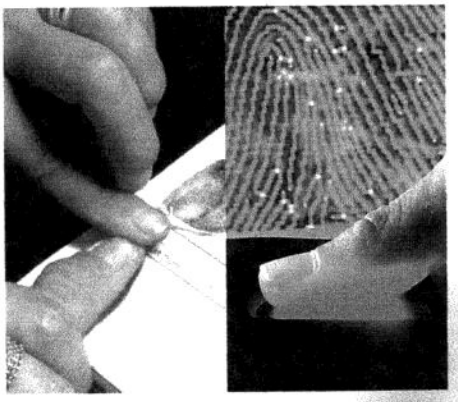
Fingerprinting

Ancient Babylonians used fingerprints to "sign" contracts as long ago as 2000 BC, but the forensic use of fingerprints only dates back to the late 19th century. Despite more modern methods, such as DNA profiling, fingerprint identification is still widespread, thanks to the unique pattern of raised ridges on our fingertips.



FINGERPRINTING SUSPECTS ▲
The traditional way to record fingerprints is to ink each fingertip and roll it across the card (above left). Increasingly, hands are scanned electronically (above right) to add prints directly to the database.

Fingerprint evidence relies on the classification of fingertip patterns. Without an organized system, police could only prove that a suspect was at a crime by directly comparing crime-scene marks with the suspect's prints. With classified files, however, police can compare the marks they find with the stored fingerprints of thousands, or even millions, of known criminals.

Classification

Systematic fingerprint records began in 1891 in Argentina (see box below). Five years later, English fingerprint expert Edward Henry developed a "ten-print" classification system—the most widely used method until computers took over in the late 20th century.

Henry separated fingerprint patterns into two groups—value patterns (whorls) and nonvalue patterns (loops and arches). A finger with a whorl pattern was given a numerical value that depended on the finger's position. For example, a whorl on the right thumb had a value of 16, but on the left little finger had a value of 1. By grouping together values from certain fingers, Henry formed a fractionlike code for each set of ten prints. He created 1,024 different codes. Any set of prints could be easily filed using their code.

This system worked well for identifying criminals working under aliases. Newly arrested suspects were fingerprinted and coded. Comparing their prints with those of known criminals filed under the same code meant searching for a match was much faster than searching through the whole collection. But because a complete set of ten prints was required, the system was of limited use for matching finger marks found at crime scenes. Single-print systems, introduced in the 1930s, got around this by classifying and filing separately the prints of individual fingers.

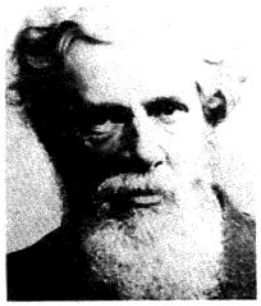
Comparison

Single-print systems did not avoid the task of comparing a crime-scene mark with every similar print on file. In this time-consuming and skilled procedure, fingerprint examiners look at the characteristic shape of ridges. They compare where the ridges start and end, and where they join and split. Also noted are the positions of short ridges and dots, as well as any areas enclosed as "lakes." Examiners look for points of similarity between mark and print to decide whether the two patterns match.

Computer databases

If a print found at a crime scene shows a complete fingertip with an unusual pattern, it can be quickly matched. However, crime-scene finger marks are rarely perfect, and their quality often restricts a search.

As fingerprint collections began to grow, the task of searching through them mushroomed. But from the 1960s

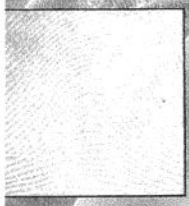


William James Herschel
1833–1917

WILLIAM JAMES HERSCHEL first used fingerprints to identify Indian pension claimants in the 1860s. He demonstrated that the pattern did not change with age. Over the next 30 years, Henry Faulds suggested that fingerprints were unique, and Francis Galton published a scientific study of prints and their value in identification. These three pioneers were all British, but it was an Argentinian police official, Juan Vucetich, who developed the first criminal fingerprint ID system, in 1891. The system was used to convict a murderer the following year.

