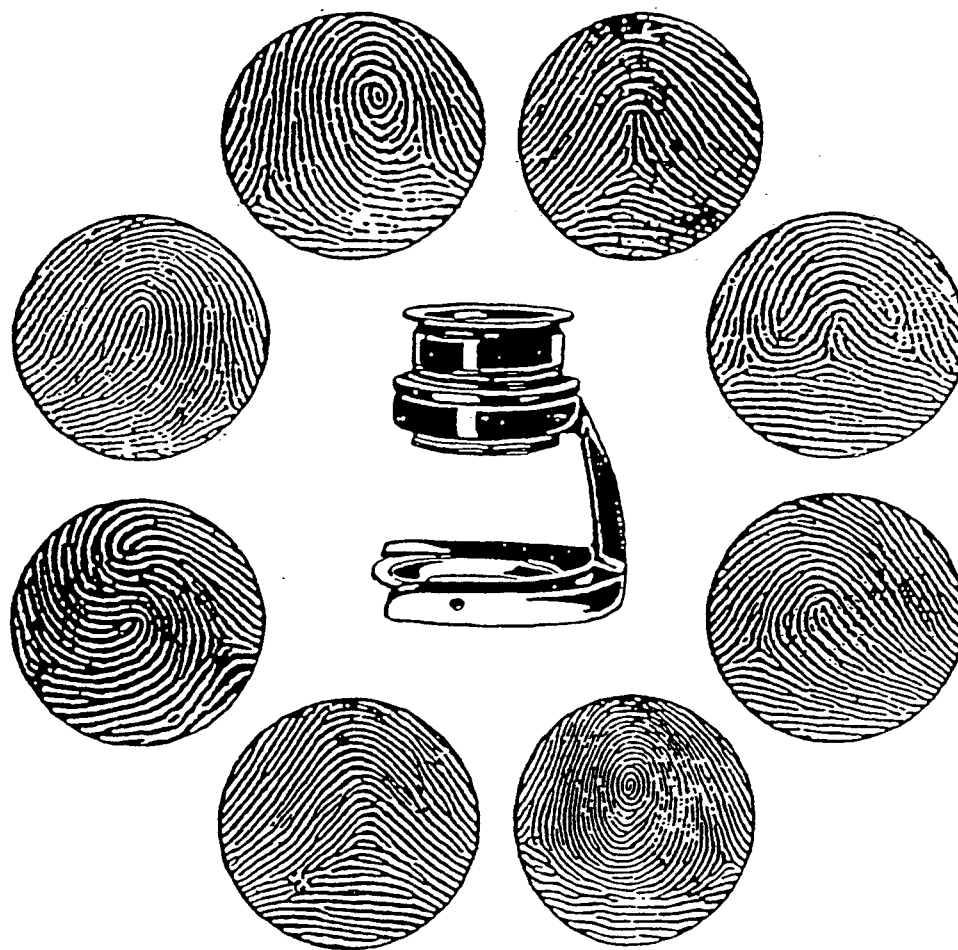

FINGERPRINT PATTERN RECOGNITION



*Criminal Justice Information Services Division
Identification and Investigative Services Section*

FEDERAL BUREAU OF INVESTIGATION
CRIMINAL JUSTICE INFORMATION SERVICES DIVISION



PLAIN ARCH



PLAIN WHORL

ILLUSTRATIONS
OF VARIOUS
FINGERPRINT
PATTERNS



TENTED ARCH

THE PRESENCE OR EXISTENCE OF WHORLS IN FINGER IMPRESSIONS IS USED AS THE BASIS FOR THE DETERMINATION OF THE CHIEF OR PRIMARY CLASSIFICATION. EACH WHORL APPEARING IN ANY OR ALL OF THE TEN FINGERS HAS A CERTAIN ARBITRARY OR FIXED VALUE. THE ADDITION OF THE VALUES REPRESENTED BY SUCH WHORLS AND THE INDICATION OF THE TOTAL VALUE IS KNOWN AS THE PRIMARY CLASSIFICATION.



CENTRAL POCKET

ILLUSTRATIONS OF THE WHORL TYPES WHICH ARE THE SAME AS PATTERNS HAVING THE FIGURED VALUE ARE SHOWN ON THE RIGHT OF THIS CHART; ILLUSTRATIONS OF THE OTHER TYPES ARE SHOWN ON THE LEFT.



LOOP



DOUBLE LOOP



LOOP



ACCIDENTAL



Fingerprints on File



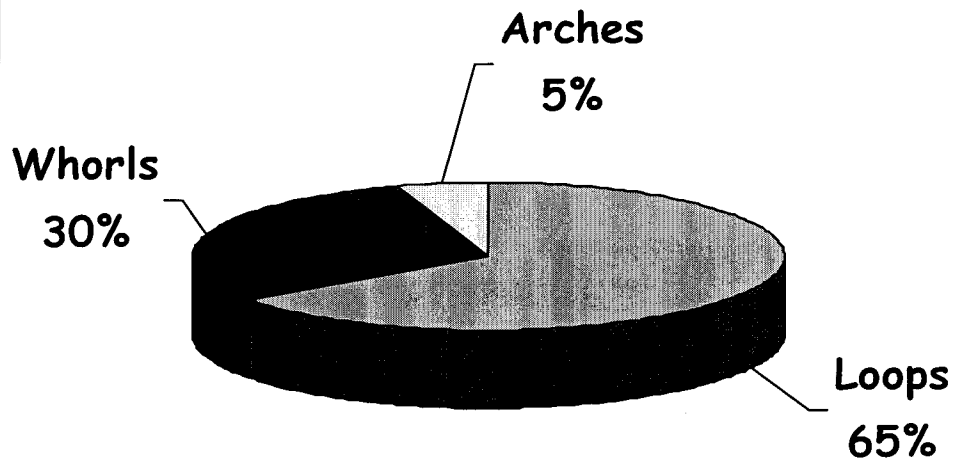
**152,881,556 - Criminal Submissions/Cards representing
43,770,185 subjects**

