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History of Fingerprinting

portrait parlé

A verbal description of a perpetrator's physical characteristics and dress provided by an eyewitness

anthropometry

A system of identification of individuals by measurement of parts of the body, developed by Alphonse Bertillon

Since the beginnings of criminal investigation, police have sought an infallible means of human identification. The first systematic attempt at personal identification was devised and introduced by a French police expert, Alphonse Bertillon, in 1883. The Bertillon system relied on a detailed description (**portrait parlé**) of the subject, combined with full-length and profile photographs and a system of precise body measurements known as **anthropometry**.

The use of anthropometry as a method of identification rested on the premise that the dimensions of the human bone system remained fixed from age 20 until death. Skeleton sizes were thought to be so extremely diverse that no two individuals could have exactly the same measurements. Bertillon recommended routine taking of 11 measurements of the human anatomy, including height, reach, width of head, and length of the left foot (see [Figure 1-3](#)).

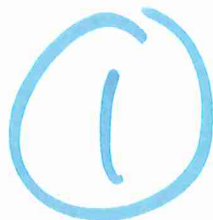
For two decades, this system was considered the most accurate method of identification. But in the early years of the 20th century, police began to appreciate and accept a system of identification based on the classification of finger ridge patterns known as fingerprints. Today, the fingerprint is the pillar of modern criminal identification.

The Chinese used fingerprints to sign legal documents as far back as three thousand years ago. Whether this practice was performed for ceremonial custom or as a means of personal identity remains a point of conjecture lost to history. In any case, the examples of fingerprinting in ancient history are ambiguous, and the few that exist did not contribute to the development of fingerprinting techniques as we know them today.

Several years before Bertillon began work on his system, William Herschel, an English civil servant stationed in India, started requiring natives to sign contracts with the imprint of their right hand, which was pressed against a stamp pad for the purpose. The motives for Herschel's requirement remain unclear; he may have envisioned fingerprinting as a means of personal identification or just as a form of the Hindu custom that a trace of bodily contact was more binding than a signature on a contract. In any case, he did not publish anything about his activities until after a Scottish physician, Henry Fauld, working in a hospital in Japan, published his views on the potential application of fingerprinting to personal identification.

In 1880, Fauld suggested that skin ridge patterns could be important for the identification of criminals. He told about a thief who left his fingerprint on a whitewashed wall, and how in comparing these prints with those of a suspect, he found that they were quite different. A few days later, another suspect was found whose fingerprints compared with those on the wall. When confronted with this evidence, the individual confessed to the crime.

Fauld was convinced that fingerprints furnished infallible proof of identification. He even offered to set up at his own expense a fingerprint bureau at Scotland Yard to test the practicality of the method. But his offer was rejected in favor of the Bertillon system. This decision was reversed less than two decades later.



Herschel 1858
AFIS DG's
JAFIS 1999

The extensive research into fingerprinting conducted by another Englishman, Francis Galton, provided the needed impetus that made police agencies aware of its potential application. In 1892, Galton published his classic textbook *Finger Prints*, the first book of its kind on the subject (see [Figure 15-1](#)). In his book, Galton discussed the anatomy of fingerprints and suggested methods for recording them. He also proposed assigning fingerprints to three pattern types—loops, arches, and whorls. Most important, the book demonstrated that no two prints are identical and that an individual's prints remain unchanged from year to year. At Galton's insistence, the British government adopted fingerprinting as a supplement to the Bertillon system.



FIGURE 15-1
The cover of Sir Francis Galton's book *Finger Prints* which discusses anatomy of fingerprint how to record them, a classification by the three pattern types—loops, arches, and whorls.

The next step in the development of fingerprint technology was the creation of classification systems capable of filing thousands of prints in a logical and searchable sequence. Dr. Juan Vucetich, an Argentinian police officer fascinated by Galton's work, devised a workable concept in 1891. His classification system has been refined over the years and is still widely used today in most Spanish-speaking countries. In 1897, another classification system was proposed by an Englishman, Sir Edward Richard Henry (see [Figure 15-2](#)). Four years later, Henry's system was adopted by Scotland Yard. Today, most English-speaking countries, including the United States, use some version of Henry's classification system to file fingerprints.

FIGURE 15-2
Sir Edward Richard Henry,
British pioneer of fingerprint-
ing for identification
purposes.