◀ LOOPS
Ridges can fold back on themselves to form a loop. Radial loops originate at the thumb side; ulnar loops travel in the opposite direction.

◀ WHORLS
When ridges revolve around a point on the finger, a whorl is formed. Along with ulnar loops, these are the most common types of prints.



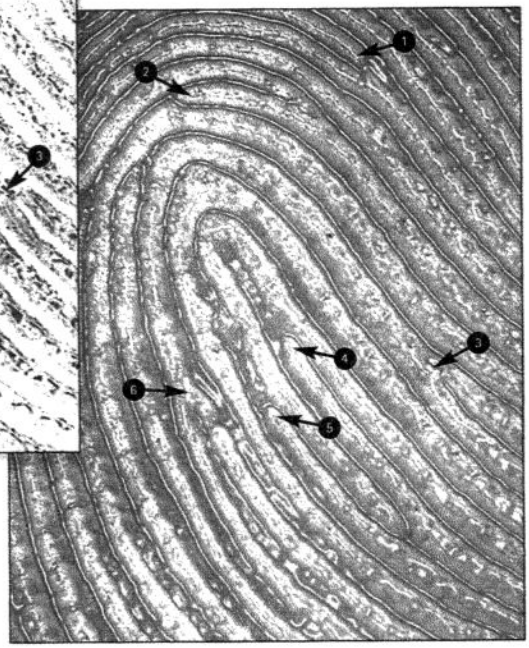
◀ ARCHES
Formed when the finger's ridges lie above one another in an arch-like shape. These are the least common of the three main patterns.

onward, computers began to help. For thirty years automated fingerprint identification systems (AFIS) were developed, until they were sufficiently fast and dependable to be widely adopted.

The computerized systems in use today scan prints retrieved from the scene and plot the relative positions of individual ridge characteristics, such as bifurcations (where the ridges divide into two). They also record the direction of the ridge at each of these points. The computer then compares this data with similar information from prints in the database, and presents a ranked list of the most likely matches. Fingerprint examiners then compare the crime-scene print with this "shortlist" in the traditional way to confirm any match.

The main advantage of this approach is with partial prints. An incomplete whorl pattern looks just like a loop, so a manual search would begin in the wrong part of the database, and would fail. AFIS systems do not need to divide prints into the traditional pattern categories, so they can process "mark against print" searches very quickly and suggest possible matches.

AFIS has revolutionized fingerprint searches: the FBI's system can perform 40,000 searches a day. Until the introduction of AFIS, suspects were often released without being charged because manual searches took so long.



PRINTING A FINGER
An inked finger prints a mirror image of its ridge patterns. The above print has been reversed to help compare it with the original finger (right). Note their unique ridge endings (points 1, 2, 4, and 5) and bifurcations (points 3 and 6).

PRINTS FROM THE DEAD ▲
Taking fingerprints from the recently dead is not generally difficult once rigor mortis has passed, but older corpses present problems. Skin often peels from drowning victims, and forensic technicians may have to wrap it around their own fingers to take prints.

CASE STUDY

"I've got him! He's here!" With a triumphant shout, a fingerprint searcher in Blackburn, England, marked the end of one of the biggest manhunts in British history. It began in May 1948, when three-year-old June Devaney disappeared from her hospital crib. After a two-hour search police found her battered corpse nearby. Fingerprints on a hospital bottle did not match those of hospital staff, or known criminals, so police fingerprinted every male voter in Blackburn—more than 40,000 people. None of them matched the prints on the bottle. Desperate to find the killer, police checked numbers on ration cards, which Britons needed to buy food during and after World War II. They found 200 Blackburn men who were not registered voters, and took their prints. One set matched: those of Peter Griffiths (pictured). Confronted with the evidence, this 22-year-old former soldier confessed to the killing and was hanged on November 19. The other citizens' fingerprint records were destroyed.

CASE STUDY