**89,724,761 - Civil Submissions/Cards representing
40,738,647 subjects**

**242,606,317 - Total Submissions/Cards representing
84,508,832 subjects**

July 2002

Fingerprint Pattern Frequency

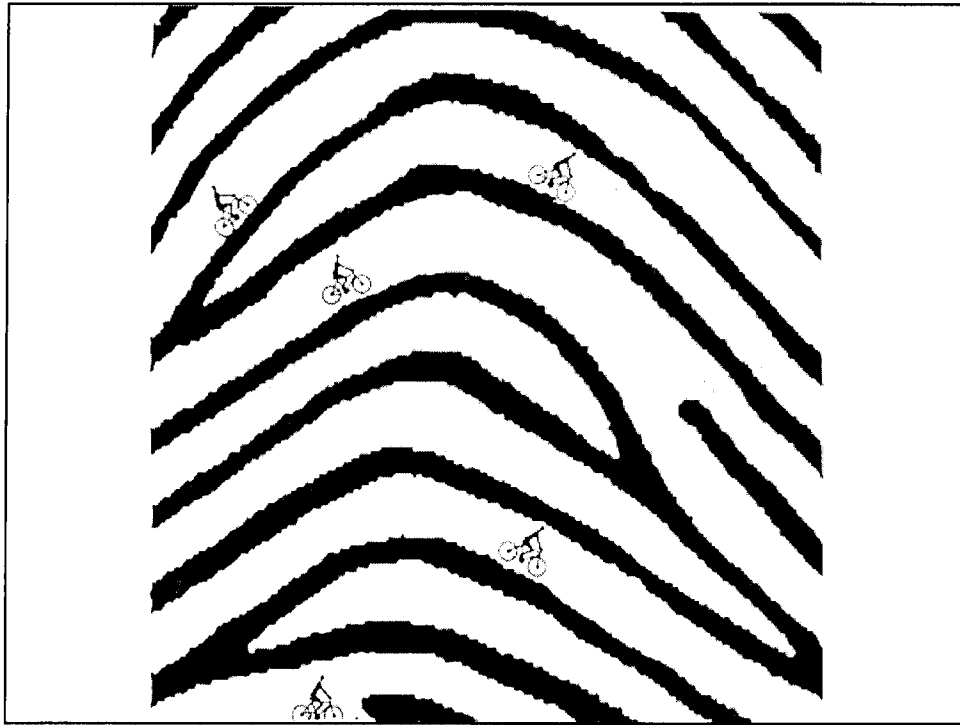




Plain Arch



Plain Arch



PLAIN ARCH



A PLAIN ARCH IS THAT TYPE OF PATTERN IN WHICH THE RIDGES ENTER UPON ONE SIDE MAKE A RISE OR WAVE IN THE CENTER, AND FLOW OR TEND TO FLOW OUT UPON THE OPPOSITE SIDE.

ARCHES

1.



2.



3.



4.



5.



6.



7.



8.



9.



10.



11.



12.

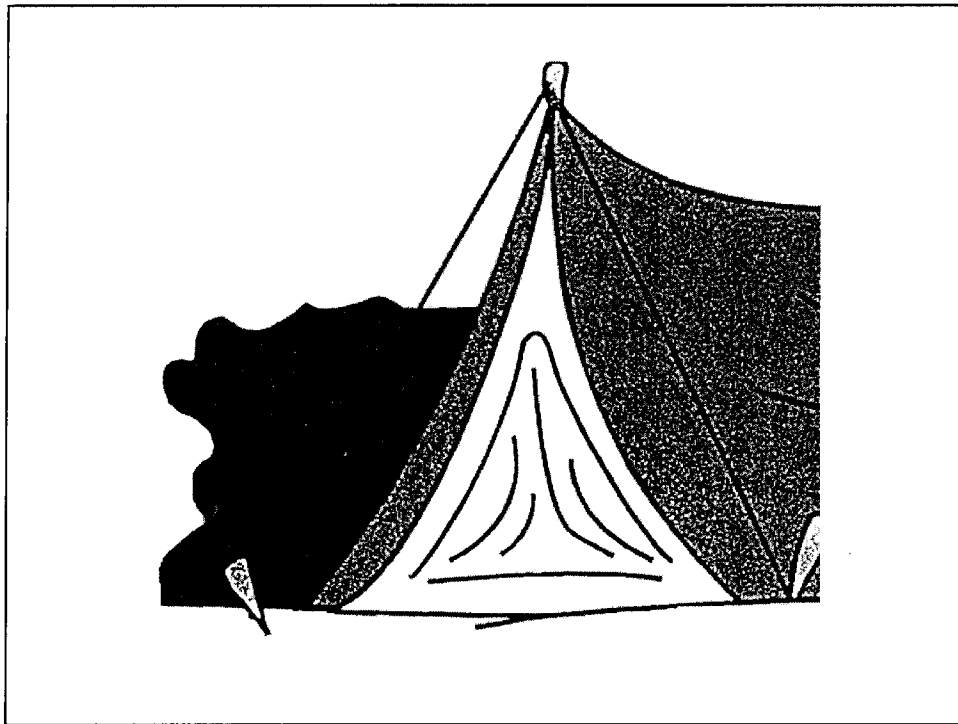




Tented Arch



Tented Arch

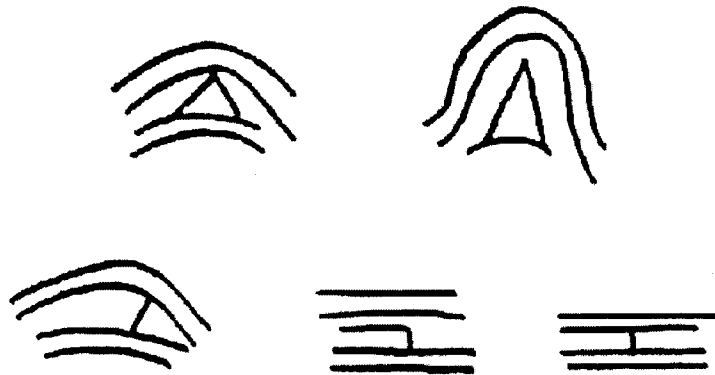


TENTED ARCH



A TENTED ARCH IS THAT TYPE OF PATTERN WHICH POSSESSES EITHER AN ANGLE, AN UPTHRUST OR TWO OF THE THREE BASIC CHARACTERISTICS OF THE LOOP