Early in the 20th century, Bertillon's measurement system began to fall into disfavor. Its results were highly susceptible to error, particularly when the measurements were taken by people who were not thoroughly trained. The method was dealt its most severe and notable setback in 1903 when a convict, Will West, arrived at Fort Leavenworth prison. A routine check of the prison files startlingly revealed that a William West, already in the prison, could not be distinguished from the new prisoner by body measurements or even by photographs. In fact, the two men looked just like twins, and their measurements were practically the same. Subsequently, fingerprints of the prisoners clearly distinguished them.

In the United States, the first systematic and official use of fingerprints for personal identification was adopted by the New York City Civil Service Commission in 1901. The method was used for certifying all civil service applications. Several American police officials received instruction in fingerprint identification at the 1904 World's Fair in St. Louis from representatives of Scotland Yard. After the fair and the Will West incident, fingerprinting began to be used in earnest in all major cities of the United States. In 1924, the fingerprint records of the Bureau of Investigation and Leavenworth were merged to form the nucleus of the identification records of the new Federal Bureau of Investigation. The FBI has the largest collection of fingerprints in the world. By the beginning of World War I, England and practically all of Europe had adopted fingerprinting as their primary method of identifying criminals.





Figure 6-1. Early, though fictional, fingerprint cards from Twain's *Pudd'nhead Wilson*.



Public Domain

From *Pudd'nhead Wilson's* Collection
 "Every human being carries with him from his cradle to his grave certain physical marks which do not change their character."

Obj. 6.1

Pudd'nhead Wilson is a lawyer created by Mark Twain in the novel of the same name, published in November 1894. In his final address to a jury, Lawyer Wilson exhibits his knowledge of the cutting-edge technology of the day:

Every human being carries with him from his cradle to his grave, certain physical marks which do not change their character, and by which he can always be identified—and that without shade of doubt or question. These marks are his signature, his physiological autograph, so to speak, and this autograph cannot be counterfeited, nor can he disguise it or hide it away, nor can it become illegible by the wear and mutations of time.

No one is sure how Mark Twain learned that fingerprints made good forensic evidence, but he used them in his book to dramatically solve a case in which identical twins were falsely accused of murder. Fingerprints as a means to identify individuals was a major breakthrough in forensic science in real life, as well as in novels, and it gave law enforcement around the world a new tool to solve crimes, clear the innocent, and convict the guilty. Fingerprint cards from *Pudd'nhead Wilson* are shown in Figure 6-1.

For thousands of years, humans have been fascinated by the patterns found on the skin of their fingers. But exactly how long ago humans realized that these patterns could identify individuals is not at all clear. Several ancient cultures used fingerprints as markings (Figure 6-2). Archaeologists discovered fingerprints pressed into clay tablet contracts dating back to 1792–1750 B.C. in Babylon. In ancient China, it was common practice to use inked fingerprints on all official documents, such as contracts and loans. The oldest known document showing fingerprints dates from the third century B.C. Chinese historians have found finger

Figure 6-2. This ancient seal shows the fingerprint of a person who lived hundreds of years ago.



and palm prints pressed into clay and wood writing surfaces and surmise that they were used to authenticate official seals and legal documents.

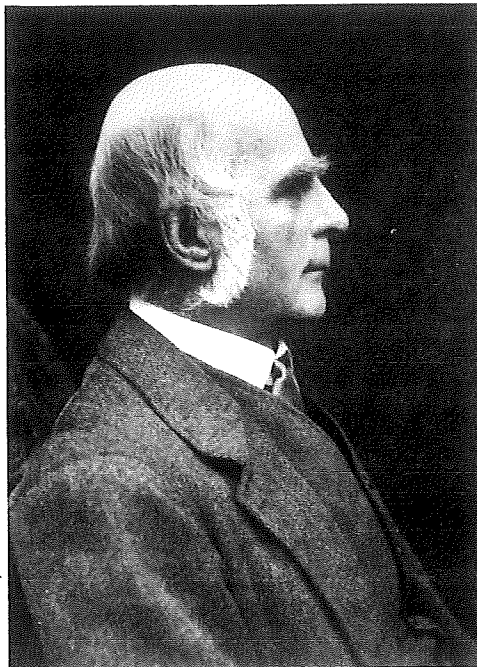
In Western culture, the earliest record of the study of the patterns on human hands comes from 1684. Dr. Nehemiah wrote a paper describing the patterns that he saw on human hands under the microscope, including the presence of ridges. Johann Christoph Andreas Mayer followed this work in 1788 by describing that "the arrangement of skin ridges is never duplicated in two persons." He was probably the first scientist to recognize this fact. In 1823, Jan Evangelist Purkyn described nine distinct fingerprint patterns, including loops, spirals, circles, and double whorls. Sir William Herschel began the collecting of fingerprints in 1856 (Figure 6-3). He noted the patterns were unique to each person and were not altered by age.

