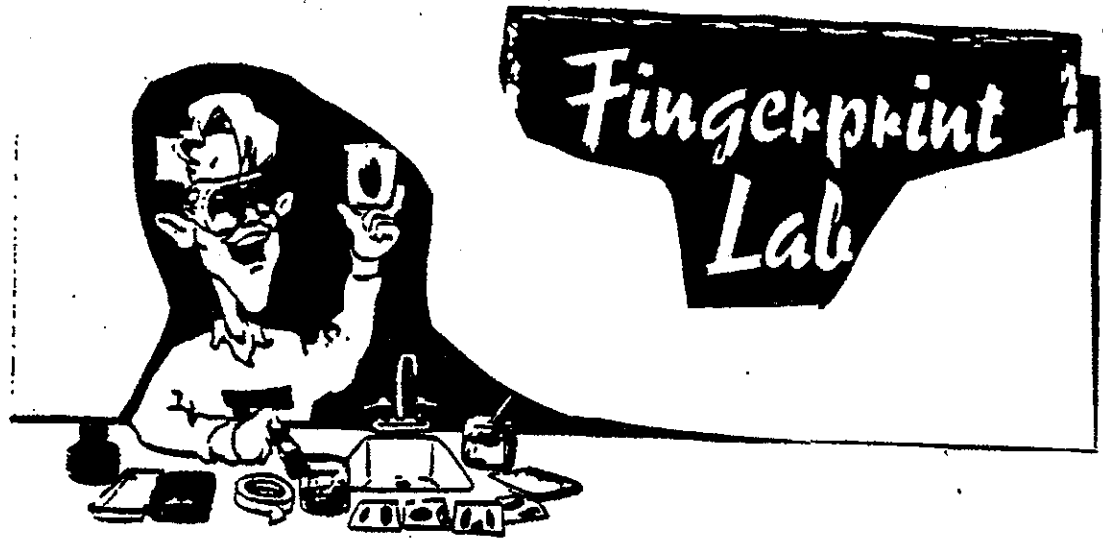


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The fingerprint is one of the most important and useful pieces of forensic evidence. Individual prints are unique. This allows them to be considered as direct evidence for identification. No two persons' fingerprints are alike, not even identical twins.

History of Fingerprinting and Personal Identification

The history of using the fingerprint as a method of identification goes back to the ancient Chinese. Whether or not the Chinese used the fingerprint as we do today is not known. The history of the fingerprint is outlined below.

3000 years ago: Chinese used fingerprint to sign legal papers.

1880: Henry Fauld suggested that friction ridges be used to identify criminals.

Several years before Bertillon: William Herschel required natives of India to sign contracts with the imprint of their right hand.

1883: Alphonse Bertillon introduced a system for identification using body measurements and photographs. He is considered the "Father of Modern Criminology."

1891: Dr. Juan Vucetich uses the work Francis Galton to refine a classification system that is still used in Spanish-speaking countries.

1892: Galton publishes the book, *Finger Prints*. Galton described the three main fingerprint patterns; loops, whorls, and arches.

1897: Sir Edward Richard Henry developed the classification system that is used in the U.S.

1924: FBI Identification Division established.

It is generally accepted that credit be given to Henry Fauld and Sir Edward Richard Henry for the use of fingerprint as a means of identification.



Fingerprint Anatomy

Human skin (Fig. 1 below) represents the body's first line of defense against foreign invasion and infection.

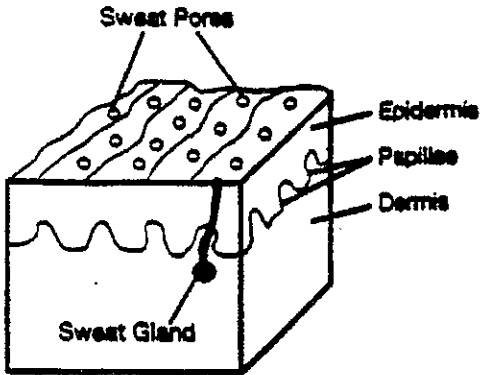


Figure 1.

Skin is composed of an epidermal outer layer and a dermal inner layer. Between these two layers are the papillae. The papillae boundary contains the friction ridge structures responsible for our one-of-a-kind fingerprint patterns. These ridge patterns form during the fetal stage of development and remain unchanged during life.

The notorious criminal John Dillinger attempted to remove his fingerprints with acid. He was partially successful, but enough remained for identification.

Sweat glands are located in the dermis and their ducts extend up through the epidermis where they release perspiration, oils, and other materials through sweat pores. The perspiration, oil, and salts from these sweat glands leave an identifiable residue conforming to the pattern of an individual's fingerprints.

Fingerprint Characteristics

Fingerprint Patterns

There are three main fingerprint patterns and sub-groups found in the human population:

Loop (65%)	Whorls (30%)	Arch (5%)
Radial loop	Plain whorl	Plain arch
Ulnar loop	Central pocket whorl	Tented arch
	Double loop whorl	
	Accidental whorl	

These fingerprint patterns are composed of many individual friction ridges.