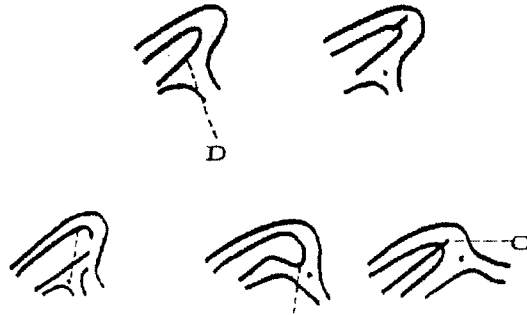
TENTED ARCHES
ANGLE



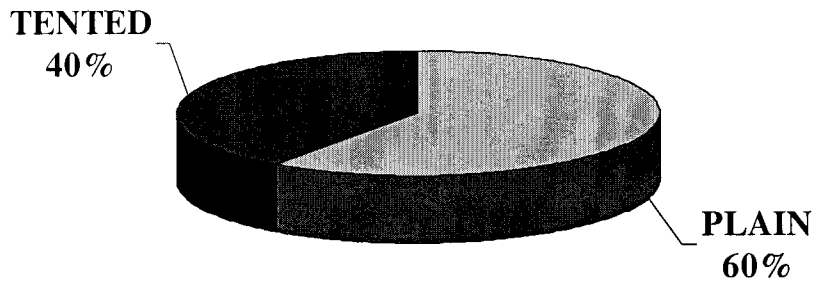
TENTED ARCHES
UPTHRUST



TENTED ARCHES
LOOP TYPE



ARCH FREQUENCY





Loop

ULNAR



Loop

ULNAR



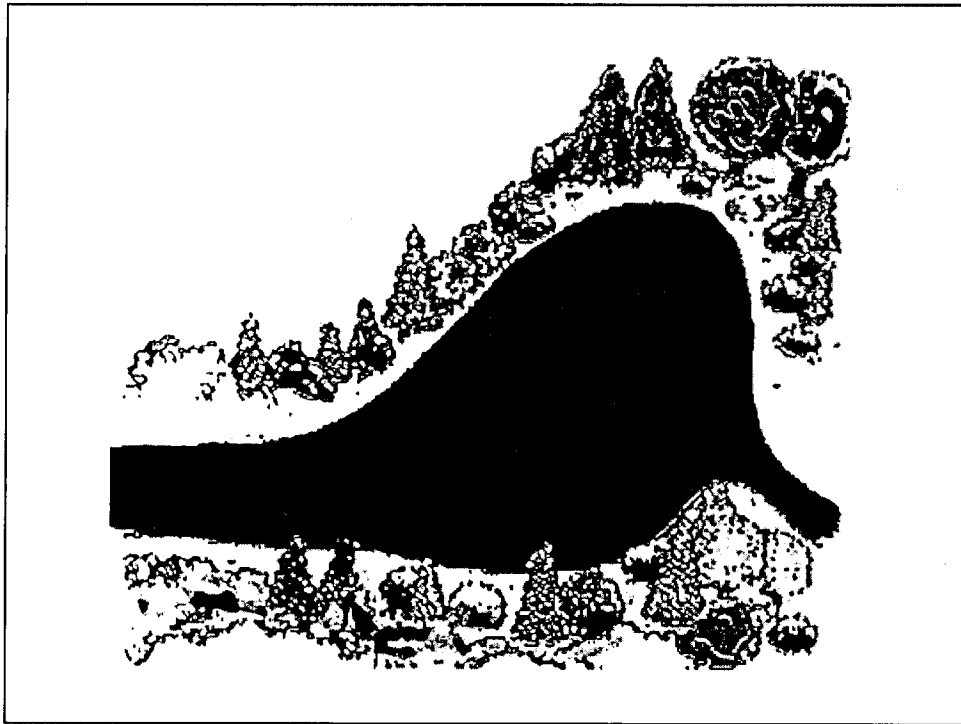
Loop

RADIAL



Loop

RADIAL



LOOP



A LOOP IS THAT TYPE OF PATTERN IN WHICH ONE OR MORE RIDGES ENTER UPON EITHER SIDE, RECURVE, TOUCH OR PASS AN IMAGINARY LINE BETWEEN DELTA AND CORE AND PASS OUT OR TEND TO PASS OUT UPON THE SAME SIDE THE RIDGE ENTERED.

FLOW OF RIDGES



ULNAR LOOP



ULNAR LOOP



RADIAL LOOP

***THE ABOVE PATTERNS SHOW THE DIRECTION RIDGES
FLOW IF LOCATED IN THE RIGHT HAND.***

FLOW OF RIDGES



RADIAL LOOP



ULNAR LOOP

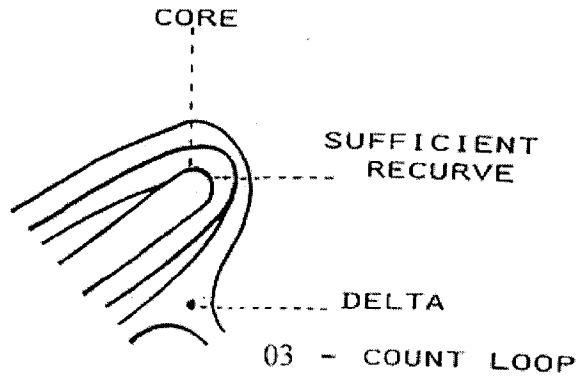


RADIAL LOOP

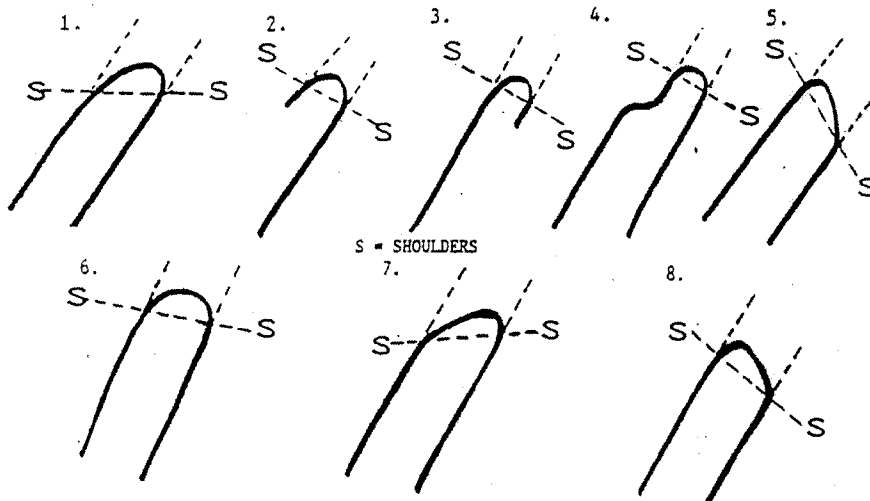
***THE ABOVE PATTERNS SHOW THE DIRECTION RIDGES
FLOW IF LOCATED IN THE RIGHT HAND.***

THREE BASIC REQUIREMENTS OF A LOOP:

