The Social History of Crime and Punishment in America: An Encylopedia

Fingerprinting

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The practice of fingerprinting has been utilized for centuries as a source of identification that ranges in use from business transactions to the identification of human remains. Since as early as the 14th century, fingerprints have been used to identify individuals based on the accepted idea that no two are alike. In relatively recent years, fingerprinting has been one of the main sources used in the identification of criminals and the recording of criminal histories. The reason fingerprinting has become such a popular form of identification stems from the fact that fingerprints do not change over time, as physical characteristics do. Some scholars and practitioners say this practice has surpassed other human identification systems such as DNA. Fingerprinting has evolved over time to the practice it is today. Techniques will continue to change and grow to ensure the validity and reliability of fingerprinting and the use of this sound forensic tool by the police and court system.

Origin and History of Fingerprinting

Although the use of fingerprinting has become mainstream, the practice has not always been widely accepted. Before the use of fingerprinting for identification purposes arose, the Bertillon **[p. 625 ↓]** system was used. This system measured and recorded the dimensions of certain bony parts of the body. It was believed that this formula matched only one person and would not change over his/her lifetime. The use of the system was discontinued circa 1900 with the discovery of two individuals who had the same measurements. Will West was sentenced to the U.S. Penitentiary in Leavenworth, Kansas, where it was found that there already existed a prisoner, William West, with identical measurements. Therefore, the Bertillon system was suspended, and fingerprints were substituted for identification purposes.

FBI analysts individually examining fingerprint records stored in hundreds of numbered file cabinets in a federal armory during World War II. The FBI uses 10 points of comparison to make a positive identification of a fingerprint, but the traditional number of points used to determine whether the prints are indeed from the same person is generally 12, as established by Edmond Locard. The court system has not yet established a definitive number of points that must be used to determine identification of a fingerprint.

The origins of fingerprinting are difficult to pinpoint directly; however, prehistoric pictures were discovered in Nova Scotia with detailed writings of ridge patterns of fingerprints. In ancient Babylon, fingerprints were discovered on clay tablets that were used for business transactions, showing that the ancient civilization viewed the prints as an identifying characteristic. Ancient Chinese artifacts show thumbprints on clay seals used for various business and personal purposes. In 14th-century Persia, various official government documents were found to have fingerprints and impressions. A government official of the time, who was also a doctor, noticed that no two fingerprints were alike. This was the first time it was recorded that individuals have distinctive and unique fingerprints.

From this discovery in the 14th century, the idea of unique fingerprints has been studied throughout history. Marcello Malpighi noted in his 1666 **[p. 626 ↓]** treatise that there appeared to be ridges, spirals, and loops in different configurations in fingerprints. He did not realize at the time that this could be a tool used for identification purposes but did discover a layer of skin that was 1.8 millimeters thick. This layer of skin was later named the Malpighi layer. John Evangelist Purkinji published his thesis, stating that there were nine different fingerprint patterns that existed. However, he too did not hypothesize that these patterns could be used for identification of individuals. Nevertheless, England started using fingerprints for identification in 1858 with the aid of Sir William Hershel. In India, Hershel used fingerprints on native contracts, requiring that the individual put his/her palm/handprints on the back of every contract. Based on their superstitious beliefs, this practice scared the natives, preventing them from

going back on their word. This method was also used to prevent pension fraud by assembling files of pensioners' fingerprints. From his work with these impressions, Hershel noticed that the impression could be used to prove or disprove identities. There was no scientific backing for this practice at the time.

In 1880, Henry Faulds studied skin furrows (grooved or deep wrinkles) that were found on prehistoric pottery. From his study, he devised a method for classification for fingerprints and realized their identification power. His classification system was published in *Nautre* (Nature), where it explained how fingerprints could be used in identification and the use of printer's ink. He was credited with the first fingerprint identification of a greasy fingerprint left on an alcohol bottle.

