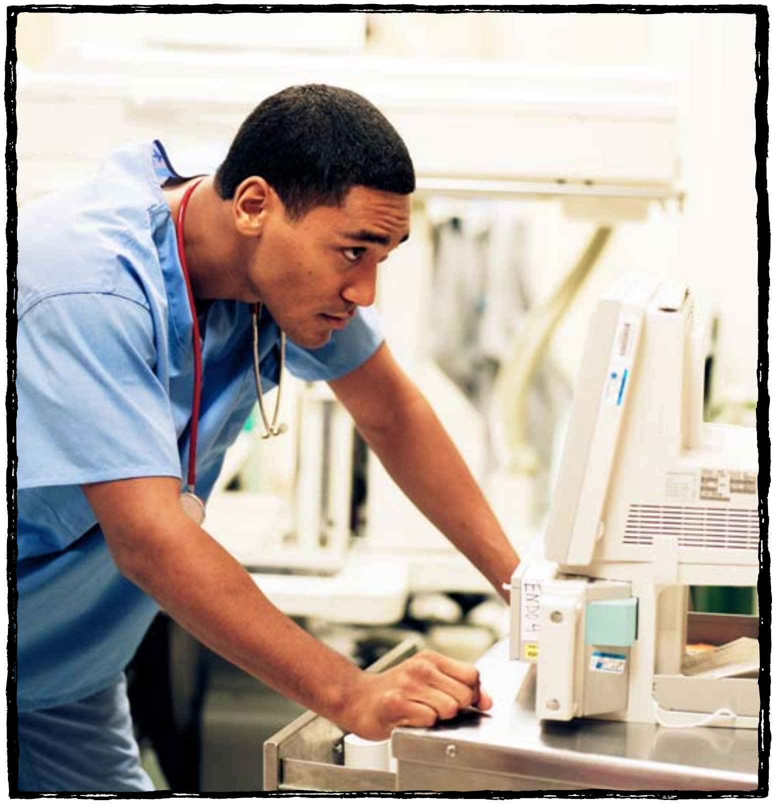
Seeing the Evidence: Forensic Scientists at Work

A Reading A–Z Level X Leveled Book
Word Count: 1,680



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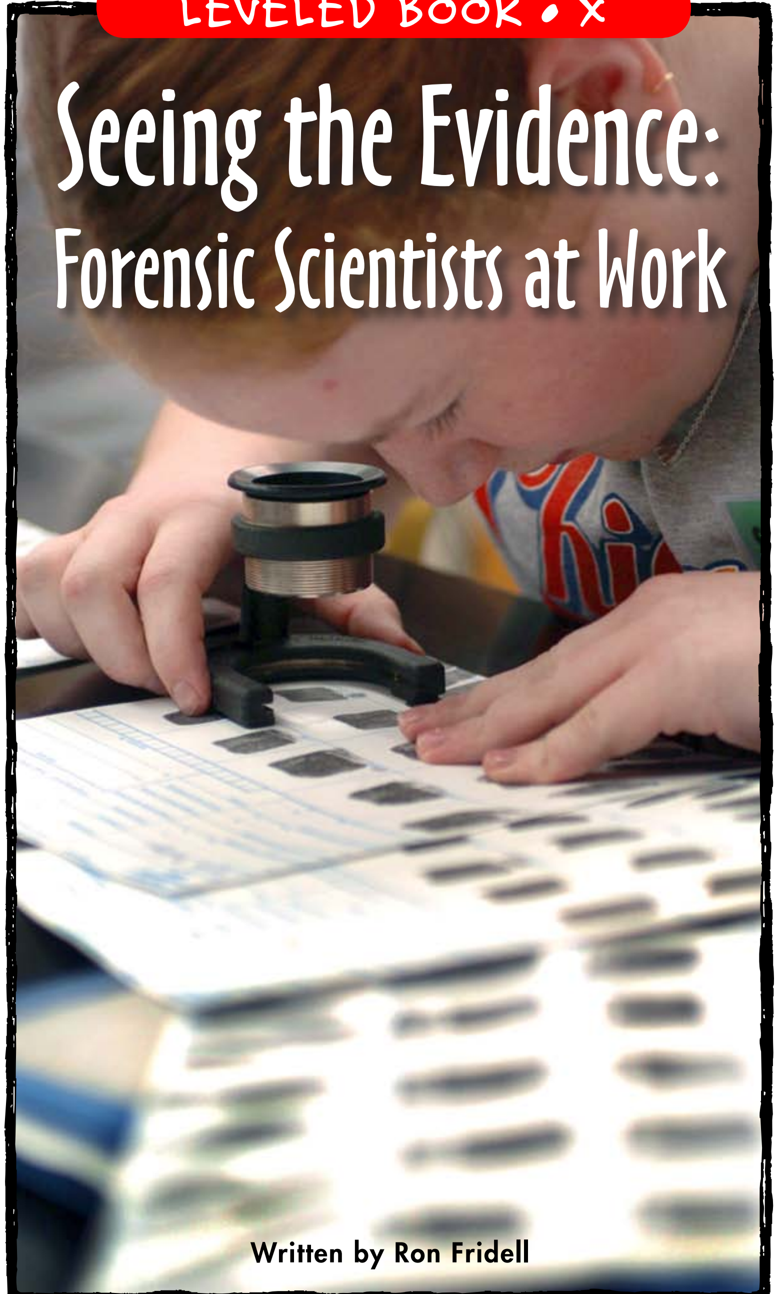