1. *Sufficient Recurve*
2. *Delta*
3. *Ridge Count - Across a looping ridge*

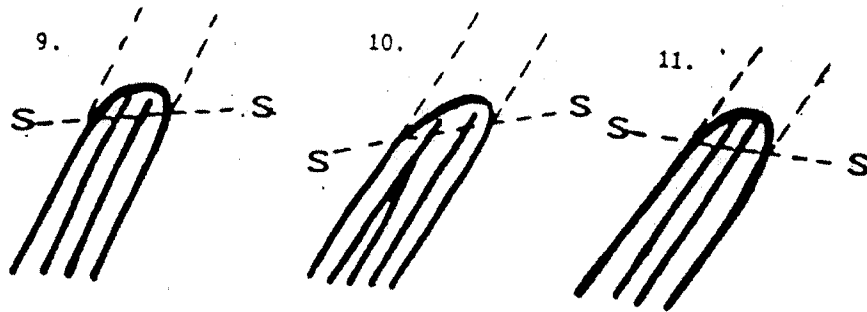


SUFFICIENT RECURVE



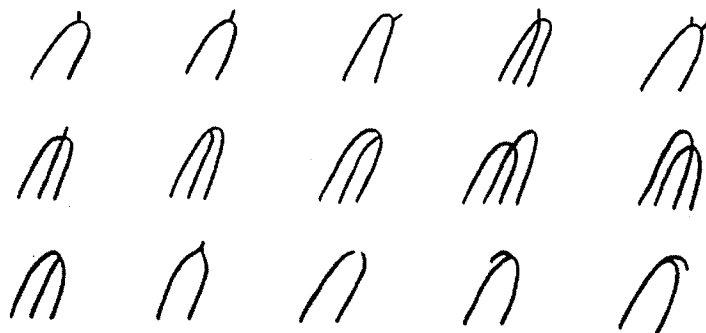
A SUFFICIENT RECURVE CONSISTS OF THE SPACE BETWEEN THE SHOULDERS OF A LOOP FREE OF ANY APPENDAGES WHICH ABUT UPON IT AT A RIGHT ANGLE ON THE OUTSIDE OF THE RECURVE.

SUFFICIENT RECURVE



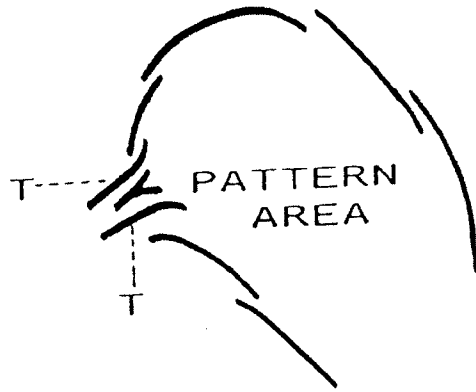
THE SHOULDERS OF A LOOP ARE THE POINTS AT WHICH THE RECURVING RIDGE DEFINITELY TURNS INWARD OR CURVES.

APPENDAGE
ATTACHMENT OR CONNECTION

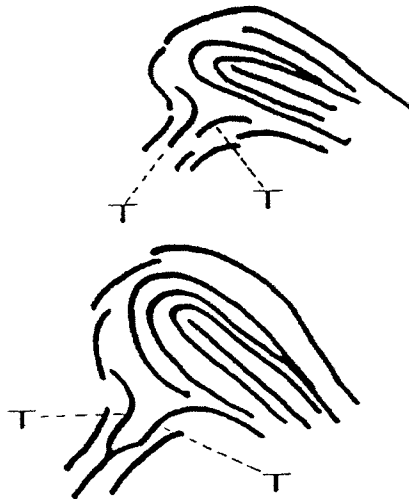


An appendage striking the outside of the recurve at a right angle will spoil that recurve.

LOOP PATTERN AREA

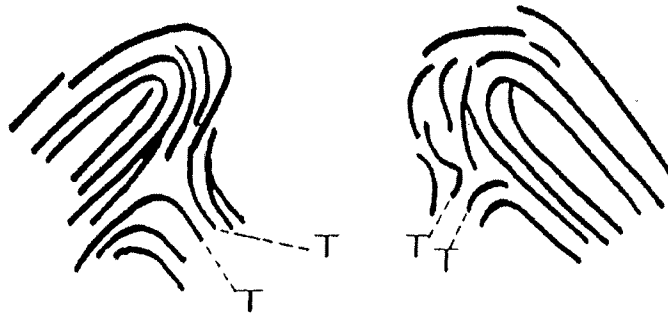


TYPELINES



THE TWO INNERMOST RIDGES WHICH START OR GO PARALLEL, DIVERGE, AND SURROUND OR TEND TO SURROUND THE PATTERN AREA.

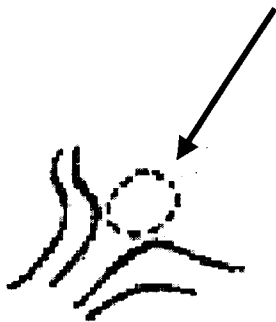
TYPELINES



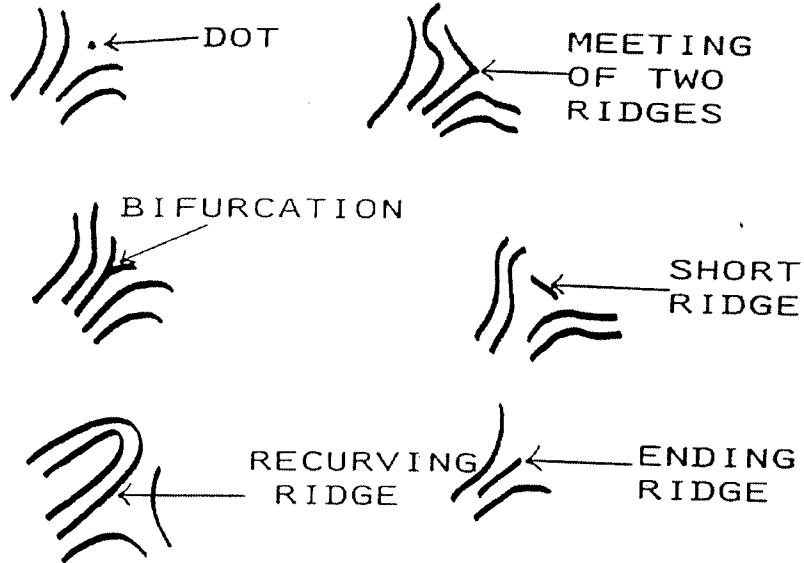
DELTA

THE DELTA IS THAT POINT ON A RIDGE AT OR NEAREST THE POINT OF DIVERGENCE OF TWO TYPELINES, AND LOCATED AT OR DIRECTLY IN FRONT OF THE POINT OF DIVERGENCE.

