How Impression Evidence Works

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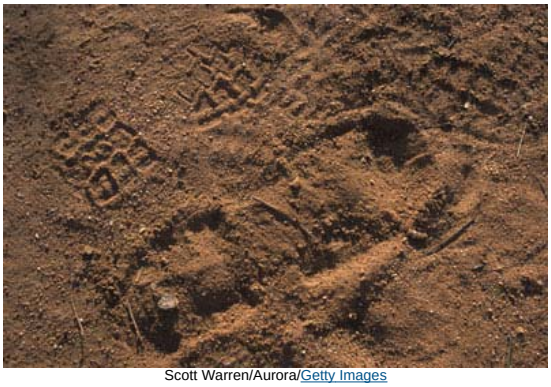
Introduction to How Impression Evidence Works

Fingerprints, along with the magnifying glass and the microscope are one of the most iconic and recognizable images connected to crime scene investigations and forensic science. The opening credit montages for many television crime dramas often superimpose large, ominous details of fingerprints over shots of the main characters. The old logo for the crime network TruTV, formerly known as Court TV, featured a prominent image of a fingerprint. This form of evidence has become a metaphor for uniqueness, an important concept in forensic science.

Forensics Image Gallery



Scott Warren/Aurora/Getty Images

Footprints are examined by customs agents tracking drug smugglers along the Mexican border. How can impression evidence help forensic scientists identify suspects? See more forensics pictures.

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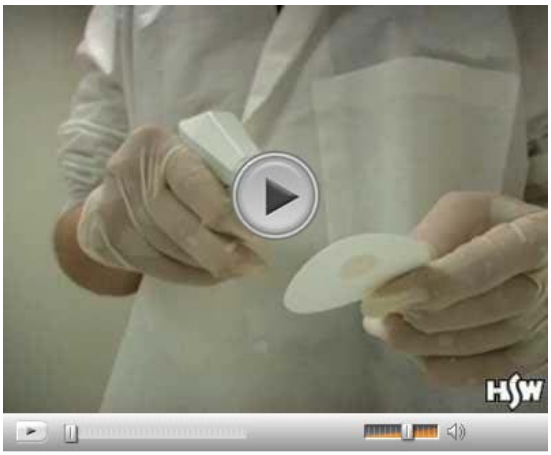
With more sophisticated technology such as DNA profiling, experts are finding that fingerprints aren't as perfect a system as we'd like to think. Despite the importance of fingerprinting and its useful practice, some actually argue against its supposed infallibility: Some courts have even overturned cases because of bad fingerprint matches, including a 1998 murder trial in which a Delaware man was wrongfully convicted and spent two years in prison [source: NY Times].

Fingerprints aren't the only things a suspect can leave at the scene of a crime. One of the most influential philosophies behind modern forensic science, commonly known as **Locard's exchange principle**, states that "with contact between two items, there will be an exchange." The late chemist and forensic scientist Paul L. Kirk elaborates:

> "Wherever he steps, whatever he touches, whatever he leaves even unconsciously, will serve as silent witness against him. Not only his fingerprints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool marks he leaves, the paint he scratches, the blood or semen he deposits or collects -- all of these and more bear mute witness against him."
> [source: Footwear Impression Evidence: Detection, Recovery and Examination]

Another option investigators have when examining a crime scene is **impression evidence**, an important and sometimes overlooked aspect of the criminal investigation process. What do forensics experts look for when they investigate impression evidence? How do they preserve impression evidence, and what can it tell them about a crime scene? To find out how forensic scientists make an impression on the jury, read on.



Forensic Experts Examine a T-Shirt
HowStuffWorks Original Video: From the archives of Discovery: Using a variety of methods, forensic researchers hope to discover evidence of crime on this t-shirt. Learn more about forensic science and methods. (February, 2008)

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Impression Evidence -- Footprints, Tire Tread and Tool Marks

Although we're not conscious of it all the time, every movement we make -- whether it's on foot or in a vehicle -- leaves some kind of impression. For example, a criminal walking into a building to rob a bank and then screeching off in a getaway car can't avoid walking on the floor or leaving tire tread marks. A murderer would also have a hard time entering and exiting his victim's home without stepping on a rug or touching the ground outside.

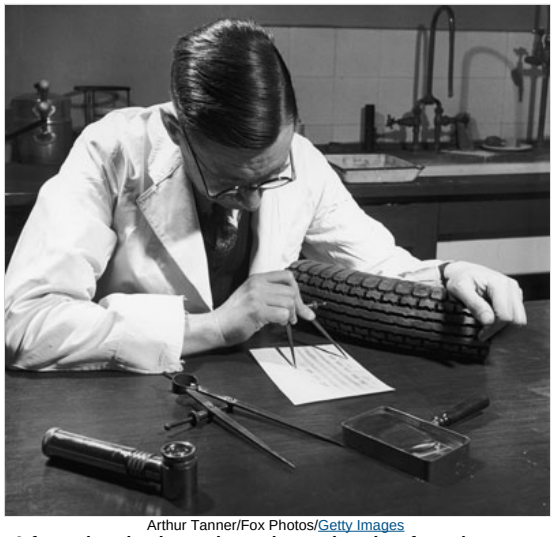
Pool/AFP/Getty Images
Defense attorney Barry Scheck shows the jury a picture of a second shoe imprint that he believes could be that of a second assailant during the O.J. Simpson murder trial in Los Angeles.