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Correlation

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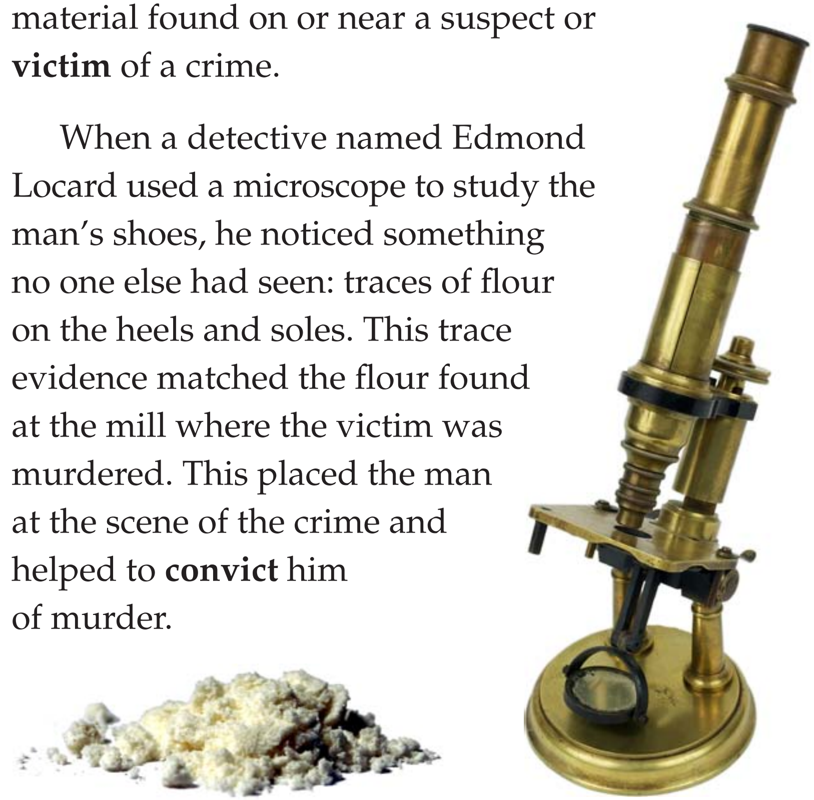
Introduction

A man walked quickly across a field into an old mill, a building where wheat was crushed to make flour. Inside the building, he murdered someone and then hurried away without being seen.