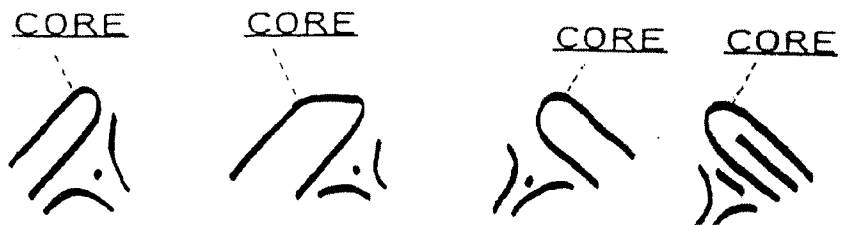
AREA TO BE CONSIDERED IN FRONT OF THE POINT OF DIVERGENCE OF TWO TYPELINES.



DELTA



CORE

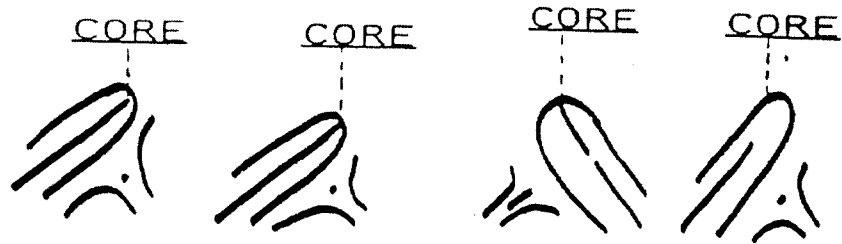


THE APPROXIMATE CENTER OF THE PATTERN

PLACED UPON OR WITHIN THE INNERMOST SUFFICIENT RECURVE.

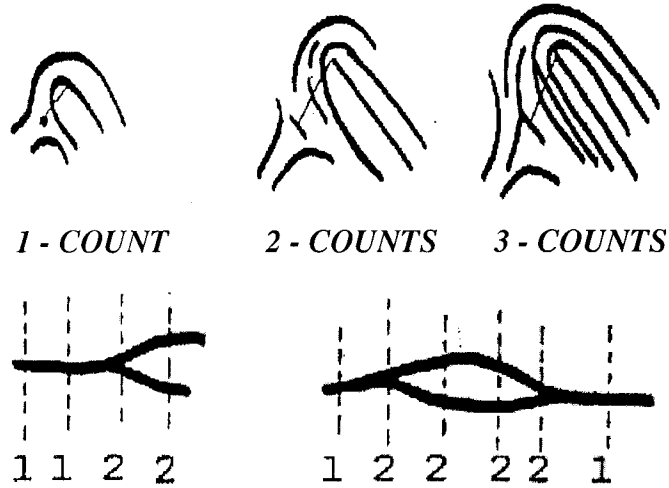
LOCATED ON THE SHOULDERS OF THE INNERMOST LOOP FARTHEST FROM THE DELTA.

CORE

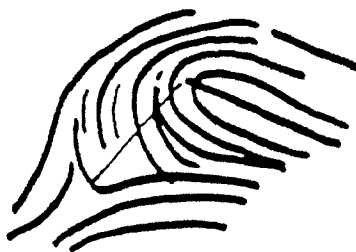


LOCATED ON THE SPIKE OR ROD IN THE CENTER OF THE INNERMOST RECURVE, PROVIDED, THE SPIKE OR ROD RISES AS HIGH AS THE SHOULDERS.

RIDGE COUNTING



RIDGE COUNTING

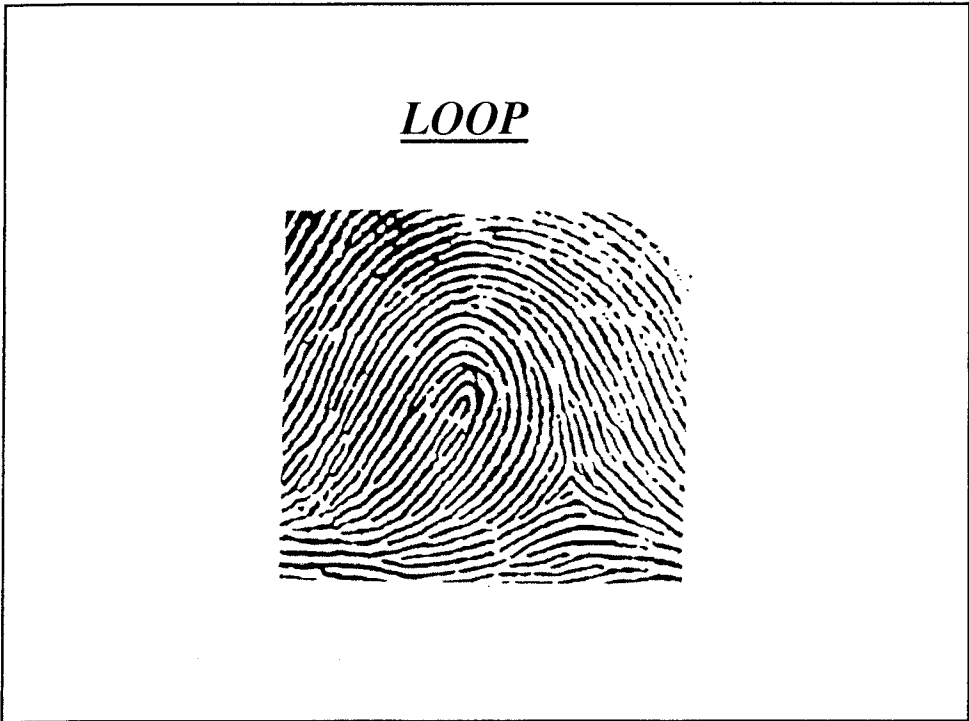
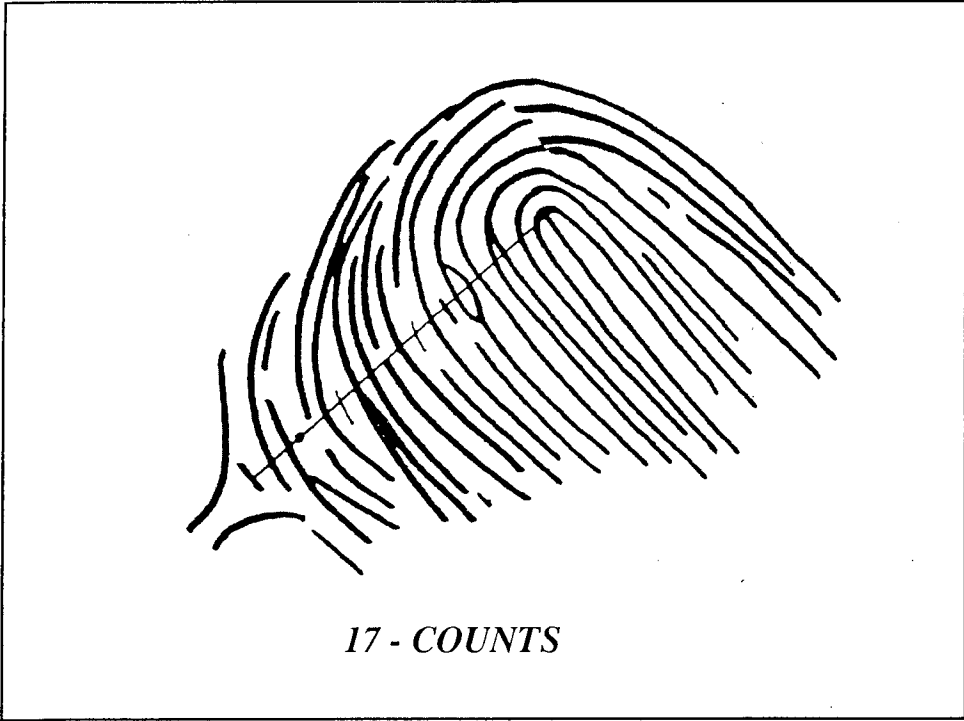