Faulds passed his classification system on to Charles Darwin for continuation; Darwin in turn passed on the system to his cousin Sir Francis Galton for prolongation. Galton published his own book *Fingerprints* showing the first classification system where the main focus was on determining heredity and racial background. His book scientifically proves that both Herschel and Faulds were correct. Fingerprints do not change over time, and no two individuals have the same fingerprints, the odds of which he found was 1 in 64 billion. In his classification system, which is still used today, Galton described characteristics by which prints can be compared. These characteristics were called Galton ridges at the time and were described as line-like structures on the skin of the palm side of the finger past the last joint (now called minutia).

In the United States, Gilbert Thompson was the first individual to use his own fingerprints to prevent forgery during his geological survey of New Mexico. The first use of fingerprinting as an identification tool in criminal matters was by Juan Vucetich in 1892. Vucetich had been filing fingerprints following the teachings of Francis Galton. When a bloody fingerprint was found at a murder scene, Vucetich used the fingerprint to identify the killer. From there, Henry P. DeForrest pioneered the widespread use of fingerprinting as an identification resource in the United States.

In 1902, the first systematic use of fingerprints in the United States by the New York Civil Service Commission for testing was implemented. A year later, the New York state prison system began the first systematic use of fingerprints for criminals. A student of Bertillon, Edmond Locard, established the first rules for the minimum number of minutia

(Galton ridges) necessary for identification: A minimum of 12 points must be established between the known and unknown prints in order to make an accurate identification. The use of fingerprints for identification purposes had already become mainstream in the United States, however, as evidenced by their inclusion in the identification of a murderer in the 1883 book *Life on the Mississippi* by Mark Twain (Samuel L. Clemens).

Collection and Comparison

Traditionally, fingerprints are detected using powder that sticks to the sweat, oils, and grease left after an individual touches an object. A technician, using a light hand, spins a fingerprinting brush that has been dipped in powder over the area in question. When a latent (unseen) print appears, the technician uses lifting tape to lift the print and place it on a print card for analysis. Collecting fingerprints has evolved over the years to involve chemical agents, such as ninhydrin and a cyanoacrylate mixture. Ninhydrin is a small particle reagent that reacts with the amino acids that are secreted from pores in the fingertips, turning the print a light purple/pink color. This chemical is mainly used on porous materials, such as paper or money. A cyanoacrylate mixture is used to fume an object for latent prints. Cyanoacrylate (superglue) **[p. 627 ↓]** is mixed with baking soda and sawdust to create a superglue mist that covers the object, gluing any prints that may be on said object and protecting them from disruption. From here, the technician can powder the print to lift and analyze.

The comparison of fingerprints is considered an art form mastered through practice and patience. To become a certified fingerprint technician, extensive training is required along with career-long maintenance training. To start a comparison between a known print and an unknown print (fingerprint lifted from an area of interest), an individual compares the cores. There are three main core patterns: arch, loop, and whorl. The arch pattern originates from one side of the print and moves laterally into a point. From here, the pattern falls back to the opposite side of the print, giving the pattern a parabolic shape. The arch pattern has two separate styles: plain or tented. The tented arch pattern differs from the plain arch by having an angle or upthrust within the arch. The loop pattern consists of the majority of ridges entering at one side of the print, recurving, and exiting on the same side as they entered. Two subgroups are associated with the loop pattern: ulnar and radial. The distinction between these subgroups can be

made by determining the side in which the loop enters and exits the print (ulnar or radial side).

The last fingerprint pattern is the whorl pattern, consisting of four subpatterns: plain, accidental, double loop whorl, and central pocket loop whorl. The whorl pattern, or plain whorl, generally is described as looking like a bull's-eye starting in the middle of the print and making concentric circles that curve around themselves, moving outward. Whorl patterns generally contain two deltas (collections of ridges that form a triangular shape). The accidental whorl pattern contains two different types of patterns but excludes the plain arch pattern. The double loop whorl pattern is distinctive because it contains two loop formations and two deltas. The last subpattern, the central pocket loop whorl, must contain one recurving ridge within the pattern.