Figure 6-3. Sir William Herschel



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Figure 6-4. Sir Francis Galton



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In 1879, Alphonse Bertillon, an assistant clerk in the records office at the Police Station in Paris, created a way to identify criminals. The system, sometimes called Bertillonage, was first used in 1883 to identify a repeating offender.

In 1902, he was credited with solving the first murder using fingerprints. Building on this success, Sir Francis Galton (1822–1911) verified that fingerprints do not change with age. In 1888, Galton, along with Sir E. R. Henry, developed the classification system for fingerprints that is still in use today in the United States and Europe. Galton is shown in Figure 6-4.

Iván (Juan) Vucetich improved fingerprint collection in 1891. He began to note measurements on the identification cards of all arrested persons, as well as adding all 10 fingerprint impressions. He devised his own fingerprint classification system and invented a better way of collecting the impressions. Beginning in 1896, Sir Edmund Richard Henry, with the help of two colleagues, created a system that divided fingerprint records into groups based on whether they have an arch, whorl, or loop pattern. Each fingerprint card in the system was imprinted with all 10 fingerprints of a person and marked with individual characteristics called a **ten card** (Figure 6-5).

Figure 6-5. An early example of a ten card.

LEAVE BLANK		TYPE OR PRINT ALL INFORMATION IN BLACK								LEAVE BLANK	
		LAST NAME: HAM		FIRST NAME		MIDDLE NAME					
STATE USAGE	ALIAS	CONFESION O R		DATE OF BIRTH DOB							
SIGNATURE OF PERSON FINGERPRINTED		DATE ADMITTED OR RECEIVED DOA		SEX	RACE	HGT.	WGT.	EYES	HAIR	PLACE OF BIRTH POB	
THIS DATA MAY BE COMPLETED IN MEDICAL, STATE AND NATIONAL FILES		YOUR NO. OCA		LEAVE BLANK							
DATE	SIGNATURE OF OFFICIAL TAKING FINGERPRINTS		FED. NO. FBI								
CHARGE			SER. NO. SID								
FICIAL DISPOSITION		SOCIAL SECURITY NO. SOC									
		CAUTION									
1. R. THUMB		2. R. INDEX		3. R. MIDDLE		4. R. RING		5. R. LITTLE			
6. L. THUMB		7. L. INDEX		8. L. MIDDLE		9. L. RING		10. L. LITTLE			
LEFT FOUR FINGERS TAKEN SIMULTANEOUSLY		LEFT INDEX		RIGHT FOUR FINGERS TAKEN SIMULTANEOUSLY							

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Alphonse Bertillon was the first person to document incoming prisoners with a photograph, the forerunner of the modern mug shot.

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objects and the authors of relevant documents. One of the best known and accepted methods of personal identification is by matching fingerprints and other friction ridges. **Friction ridges** are the raised portions of the outside layer of skin that form rows that curve and loop across the finger. The pattern these ridges make varies from one person to another and from finger to finger on a single individual. The science of comparison of friction ridge structures such as fingerprints is called **dactyloscopy**. Dactyloscopy employs the science of ridge analysis to analyze and compare fingerprints. Although the use of fingerprints for personal identification has been around for thousands of years, it is still evolving. Scientists are actively researching more objective methods of comparing fingerprints and new ways of visualizing them. To some extent, the principles discussed in this chapter also apply to other areas of the body that contain friction ridges. These include the palms of the hands, the soles of the feet, and even lip prints. However, these prints are much less commonly encountered than fingerprints and will not be discussed further in this chapter.

The Quest for a Reliable Method of Personal Identification

There is anecdotal evidence that Chinese people used fingerprints as a form of signature for legal documents more than three thousand years ago. It is not known whether this was done for the purpose of identifying the author of the document and there is no surviving evidence that any basic principles were developed that guided people in identifying fingerprints or comparing them.