4 - COUNTS

RIDGE COUNTING



2 - COUNTS



LOOP



LOOP



LOOP

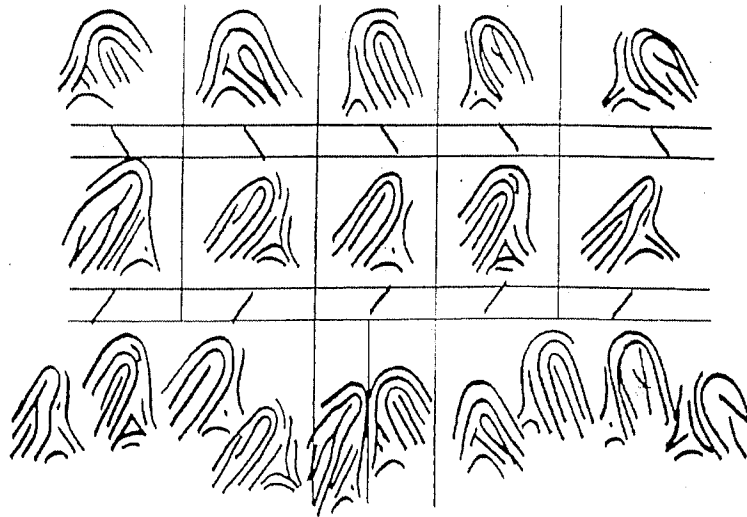


LOOP



ULNAR LOOP

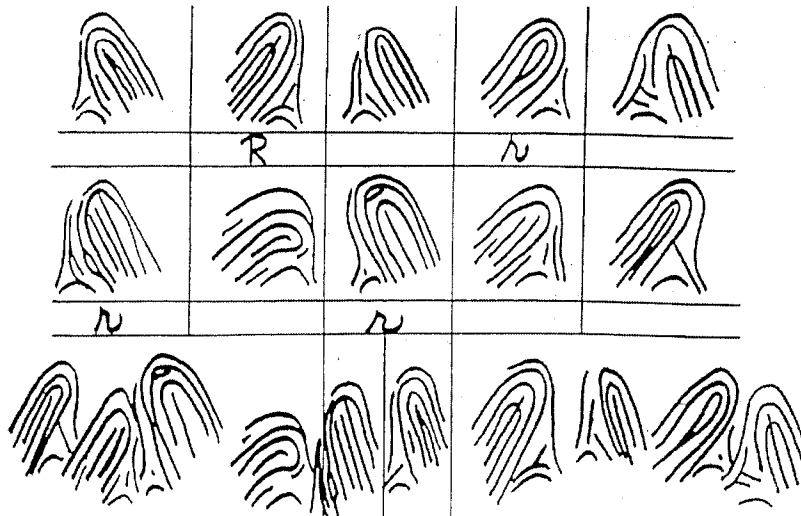
Ulnar Loops flow toward the little finger.



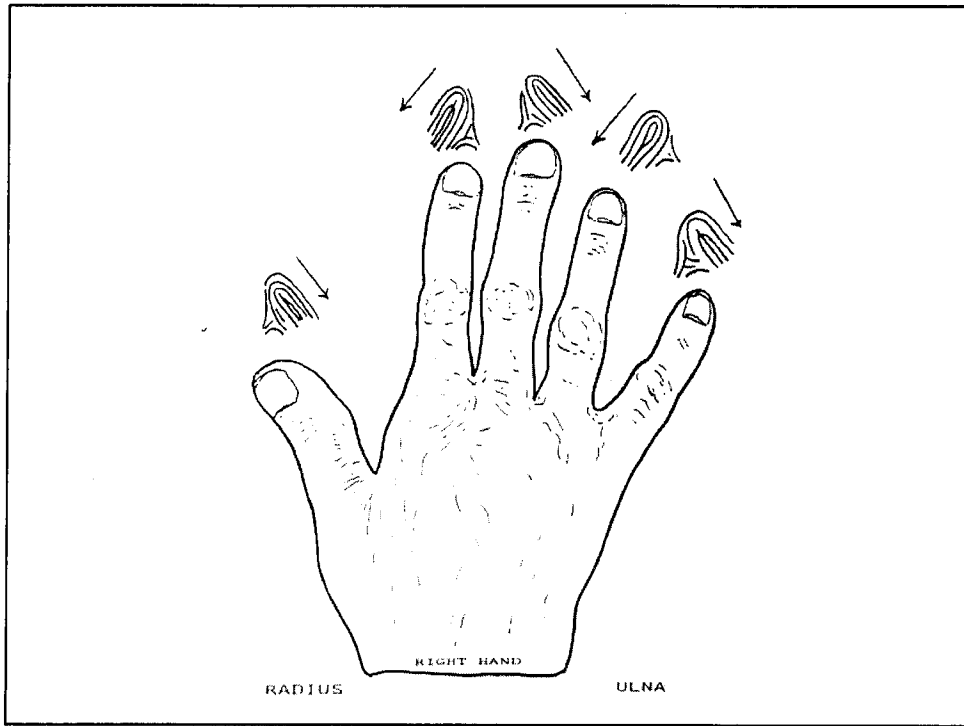
The direction of flow applies to the fingers on the hand and not as they appear on the fingerprint card.