Impression evidence happens when any object or material takes on the form of another object though direct physical contact. A judge or jury can consider any type of impression as evidence in a trial, and the practice works the same way as fingerprinting: Once investigators collect evidence, impressions are used to find legitimate matches. There are three main types:

- Footprints (or shoe impressions)
- Tire tread impressions
- Tool markings

When we walk into a room, we're usually not thinking about our footprints. Unless we're tracking in mud or rainwater and making a huge mess, it's nearly impossible to see the traces we leave with each step. But several things happen when our shoes touch the ground.

Perhaps most surprisingly, even clean, dry shoes can leave an impression on a hard surface by creating **electrostatic charges**. Simply sprinkling fingerprint dusting powder over recent footprints will attract the powder to the charge and create a visual image of the impression. Unfortunately, residual static charges don't last very long and can be easily upset, so forensic experts rely more on the deformation of surface areas. Shoe impressions on materials such as soil, sand or snow can produce a largely three-dimensional footprint. If you've ever driven a car through the mud, you've probably seen the clear scar the tires have left in the earth. Carpet or grass, however, will rebound and regain a flat surface more easily, and an impression on these types of surfaces will only last a short time. Still, stains and other residue will leave two-dimensional marks and create a recognizable image.



Arthur Tanner/Fox Photos/Getty Images
A forensic scientist analyzes tire tracks taken from the scene of a hit-and-run car crime.

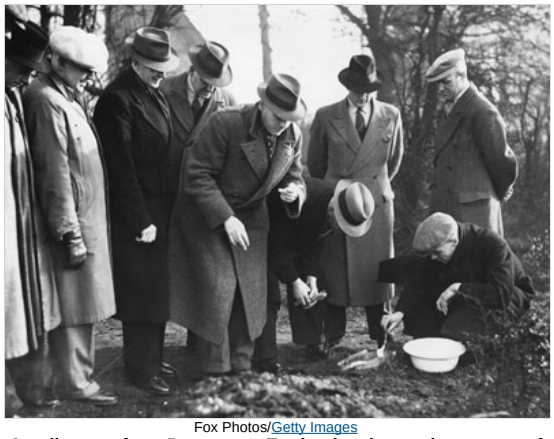
Tire marks work the same way as footprints, although tire marks are much easier to identify. Initially, a tire mark can tell an investigator the brand of tire a criminal used, but that only narrows things down slightly. Further inspection, however, can reveal more -- defects and wear on a tire tread caused by nails, gravel, patches and alignment problems can identify a unique set of tires.

Lastly, tool marks are created when a tool comes into contact with another object or surface and leaves a significant impression. Suspects typically use wire cutters, crowbars and screwdrivers to cut and pry their way into windows and doors. All of these tools leave distinctive marks that investigators can easily identify -- almost as if the tool itself were leaving a fingerprint at the crime scene.

We know that criminals can leave these traces behind them after they commit a crime, but how easy is it to detect them? And how do experts record them for later analysis? To read about preserving impression evidence, pry open the next page.

Preserving Impression Evidence -- Plaster Casts

When approaching a crime scene with the intention of recording impression evidence, the first thing forensic investigators are taught to do is to secure and preserve the area. Because impressions are easily disturbed and often overlooked, a scene filled with too many people walking around could quickly become worthless to someone looking for footprints.



Fox Photos/Getty Images
A policeman from Doncaster, England makes a plaster cast of footprints left by a housebreaker.

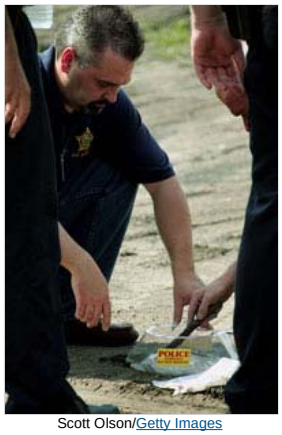
Once a perimeter is secure, investigators walk inward, looking for impressions and reconstructing the events of the crime to the best of their knowledge. They try to determine important facts such as the direction of travel or the number of suspects at the scene. Special lighting techniques can uncover hidden impressions, including the use of **oblique lighting**. By shining a light source diagonally at the ground, not vertically, the ridges of an impression create shadows which alert investigators to disturbed and uneven surfaces. Photographs of discovered impressions are also taken for visual documentation.

Although impression evidence is extremely fragile, if left undisturbed it can remain for long periods of time. As long as a crime scene area isn't harmed by weather (mainly wind, rain and snow) or disturbance from other shoes, tires or tools, there are two major techniques experts use to gather impression evidence:

- **Latent (two-dimensional) impressions** - Latent impression recovery is very similar to basic fingerprinting. This technique is used for difficult-to-preserve, two-dimensional impressions on materials such as tile floors, wood floors or chairs. Powder is applied with a brush to make the

print more visible, and then tape or a lifting machine records a visual of the impression.

- **Casting** - To recover larger, three-dimensional impressions such as tire marks or footprints left in muddy conditions, experts use casting. The process works in very much the same way as an orthodontist makes a model of a patient's teeth: A substance is poured into the impression, hardened, and then removed, providing a cast of the print on the ground. Investigators use a variety of products to create casts, but dental stone, in fact, is widely considered the best casting material due to its strength, accuracy and ease of use.



Scott Olson/Getty Images
Hammond, Ind. police officers make a mold of a tire track near the scene of a reported sniper shooting.

As available equipment and techniques for forensic science improve, many in the field are realizing the importance of impression evidence. Although easy to overlook and difficult to locate, footprints and other impression evidence left at the scene of a crime are typically even more prevalent than fingerprints, and they can provide important clues to mysterious cases. To learn more about the shadowy world of criminal investigation, step lightly to the next page.

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Sources

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