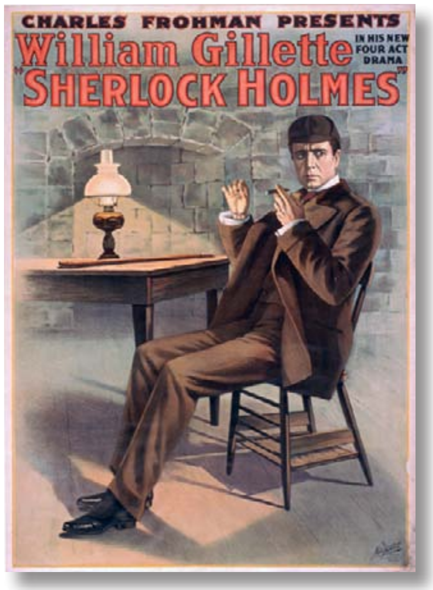
Later, when police questioned the man, he insisted he was innocent. This **suspect** might have gotten away with murder if only he had wiped **trace evidence** off his shoes. Trace evidence is dust, hairs, threads, and other tiny bits of material found on or near a suspect or **victim** of a crime.

When a detective named Edmond Locard used a microscope to study the man's shoes, he noticed something no one else had seen: traces of flour on the heels and soles. This trace evidence matched the flour found at the mill where the victim was murdered. This placed the man at the scene of the crime and helped to **convict** him of murder.



Traces of flour could be seen on the suspect's shoes with a microscope.

The flour mill murderer was caught by **forensic science**, the use of science to solve crimes and convict criminals in courts of law. Detectives began to use science to solve crimes around 1900. Before then, police used **eyewitnesses** and **informers** to solve crimes.



One of the first detectives to use forensic science was a make-believe one, an Englishman named Sherlock Holmes. The popular Holmes stories and novels, written by Sir Arthur Conan Doyle, started appearing in 1887. Most of the stories began in the fictional detective's cluttered London home, where shelves bulged with scientific reference books, and tables teemed with test tubes and microscopes.

Besides these tools of science, Holmes used his powers of concentration and **deduction** to see what no one else noticed. In *A Case of Identity*, for example, Holmes and his friend, Dr. Watson, receive a visit from a young lady who seeks their help in solving a crime. Holmes comments that she must have left home in a hurry, since her boots were mismatched and not properly laced up.

Victorian boots, such as those from *A Case of Identity*

Holmes's deduction amazes Watson. Watson wonders how he missed this detail about their visitor. It's simple, Holmes says, "You did not know where to look, and so you missed all that was important."

In the following four real cases, forensic scientists, like Holmes, know where to look to spot important evidence. As you read, put yourself in their place and test your own powers of concentration and deduction.

Case File #1

Place: Oregon, U.S.A.

Date: October 11, 1923

Crime: attempted robbery of a train known as the "Gold Special"

Evidence: a pair of men's overalls

The Crime

The scene of the crime is a remote stretch of railroad track in southern Oregon. The year is 1923. A Union Pacific freight train has been robbed. The bandits killed the engineer and used a homemade dynamite bomb to blow open the mail car. Back then mail often held valuable stock and bond certificates and sometimes cash or gold. When police searched the scene, the only piece of evidence they found was a pair of stained overalls that one of the bandits had left behind.

STOP & THINK

What could someone discover about you from examining your clothing? What would it tell about you?