RADIAL LOOP

Radial Loops flow toward the thumb.

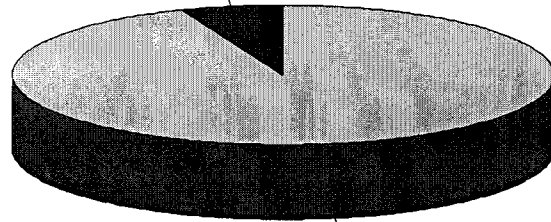


The direction of flow applies to the fingers on the hand and not as they appear on the fingerprint card.



LOOP FREQUENCY

RADIAL
6%



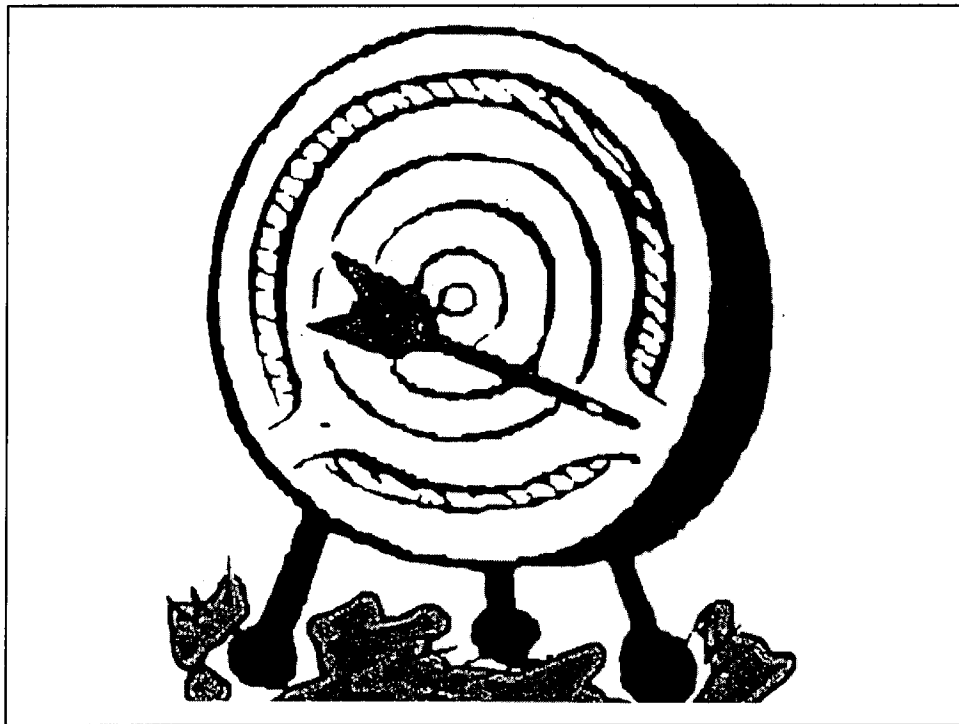
ULNAR
94%



Plain Whorl



Plain Whorl



PLAIN WHORL

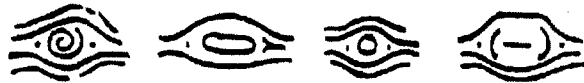


A PLAIN WHORL CONSISTS OF ONE OR MORE RIDGES WHICH MAKE A COMPLETE CIRCUIT, WITH TWO DELTAS, BETWEEN WHICH, WHEN AN IMAGINARY LINE IS DRAWN, AT LEAST ONE RECURVING RIDGE WITHIN THE INNER PATTERN AREA IS CUT OR TOUCHED.

WHORLS

MINIMUM REQUIREMENTS ARE TWO DELTAS AND A RECURVE IN FRONT OF EACH.

IT CAN BE SPIRAL, OVAL, CIRCULAR, OR ANY VARIANT OF A CIRCLE.



AN IMAGINARY LINE DRAWN FROM DELTA TO DELTA MUST CUT OR TOUCH AT LEAST ONE RECURVING RIDGE WITHIN THE INNER PATTERN AREA.

PLAIN WHORL



PLAIN WHORL



PLAIN WHORL





Central Pocket Loop



Central Pocket Loop

CENTRAL POCKET LOOP WHORL



A CENTRAL POCKET LOOP WHORL CONSISTS OF AT LEAST ONE RECURVING RIDGE, OR AN OBSTRUCTION AT RIGHT ANGLE TO THE LINE OF FLOW, WITH TWO DELTAS, BETWEEN WHICH, WHEN AN IMAGINARY LINE IS DRAWN, NO RECURVING RIDGE WITHIN THE INNER PATTERN AREA IS CUT OR TOUCHED.

CENTRAL POCKET LOOP WHORLS



DIFFERENCE FROM A PLAIN WHORL - AN IMAGINARY LINE DRAWN FROM DELTA TO DELTA MUST NOT CUT OR TOUCH A RECURVING RIDGE IN FRONT OF THE INNER DELTA.

LINE OF FLOW



THE LINE OF FLOW OF A CENTRAL POCKET LOOP WHORL IS DETERMINED BY DRAWING AN IMAGINARY LINE BETWEEN THE INNER DELTA AND THE CENTER OF THE INNERMOST RECURVING RIDGE

CENTRAL POCKET LOOP



CENTRAL POCKET LOOP



CENTRAL POCKET LOOP





Double Loop



Double Loop

DOUBLE LOOP WHORL



A DOUBLE LOOP CONSISTS OF TWO SEPARATE LOOP FORMATIONS WITH TWO SEPARATE AND DISTINCT SETS OF SHOULDERS AND TWO DELTAS.

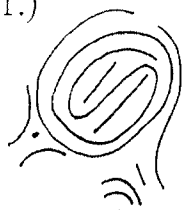
DOUBLE LOOP WHORLS



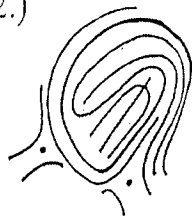
TWO SEPARATE LOOP FORMATIONS

“S” type loop whorls are not considered double loop whorls.

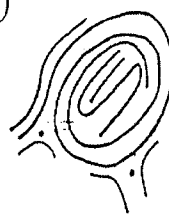
(1.)



(2.)

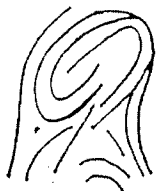


(3.)

