Fingerprint Analysis

Background:

The contact surfaces of your hands and feet have a series of raised spiral and concentric patterns called “friction ridges.” Friction ridges are formed before birth between the sixth and thirteenth week of development. It is the identity, number, and relative location of these ridge characteristics that individualize a fingerprint. These patterns remain virtually unchanged throughout life except to enlarge during growth.

Each friction ridge is populated by a single row of pores that are openings for ducts leading from the sweat glands. It is through these pores that perspiration is discharged and deposited on the skin’s surface. Once a finger touches a surface, perspiration along with oils that have been picked up by touching hairy portions of the body, is transferred to that surface in the form of an impression of the friction ridge pattern. A fingerprint is the result. Although people had been aware of the fact that all individuals possesses a unique set of ridges on the hands and feet, the use of these prints for criminal identification was not accepted until the early 1900s.

The present system of fingerprint identification is based upon Sir Edward Henry’s (1850-1931) first orderly classification scheme which was modeled on the thumbprint. Henry established the first fingerprinting bureau with Scotland Yard in 1900.

Fingerprint Ridge Category Patterns:
Fingerprint ridges may be grouped into three general category patterns: the “arch,” the “loop,” and the “whorl.”

Arch Patterns: Ridge lines start from one side of the fingertip, rise at the center, and exit on the other side of the fingertip.

Loop Patterns: Ridge lines start and end on the same side of the fingertip.

Source: Neo/Sci, 2000
Whorl Patterns: Ridge lines are circles which do not begin or end on either side of the fingertip.

There are three fundamental principles of fingerprints that helped propel their use as a tool in identification:

1. Fingerprints have general friction ridge patterns (i.e. arches, loops, whorls) that allow for systematic classification.
2. A fingerprint is an individual characteristic. No two fingers have yet been found to possess identical friction ridge patterns.
3. Fingerprints will remain virtually unchanged during an individual’s lifetime.

Common Fingerprint Ridge Details:
These fingerprint ridge details are listed in their order of frequency – an “ending ridge” being the most frequent and a “triple fork” being the most infrequent.

Source: Neo/Sci, 2000
Below is an analysis example of an “identical” match of two separate right thumbprints from the same individual. Notice that there are at least 10 areas of agreeing ridge detail location.
Procedure:

Make sure you perform the following steps to be as thorough as possible in your investigation.

1. Identify the ridge pattern category for the submitted fingerprints on the Fingerprint Evidence Sheet (obtain from your instructor). Record whether each examined fingerprint is an arch, loop, or whorl.

   *Note: DO NOT WRITE on the Fingerprint Evidence Sheet! You can take it out of the protective cover but DO NOT write on it.

2. Compare the ridge pattern category of each recovered fingerprint on the Fingerprint Evidence Sheet to those on the Police Fingerprint Record Sheets to eliminate possible suspects. You can obtain the Police Fingerprint Record Sheets from your instructor. A match of a ridge pattern category indicates only a “preliminary match”.

3. Perform a ridgeline detail analysis for each fingerprint on the Fingerprint Evidence Sheet having a preliminary match to a fingerprint of known identity on the Police Fingerprint Record Sheets. Record matching ridgeline detail characteristics on the Fingerprint Analysis Sheet for each preliminary match. Use the magnifying glass if needed. Remember, there will always be slight differences in different fingerprint impressions from the same finger.

   *Note: You must have a Fingerprint Analysis Sheet for each fingerprint found at the scene from the Fingerprint Evidence Sheet – a total of five.

Source: Neo/Sci, 2000