How the Case Was Solved

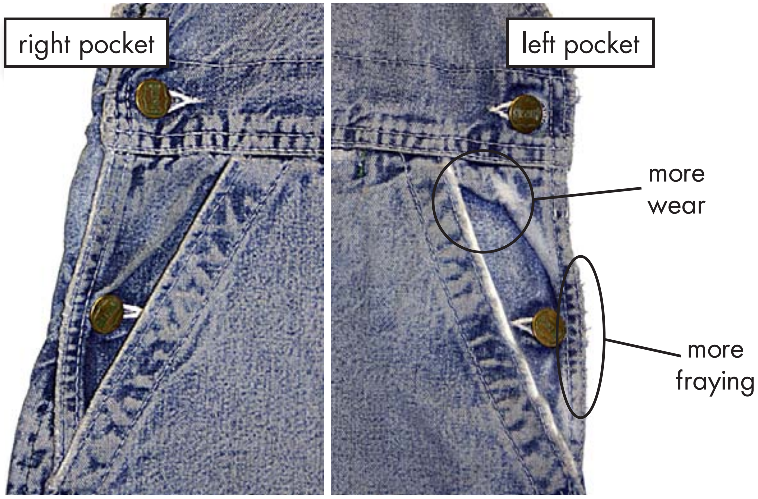
The police asked for help from Edward Heinrich, head of the Berkeley, California, forensic science laboratory. Heinrich was famous for being able to discover a great deal from very little evidence.

Heinrich told the police to be on the lookout for a left-handed lumberjack in his early twenties weighing about 166 pounds and standing 5 feet 10 inches tall. He also said the lumberjack had light brown hair, rolled his own cigarettes, and was unusually neat about his appearance.

Keen observation led Heinrich to conclude that one of the train bandits was a left-handed lumberjack.

Case Fact!

The bandits actually used too much dynamite and blew up any money that may have been in the mail car. The explosion was so loud and destructive they ran from the scene without having robbed anyone of anything.



Just as Holmes amazed Dr. Watson, Heinrich amazed the police. How could he have discovered all that from a pair of overalls?

Heinrich explained: The fact that the left pocket was more worn than the right meant the owner was left-handed. What stained the overalls was sap from trees that grow in southern Oregon forests where lumberjacks work.

The overalls' size told Heinrich the lumberjack's height and weight, and he could estimate the owner's age from a light brown hair caught on a button. Tobacco shreds in a pocket and nail clippings caught in a seam told him the rest.

Tobacco strands

Nail clippings

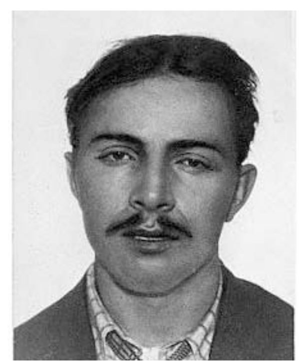
Single hair

And one more thing, Heinrich said, showing police a piece of paper he had found rolled up at the bottom corner of a pocket. The paper was bleached clean from many washings, but when treated with iodine, words began to appear. It was a receipt from a post office, made out to Roy D'Autremont of Eugene, Oregon.

Post Office receipt

Police went to Roy's house and learned that he was missing, along with his two brothers. Neighbors' descriptions of Roy matched Heinrich's description exactly. When police tracked down the brothers several years later, they confessed to the robbery and murder and were sent to prison. The railroad robbers case was just one of some 2,000 cases that Heinrich solved during his career as a forensic investigator.

Hugh D'Autremont



Roy D'Autremont

Ray D'Autremont

Case File #2

Place: Anyplace U.S.A.
Date: Anytime after 1950
Crime: a series of burglaries
Evidence: dirty dishes


Unwashed dishes

The Crime

Police believed that a series of burglaries had been committed by the same gang of thieves. Finally, they discovered where the thieves lived. The gang was one step ahead, though. When detectives raided their apartment, it was empty. The thieves were gone.

The police searched the apartment, but they could find no trace evidence. The entire place had been wiped clean, but not quite. The thieves had forgotten to run the dishwasher.