A Loop pattern has one or more ridges entering from one side, curving, and then leaving the same side it began, as illustrated in Figure 2. Loop patterns always develop ridges that diverge to form a delta. All loops must have one delta.

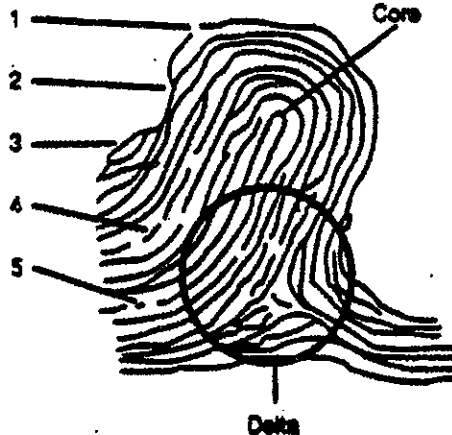


Figure 2.
Loop Pattern with Ridge Characteristics.
Key: (1) Ridge Ending, (2) Bifurcation, (3) Enclosure, (4) Short Ridge, (5) Dot (Island).



A Loop pattern on a fingerprint card that opens toward the thumb is a radial loop. A loop pattern that opens opposite the thumb is an ulnar loop, as shown in Figure 3.

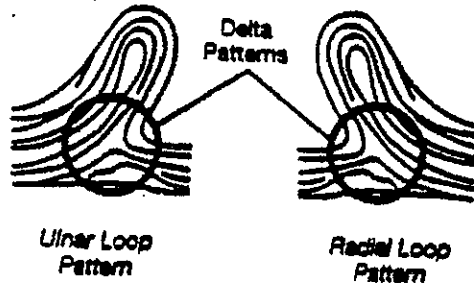


Figure 3. Left Hand

Whorls are friction ridge patterns that have a minimum of two deltas as illustrated in Figure 4. There are four whorl sub-groups: plain, central pocket, double, and accidental.

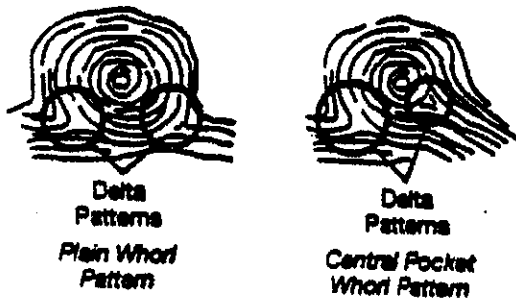


Figure 4.

The plain whorl has two deltas and a complete ridge circuit. The central pocket whorl differs from the plain whorl in one of the delta areas as shown in Figure 4. Here, the delta appears to be stretched like elastic.

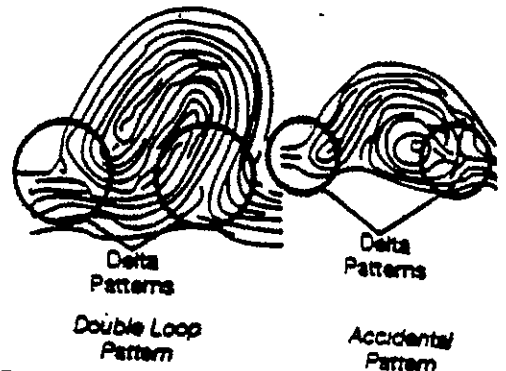


Figure 5.

The double loop whorl (Figure 5) is composed of two loops and two deltas.

The last whorl sub-group is the accidental (Figure 5). This pattern is defined as a "pattern consisting 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."¹

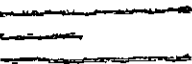

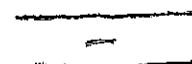
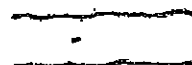
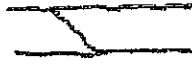
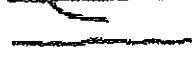


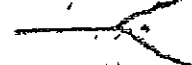
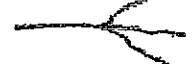
Arches (Figure 6) are friction ridges that enter on one side of the finger and cross to the other side while rising upward in the middle. The simplest is the plain arch with mild bulging. The tented arch appears to have a spike acting as a pole in the middle.



Figure 6.

¹The Science of Fingerprinting. Washington, D.C.: U.S. Government Printing Office.



Name	Visual Appearance
1. Ending ridge (including broken ridge)	1. 
2. Fork (or bifurcation)	2. 
3. Island ridge (or short ridge)	3. 
4. Dot (or very short ridge)	4. 
5. Bridge	5. 
6. Spur (or hook)	6. 
7. Eye (enclosure or island)	7. 
8. Double bifurcation	8. 
9. Delta	9. 
10. Trifurcation	10. 

Fingerprint Ridge Patterns