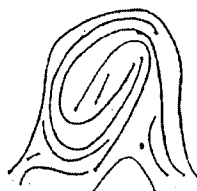


“Interlocking” loops are not considered double loop whorls.

(1.)



(2.)



(3.)



DOUBLE LOOP



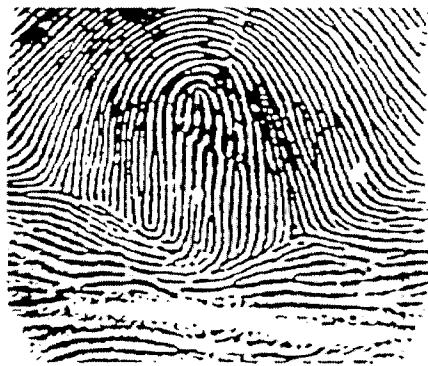
DOUBLE LOOP



DOUBLE LOOP



DOUBLE LOOP





Accidental



Accidental

ACCIDENTAL WHORL



AN ACCIDENTAL WHORL CONSISTS OF A COMBINATION OF TWO DIFFERENT TYPES OF PATTERNS WITH THE EXCEPTION OF THE PLAIN ARCH, WITH TWO OR MORE DELTAS OR A PATTERN WHICH POSSESSES SOME OF THE REQUIREMENTS FOR TWO OR MORE DIFFERENT TYPES OR A PATTERN WHICH CONFORMS TO NONE OF THE DEFINITIONS

ACCIDENTAL WHORL



ACCIDENTAL



ACCIDENTAL



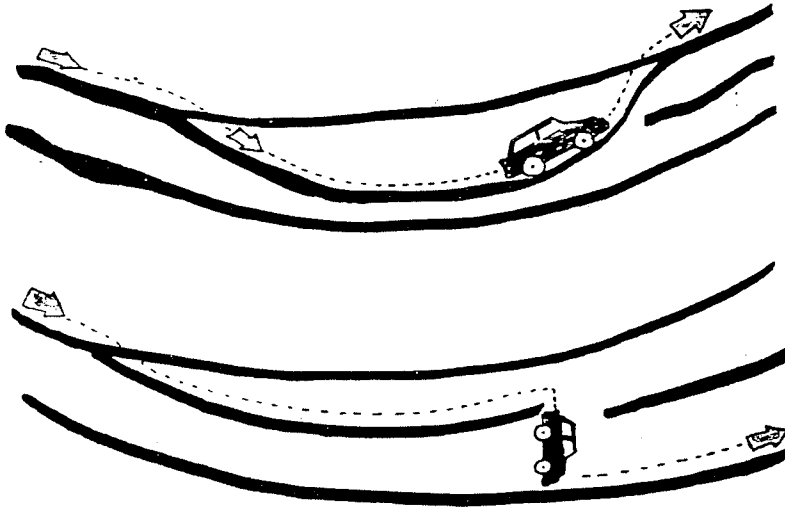
WHORL TRACINGS

1. Trace from left delta, to a point opposite the right delta.
2. Trace from the farthest left delta to a point opposite the farthest right delta when there are three or more deltas present.
3. Drop down at ending ridges. Follow the lower fork of a bifurcation.
4. Stop at the point opposite the right delta and count ridges between that point and the delta.
5. If there are three or more ridges inside the right delta, the tracing is an - I - INNER.
6. If there are three or more ridges outside the right delta, the tracing is an - O - OUTER.

WHORL TRACINGS

7. If there are one or two ridges either inside or outside the right delta, or if the tracing stops on the right delta itself, the tracing is an - M - MEETING.
8. It is not necessary to count more than three ridges.
9. Do not count delta or tracing ridge. The tracing ridge is the ridge where the tracing stopped opposite the right delta.

WHORL TRACINGS

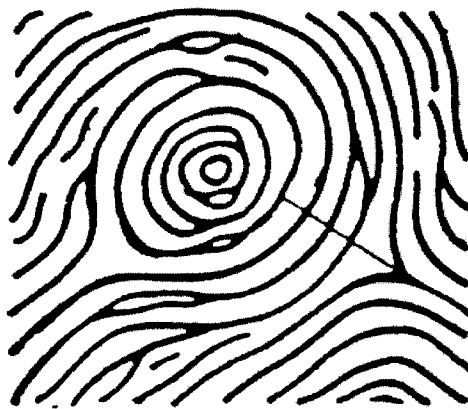


WHORL TRACINGS



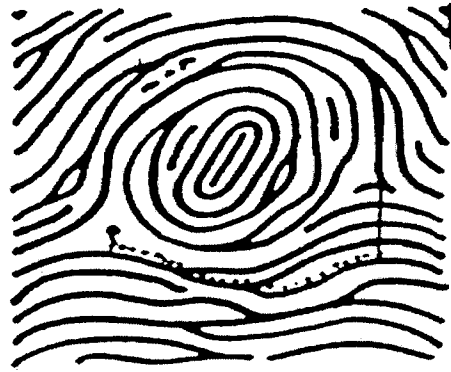
CENTRAL POCKET LOOP - INNER TRACING

WHORL TRACINGS



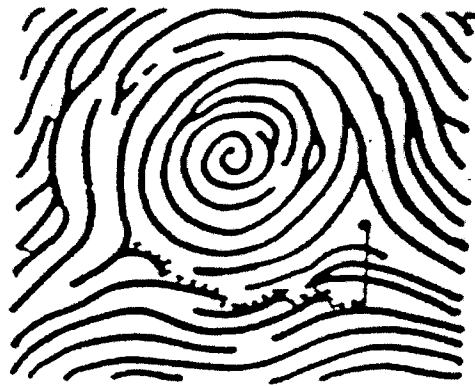
CENTRAL POCKET LOOP - INNER TRACINGS

WHORL TRACINGS



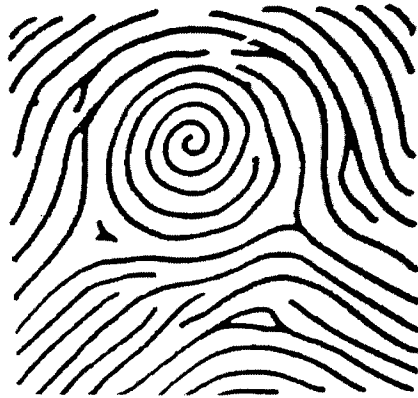
PLAIN WHORL - OUTER TRACING

WHORL TRACINGS



PLAIN WHORL - OUTER TRACING

WHORL TRACINGS



PLAIN WHORL - MEET TRACING

WHORL FREQUENCY