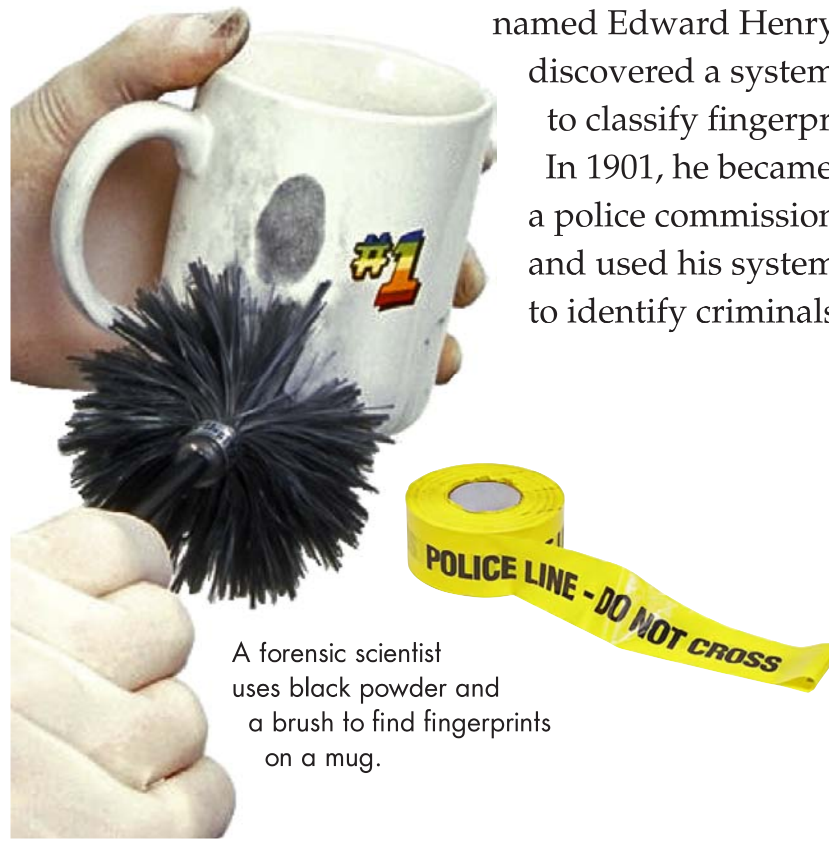
STOP & THINK

What evidence could the police find in the dishwasher?

How the Case Was Solved

How could the police discover their identities? The secret was on the thieves' hands. Look closely at the tips of your fingers and thumbs, and you will see raised ridges of skin running in patterns of curving lines: your **fingerprints**. Each of your fingerprints is different from the other nine, and each one is unique. No one else on Earth has fingerprints like yours, and no one ever will.

In 1896, an Englishman named Edward Henry discovered a system to classify fingerprints. In 1901, he became a police commissioner and used his system to identify criminals.

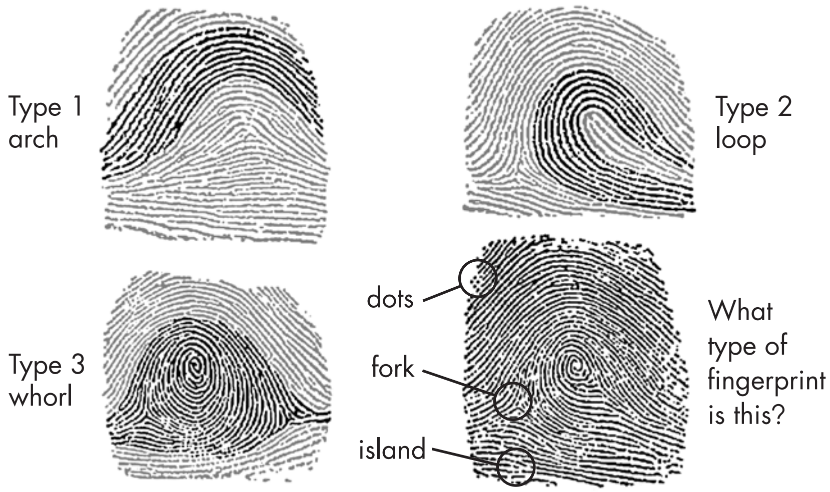


A forensic scientist uses black powder and a brush to find fingerprints on a mug.