Once the fingerprint technician has determined the central core pattern, minutia points are determined to match the prints to one another. There exist a number of different minutia points, but the most widely used are as follows: delta, ending, island, bifurcation, enclosure, dot, bridge, double bifurcation, trifurcation, spur, and crossover. As described above, a delta is a collection of ridges that form a triangular shape, as in the triangular shape of soil deposits when several rivers collide. An ending ridge steps abruptly and never picks up again. An island ridge has a starting and stopping point (most ridges do not have definitive beginnings and endings). A bifurcation involves a single ridge that divides into two ridges. An enclosure involves the splitting of a ridge into two ridges that eventually come back together. A dot is a short ridge that does not continue in any direction, with the appearance of a small dot. A bridge involves two ridges that are connected by another ridge, as in a bridge connecting two streets. A double bifurcation point involves a single ridge that divides into two ridges, then divides once again. In relation, a trifurcation point is where a double bifurcation divides a third time. A spur is a short ridge that extends off a longer ridge, as in a spur to a highway in relation to roads. A crossover point is where two ridges cross over one another.

Technicians use these minutia to compare known and unknown prints to one another to determine if they are from the same individual. Comparisons are made by picking a point on the known print to start from and finding the same point on the unknown or lifted print. From this point, another point is found on the known print and marked. The technician counts the ridges from the new point to the original point. He/she uses

this number to determine if the second point of comparison exists on the unknown print as well. The technician continues to determine points of comparison and matches them to the unknown print to determine if the two prints are from the same individual. The traditional number of points used to determine whether the prints are indeed from the same person is generally 12, as established by Edmond Locard. However, the Federal Bureau of Investigation (FBI) uses 10 points of comparison to make a positive identification. There is no definitive number of points that must be used to determine identification of a fingerprint established by the court system as yet.

Flaws and Mistaken Identification

The admissibility of fingerprints as scientific/forensic evidence was debated within the court system for a number of years. However, in 1993, **[p. 628 ↓]** the Supreme Court case *Daubert v. Merrill Dow Pharmaceutical* determined the admissibility of scientific evidence in the court system by establishing five characteristics. The theory or technique must (1) have been or be able to be tested, (2) been subjected to peer review or publication, (3) have in existence standards controlling the use of the technique as well as maintenance, (4) have general acceptance in the scientific community, and (5) have a known potential rate of error.

Despite the best efforts of fingerprint technicians and the advancement of technology, mistakes can be made in fingerprint comparisons. Many factors can contribute to these errors, such as distortion, small segments, or the absence of a core. Sometimes when a print is lifted from an object, it is distorted because of the angle at which the print was positioned on the object. If distortion occurs, it is hard to accurately match minutia points because they may be missing or stretched. If only a small segment of the print exists or the core is missing, orientation of the print is almost impossible to determine.

Because of these distortions and errors, technicians and software used to compare fingerprints statewide and nationally can make mistaken identifications. There have been several cases involving the mistaken identification of individuals with the use of fingerprints. For instance, in 2004, Brandon Mayfield was originally identified as a participant in the Madrid bombings by a latent print found on the bomb. It was later discovered that a misidentification of fingerprints led to his detainment in relation to

the bombings. In 1998, Stephan Cowans was convicted of the attempted murder of a police officer while fleeing a robbery in Massachusetts. He was acquitted six years later with DNA evidence that showed the fingerprint comparison to be flawed. In 1997, the fingerprint of Shirley McKie (an American citizen) was found at a murder scene in Scotland. Experts in the United States compared the prints found to McKie's and testified on her behalf, and she was cleared of suspicion.

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See Also:

- 1921 to 1940 Primary Documents 1941 to 1960 Primary Documents
- Bertillon System
- Crime Scene Investigation
- Federal Bureau of Investigation
- Forensic Science
- Technology, Police
- Trials

Further Readings

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