The first organized use of friction ridges for identification occurred in the late 1870s when William Herschel, a British official posted in India, started requiring that any contracts involving indigenous people contain imprints of their entire hands. Again there is no evidence that he had developed any systematic way of linking these handprints to a particular person.

The first article that discussed the use of fingerprints for identification purposes was published in *Nature* in 1880 by Henry Fauld. He was a missionary in Japan working in a hospital when he discovered that there were unique patterns of human fingerprints. He tried to chemically alter his own fingerprints but the original pattern grew back. He demonstrated that fingerprint impressions could be taken by dipping the fingers in ink and suggested that they could eventually be collected from crime scenes. He even used fingerprints to help the Tokyo police in a burglary investigation. Fauld was interested in doing more research and eventually appealed for funds to the famous anthropologist, Charles Darwin. Darwin passed on the appeal to his nephew, Sir Francis Galton. Galton didn't fund Fauld, but did take credit for Fauld's discoveries.

During this same time period, in 1883, a French police expert, Alphonse Bertillion devised the first systematic method of personal identification. His system relied on a carefully constructed and detailed description of a person. This was called the portrait *parlé* and was accompanied by full-length photographs and precise measurements of the body called **anthropometry** (an-thro-póm-e-tree). Bertillionage, as the complete system was called, was based on the unproven premise that, after the age of about 18, the human skeleton stops growing. In addition, it was thought that all skeletons were different and this was reflected in the uniqueness of the body measurements that he prescribed. Bertillionage was considered a reliable method of personal identification into the beginning of the twentieth century. However, in 1903 the Will West affair signaled the demise of Bertillionage. Will West was sentenced

to Leavenworth Prison in Kansas after being convicted of a crime. At that time, the prison system routinely collected portraits parlé on its prisoners to keep track of them. When West was being processed at the prison, officials found that there already was a William West serving time in Leavenworth. His body measurements were virtually the same as the incoming prisoner and in fact, the two men looked like twins. Their fingerprints were very different, however. This case showed that Bertillionage could not be relied upon as a means of personal identification and it quickly fell out of favor and was replaced by fingerprints.

Meanwhile Sir Francis Galton published a book titled *Finger Prints*. This book can be found online at the website www.galton.org. One of the major contributions of this book was that it proposed that all fingerprint patterns could be put into one of three categories: loops, arches, and whorls. Galton also asserted that all fingerprints were unique and that they didn't change throughout life.

Once Galton suggested that fingerprints fell into certain patterns, the next step was the development of a classification system. The goal of such a system was to put a set of fingerprints from one person into one of a small number of groups. This would make searching through many sets of fingerprints easier. If a person were fingerprinted and the police wanted to know if that person was already in a data base, the classification of fingerprint sets would make that feasible. As it turned out, two independent classification systems were developed at about the same time. Juan Vucetich, an Argentine police officer, became interested in Galton's work and developed the first classification system. It has been continuously refined and is still widely used today in South and Central America. In England, Sir Edward Henry developed a somewhat different classification system. It too has survived and, although it has been modified, is used today in the United States and much of Europe.

The original Henry system used five classifications to put a set of ten fingerprints into one of thousands of classes. This worked well until the number of sets of fingerprints in each class became so large that it ceased to be practical as a searching tool. In recent years, the FBI has added additional classifications to increase the number of classes. The classifications developed by Henry used certain characteristics of each fingerprint. These included designating which fingers had loops, arches, and whorls and how many ridges were in a particular pattern. The Henry classification system is discussed in more detail later in this chapter.

The Origin of Fingerprints

The purpose of fingerprints as well as the friction ridges on the palms and soles of the feet is to provide a textured surface for gripping and holding on to objects. Fingerprints arise from the skin, particularly the **dermal papillae**, the layer of cells between the **epidermis** (the outermost skin layer) and the **dermis** (the inner layer of the skin). These layers can be seen in Figure 7.1. Fingerprint ridges begin forming when the fetus is in the womb at about the eighth week of gestation and are fully formed by the seventeenth week. From that point on, barring artificial means of alteration, fingerprints do not change throughout life except to grow larger as the body grows.

As the friction ridges develop, perspiration glands are formed. These terminate in rows of sweat pores that form on the fingerprint ridges. As perspiration is discharged from the sweat glands, it exits through the pores onto the surface of the ridges. Perspiration residue along with sweat, skin cells, proteins, fats, and other