Classifying Fingerprints

Edward Henry based his system on features that every fingerprint shares. Every print has ridges (the raised lines) and furrows (the low spots between ridges). And every print has arches, loops, and whorls. Arches are either tented (pointed at the top) or plain (rounded). Loops are either radial (running toward the thumb) or ulnar (running toward the little finger). Whorls are circular.

Henry added smaller features to his system, known as forks, dots, islands, hooks, and bridges. All together, the type, number, and position of these features make each fingerprint unique.



Henry's basic system is still used today. Police have about 50 million fingerprints in computer databases. Prints found at crime scenes can be compared quickly with all the prints in the databases. When a match turns up, police have a piece of evidence that places a person at the scene of a crime.

Criminals know this, and many are careful to leave no fingerprints behind. When **crime scene investigators** (CSIs) searched the thieves' apartment, at first they found no fingerprints. It looked as if the thieves had carefully wiped the whole place clean, floor to ceiling. However, the CSIs got fingerprints from the dishes in the dishwasher and matched them to prints in the database. The robbers were caught because of their dirty dishes.

A technician uses a computer database to match fingerprints of suspects to crimes.

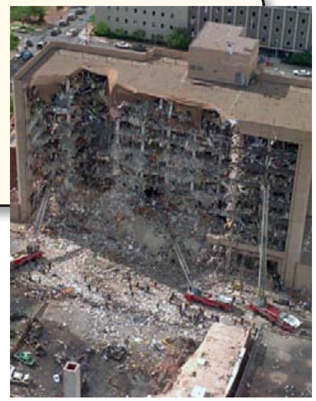
Case File #3

Place: Oklahoma, U.S.A.

Date: April 19, 1995

Crime: a federal building is blown up

Evidence: a truck axle



Murrah Federal Building, Oklahoma City

The Crime

The crime scene investigators sometimes have only a small apartment to search. But sometimes the crime scene is huge. In this case, the CSIs had several city blocks covered in thousands of tons of rubble to search for clues that would lead them to a suspect.

At 9:08 on the morning of April 19, 1995, an explosion rocked downtown Oklahoma City, Oklahoma. A truck carrying a 5,000-pound bomb exploded, blowing away the front of the nine-story Murrah Federal Building. The blast killed 168 people and injured more than 500. The bomber set off the blast by remote control and drove away.

STOP & THINK

How could a truck axle lead investigators to the suspect?

This part of a truck's vehicle identification number gave investigators evidence used to solve the bombing case.

How the Case Was Solved

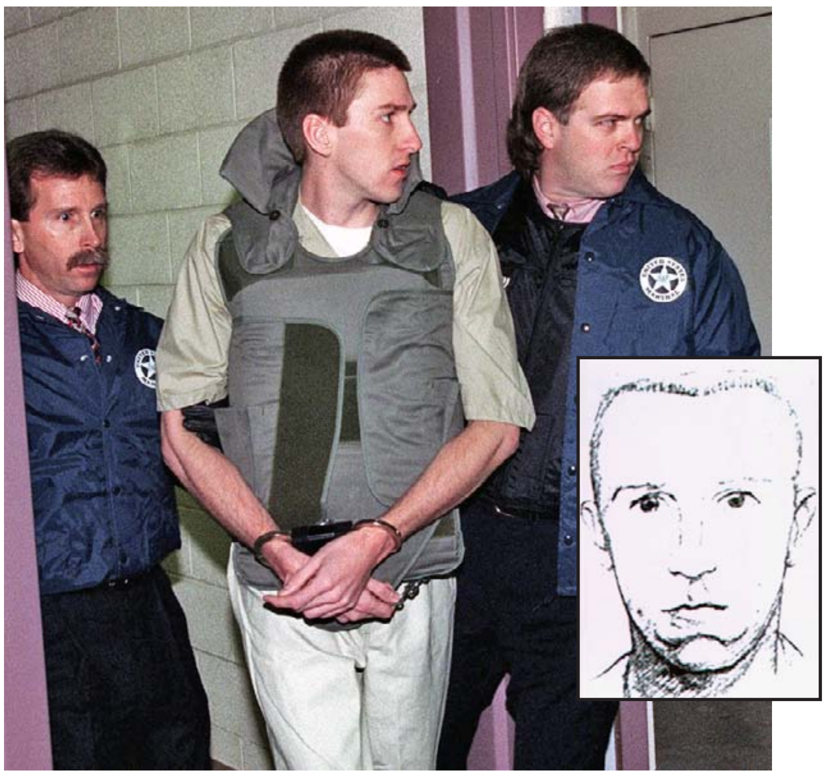
After searching for days, investigators finally found a small piece of a truck's axle. The rear axle belonged to the truck that carried the bomb. The rear axle of every truck has a **vehicle identification number** (VIN) in the metal. This piece of axle had only part of the VIN, but it was enough to lead investigators to a truck rental office in Junction City, Kansas.

