

How is a Fingerprint Classified and Identified?

Fingerprint bureaus were established about three decades before crime laboratories; hence, historically, the identification of a latent print was often not considered the responsibility of the crime laboratory. Because the fingerprint personnel of the past were not trained in science, such identification work traditionally had not been thought of as a criminalist's work. Fortunately, James F. Cowger helped to correct this in 1983 with his book, *Friction Ridge Skin*, which emphasized the basis on which a fingerprint identity is established. It avoids the complicated, arbitrary rules for building fingerprint classification schemes, with the exception of those rules necessary to understand why some inked record prints are rejected by the FBI.

How fingerprints are classified and filed is not given an extended explanation in this text because:

1. The field investigator generally does not possess the know-how to classify a set of fingerprints, and only a general understanding is required to answer a complainant's questions.
2. Unless utilized on a regular basis, classification rules beyond the few described are arbitrary and soon forgotten. In addition, because fingerprint files grow in size, so does the need to define more subtypes. As this need is met, variations will be found between agencies, there being no single authority for the introduction of new rules. Classification schemes thus require a text of their own.
3. The use of Automated Fingerprint Identification Systems (AFISs) is becoming more available to local agencies through state and federal organizations.

Ridge Line Details

Different features of the friction ridge lines are significant in the classification and the individualization of fingerprints. Classification details are largely concerned with line patterns, whereas individualization (comparison) details focus on deviations from a straight or curved continuous ridge line. To the criminalist, ridge line patterns represent *class characteristics*; ridge line deviation details, *individual characteristics*.

Classification by Ridge Line Patterns: Listed in increasing order of complexity, there are three basic patterns: arches, loops, and whorls. About 5 to 10 percent of all patterns are arches, 60 to 65 percent are loops, and 25 to 30 percent are whorls (see Figure 2.8). Fingerprint patterns are used to classify, not to individualize, a print. When a complete (as opposed to a partial) latent print is developed, and the pattern on each finger of a suspect differs from that of the latent, that suspect is definitively eliminated as the source.

In building the classification scheme, arches are further divided into plain and tented arches; loops into radial patterns (the open end leads out to the thumb) and ulnar patterns (the open end leads out to the little finger). An ulnar loop on one hand becomes a radial loop on the other. Ulnar loops are far more common than radial loops. Whorls, the most complex pattern, have four subdivisions: plain, central pocket loop, double loop, and accidental. Too complicated for the purposes of this text, they need not be explained in detail.

—Ridge Counting: Loops

Loops are further divided by counting ridges between the delta and the core, the count running from 1 to 30 (but rarely higher) (see Figure 2.17).

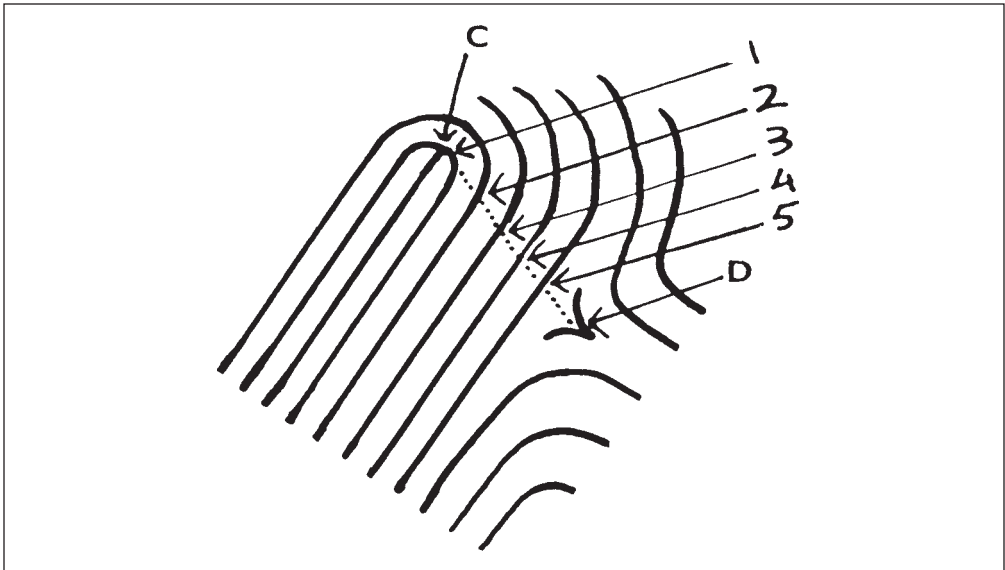


Figure 2.17
Loop pattern with a ridge count—from core (C) to delta (D)—of five.