The clerk remembered renting the truck to a man named Robert Kling. The name was false, but the clerk remembered what the man looked like.

A forensic artist made a sketch from the clerk's description, and the owner of a nearby motel recognized the face. The man had rented a room from him and had used the name Timothy McVeigh.

Investigators ran the name through a national crime computer database and came up with a match. A man by that name was being held on a traffic and weapons charge in the Perry, Oklahoma jail—and was about to be released.

Investigators got there just in time. The Oklahoma City bomber was caught, thanks in large part to the work of forensic investigators. Timothy McVeigh was later tried, convicted, and put to death for the bombing.



The forensic artist's sketch led investigators to Timothy McVeigh.

Locard's Exchange Principle

Edward Heinrich did his work in a **crime lab**, a room filled with scientific equipment used to help discover and study forensic evidence.

The world's first crime lab was set up in 1910 in Lyons, France, by police detective Edmond Locard. Locard stated a guiding principle that today's forensic scientists still follow. He called it the **Exchange Principle**: "Objects or surfaces that come into contact always exchange trace evidence."

In other words, everyone who enters a **crime scene** takes away something from the scene and leaves something of themselves behind. Locard, you'll remember, was the detective who solved the flour mill murder case.

A forensic scientist works in a lab more modern than that of Edward Heinrich.

Case File #4

Place: England, U.K.

Date: 1993

Crime: armed robbery of $100,000

Evidence: a nylon stocking used as a mask

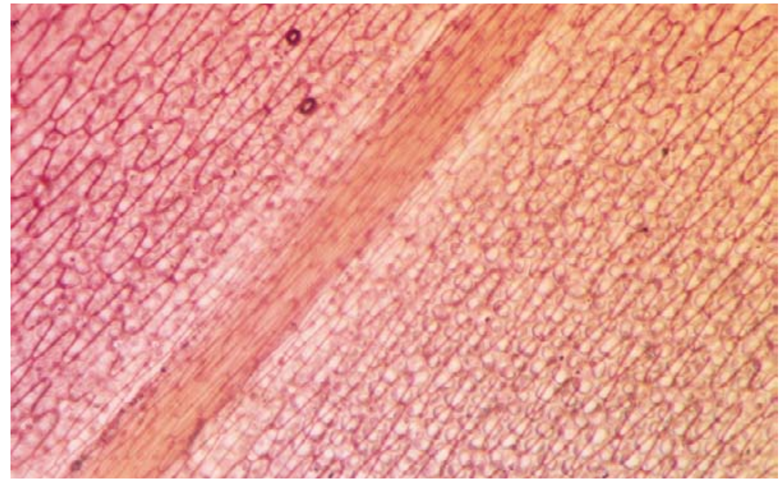
nylon mask no mask

The Crime

The scene of this crime is the office of a manufacturing company in England in 1993. The $100,000 cash used to pay workers is in the office when an armed robber breaks in and carries off the money.

Crime scene investigators found no fingerprints in the office. The only piece of evidence left behind was the robber's mask, a woman's black nylon stocking. Unlike the overalls in Case No. 1, the stocking had no pockets or seams where trace evidence could be discovered.

What tiny bits of evidence might be left on the stocking?



A view of skin under a microscope isn't the same as a microscopic picture that makes a DNA profile.

How the Case Was Solved

When the robber pulled off his mask back in 1993, twenty-five of his skin cells came off with it. In 2004, eleven years later, scientists were able to make a **DNA profile** from the stored skin cells, which led police to a suspect named Andrew Pearson.

At Pearson's trial in 2004, a forensics expert showed that his DNA profile was an exact match for the profile from the skin cells on the robber's mask. What were the chances that these skin cells could have come from another person and not Pearson? A billion to one, the expert said. Pearson was convicted of the 1993 robbery and sent to prison.

DNA Profiling

Modern scientists and engineers keep inventing new and better ways to gather forensic evidence. The most important new way is known as DNA profiling.

DNA is the part of each of your body's cells that carries instructions that tell your body how to live and grow. About 98 percent of these instructions are the same in all people. The 2 percent that are different make your DNA unique, just like your fingerprints.

Scientists can make **microscopic**, X-ray pictures of unique DNA, known as DNA profiles. Police have developed computer databases of DNA profiles, just like fingerprint databases.

DNA can be collected from almost any cell in your body, including cells in your hair, saliva, blood, sweat, and tears. Police hoped to gather DNA evidence from the robber's stocking. They failed in 1993, but in 2004 things were different. DNA technology had advanced so that even a single skin cell could produce a DNA profile.

A computer is used to match DNA profiles.

Conclusion

Each of the four cases in this book deals with a different kind of forensic evidence. There are other kinds of forensic evidence, too—footprints, shoe prints, palm prints, lip prints, bite marks, paint chips, tire tread marks, the markings on a bullet, and more. Any of these can link suspects to the scene of the crime, or can show who is innocent.

tire tread marks

bullet

shoe print

Together, the law enforcement officers and scientists who gather and study forensic evidence use virtually all of the sciences, from anthropology to zoology, in their work. Whatever science they specialize in, they all have one thing in common. Like the fictional Sherlock Holmes, they use their knowledge to see what goes unnoticed by the rest of us.

Glossary

convict *(v.)* — to prove guilty of a crime (p. 4)

crime lab *(n.)* — place where scientific materials, such as microscopes and chemicals, are used to analyze forensic evidence (p. 18)

crime scene *(n.)* — place where a crime has been committed and where investigators look for evidence to solve it (p. 18)

crime scene investigator (CSI) *(n.)* — law enforcement officer who investigates a crime scene to search for forensic evidence (p. 14)

deduction *(n.)* — a specific conclusion made from general evidence (p. 6)

DNA *(n.)* — deoxyribonucleic acid; a single molecule in a cell containing the instructions for growing and operating a living organism (p. 21)

DNA profile *(n.)* — X-ray photograph of a section of DNA that positively identifies the person it came from (p. 20)

Exchange Principle *(n.)* — Edmond Locard's idea that objects or surfaces that come into contact always exchange bits of trace evidence (p. 18)

eyewitnesses *(n.)* — people who have seen something happen such as a crime or accident (p. 5)

fingerprints *(n.)* — the unique patterns of ridges and furrows on the tips of fingers and thumbs (p. 12)

forensic science *(n.)* — the areas of science that apply to a court of law, often proving guilt or innocence (p. 5)

informers *(n.)* — people who secretly give information about a crime, often for a reward (p. 5)

microscopic *(adj.)* — so small that it can only be seen with a microscope (p. 21)

suspect *(n.)* — a person who is believed guilty of a crime (p. 4)

trace evidence *(n.)* — dust, hairs, threads, and other bits of material used as forensic evidence (p. 4)

vehicle identification number (VIN) *(n.)* — unique multi-digit number imprinted on a car or truck (p. 16)

victim *(n.)* — someone harmed by an act or condition, such as a crime or war (p. 4)

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