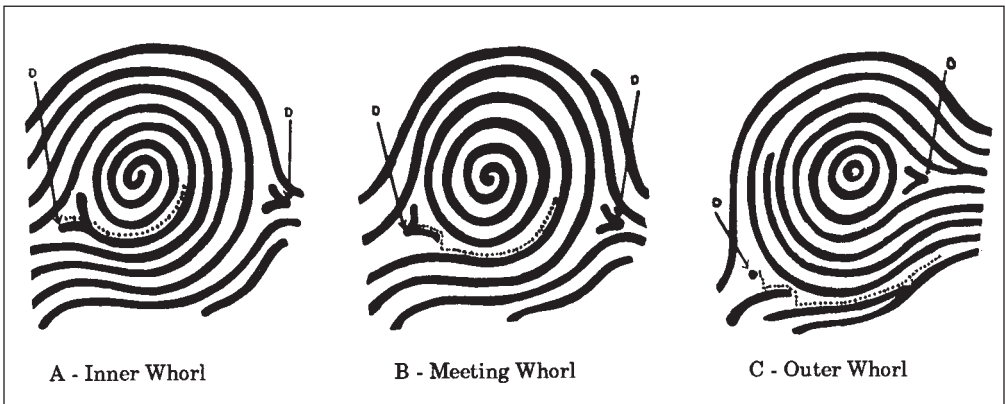


Figure 2.18
Three kinds of whorls as determined by ridge tracing from the left delta to the right delta. “D” points to the two deltas. The dotted line is adjacent to the traced ridge.

—*Ridge Tracing: Whorls*

Starting at the left delta and tracing the ridge line toward the right delta, if the traced ridge comes within three ridges (at its closest point) to the right delta, the pattern is called a meet. If there are three or more ridge lines between the traced ridge and the right delta, and if the trace ridge runs between that delta and the core, the pattern is called an inner tracing. If the right delta lies three lines or more above the traced ridge—between the core and the traced ridge, it is an outer tracing. (see Figure 2.18).

A fingerprint cannot be classified if the ridge lines are blocked out by too much ink having been rolled onto the finger. If the lines between the delta and core are not clear in a loop pattern, a ridge count cannot be made; therefore, the print is unclassifiable. Similarly,

if ridge tracing between deltas is not possible, the whorls cannot be classified. Any blockage of details in these critical areas requires that the person's prints be taken over again.

Individualization by Ridge Line Deviations

A ridge line, whether straight or curved, can deviate from its course in the ways depicted in Figure 2.1. To the criminalist such divergences are *individual characteristics*; to the latent print examiner they are *points of identification* (also called minutiae, Galton details, or ridge characteristics). By means of these characteristics or points, a latent fingerprint is shown to be that of a particular individual. No standard terminology has been established. Most terms being sufficiently descriptive, the average juror encounters little difficulty in following expert testimony on the identification of a fingerprint.

Identifying a Latent Fingerprint: A latent fingerprint cannot be identified unless one of known origin is available for comparison. For this, fingerprint exemplars must be acquired. The sources through which known fingerprints are secured and the way the comparison is made are discussed below.

—*Fingerprint Exemplars: Sources*

The three sources providing the exemplars needed for comparison with a latent print are: police fingerprint files, a set of prints taken from a suspect who has no arrest or fingerprint record, and a set of prints taken from each person who frequents the area in which the latent print was found. The last set, called *elimination prints*, is used to determine whether the latent print is that of a stranger or someone who is customarily present. An unidentified latent print found on an object or in places that a stranger would be unable to justify is potentially valuable evidence.

—*Comparison of a Latent with a Known Fingerprint*

The first step toward identifying a latent fingerprint is to scrutinize it for any discernible class characteristics in order to eliminate comparison prints that are not of the same pattern type. The next task is to find a cluster of individual characteristics—two or three points bunched together. This grouping is chosen as a landmark to be searched for in the known comparison print. If a corresponding cluster is not noted, the known print is eliminated. If one is noted, the third step is to examine the latent for the next point of identification closest to the landmark cluster; then compare it to the known print to see if that characteristic is present in the same location, based on ridge counting. If it is, the latent is further examined for yet another individual characteristic, and the known is checked to see if there is a match. When all points of identification in each print are of the same type (bifurcation, dot, etc.) in the same unit relationship (same location), and no inexplicable differences are noted in either print, a conclusion that both impressions were made by the same person may be warranted.

—*Number of Points Necessary for an Identification*

The question of how many individual characteristics are needed for “a conclusion of an identity” (in the language of criminalistics) or “an identification” (in the language of latent print examiners) has not been definitively settled. Among European countries, the minimum number of points is set in France at 17, in England at 16, and in Spain at 10 to 12. In the United States at one time, 12 was common. Nevertheless, in 1973 following a three-year

study, the International Association for Identification (IAI) pronounced: “. . . no valid basis exists at this time for requiring that a pre-determined number of friction ridge characteristics must be present in two impressions in order to establish a positive identification.”¹⁸

The qualitative value of each kind of individual characteristic is a matter largely ignored in establishing a minimum quantitative standard as proof of an identity. For example, about half of all characteristics present in a fingerprint are ridge endings; fewer than one in 100 are trifurcations. Obviously, one trifurcation is worth several ridge endings. This is an area worthy of further research that, if fruitful, will make latent print identification less subjective. When the requisite statistical means are developed and applied to the evaluation of individual characteristics in other areas of criminalistics—firearms and tool marks, for instance—it will render decision-making more precise and scientific.